



**Public work contract for “Public works contract for the
construction of the Nsumbu Enviromental and Climatic Monitoring
Centre ”**
Reference N°: BDI25003-10005
Country: Zambia

GENERAL SPECIFICATIONS

JULY 2026

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GENERALLY

A.1 Description of work

Taking account of sustainable green construction the construction shall involve the use of a stone masonry foundation since stones are locally available at the villages and will not require long distance transportation a depth of foundations shall be of about 1.5m (the exact depth to be confirmed at the site),

Walling: we will use interlocking soil-stabilized bricks (ISSB) wall, which reduces the carbon emission foot print compared to concrete or fired bricks. The height of the wall will be of 2.8m, hollow bricks at a height of 3.1m on the beam. The roof is mono pitched roof with gutters around to collect rainwater to a 5000L tank placed on the constructed ground base of 0.6m high.

Above the ring beam, there is a perforated bricks wall of 0.74 m high, which shall include a coffee mesh inside to protect the rooms from dusts and pests. The construction shall include vented windows, large enough to allow usage of daylight in the building, toilets, incinerator, laundry, fence and water tank tower.

The roof will be made of timber trusses as timber is a sustainable material which grow faster. All truss members shall be of eucalyptus timber with greater than 18% moisture content to archive workability while purlins, fascia board and brandering will be of well-treated pine timber.

A.2 Standard of materials

Throughout this document, products, materials and workmanship have been specified to be in accordance with relative British Standard Specifications or British Codes or Practice.

If products or materials which comply with these standards are no longer locally available or not imported and the tenderer, if awarded this contract, intends to use other materials which do not comply with these standards, then tenderers must allow in their prices for the best quality of such materials s in locally available.

In the event of the tenderer allowing in his prices for using alternative standards of materials to those specified, his tender must be qualified by listing the various alternatives to be used. The successful tenderer must then subsequently submit samples of the alternative materials to the Architect as soon as practicable after the award of the contract, and must obtain his written approval before purchasing the particular materials.

Where alternative materials are not listed with the tender, the tenderer will be deemed to have allowed in his prices for the standard of materials specified.

A.3 Alterations or qualifications

No alteration addition or qualification of any kind whatsoever may be made by the Tenderer to the text of the Bills of Quantities.

If any alteration addition or qualification is made by him it will be ignored and the text as prepared by the Quantity Surveyor will be rigidly adhered to.

Tenderers must tender strictly on the basis of the terms and conditions of contract specified in this document. Tenderers wishing to put forward alternative conditions may only do so by submitting an alternative tender under the terms and conditions which they wish to substitute for the conditions given in this document. Tenderer submitting an alternative tender must however also tender on the conditions given in this document, otherwise their tender will be automatically disqualified.

A.4 Contractor to Check

The Contractor is required to check the page numbers of the Bills of Quantities and should any be found missing or in duplicate or other figures or writing indistinct, the Contractor must notify the Quantity Surveyors at once and have the matter rectified before the Tender is submitted. No liability whatsoever will be entertained in respect of any claim for errors in the Contractor's Tender resulting from failure to comply with the foregoing.

A.5 Details to be private and confidential

The Drawings, Bill of Quantities and Contract Documents applicable to this Contract are restricted by copyright.

The Contractor shall treat the details of this Contract as Private and Confidential for his own information only and shall not publish or disclose the details of the Contract in any trade or technical paper or disclose the details of the Contract in any trade or technical paper or elsewhere (except as necessary for the purpose hereof) without the previous consent in writing of the Employer.

A.6 Method of Measurement and Notes

The whole of the work contained in these Bills of Quantities is measured in accordance with the Standard Method of Measurement of Building Works for East Africa – metric edition October 1970 published by the Architectural Association of Kenya, Chapter of Quantity Surveyors, and such measurements and descriptions contained in these Bills shall be deemed to be full and sufficient for the purpose of this Contract, subject to the correction of omissions and errors in accordance with Clause 12(2) of the Conditions.

Notwithstanding the provision of SMM Clause A.6 (a), (b) and (c), fractions of a unit or of a kilogramme less than half which would cause an entire item to be eliminated have been regarded as whole indicating a reference e.g. BS, type, grade.

The following abbreviations have been used: -

Number	No
Metre	M
Lineal metres	LM
Square metres	SM
Cubic metres	CM
Kilogrammes	KG
Millimetre	mm
Centimetre	cm

A.7 Standard Measurements

All units of weights and measurements shall have the meaning ascribed to them by the Weights and Measures Ordinance, CP. 426.

A.8 Dimensions and Details

Figured dimensions on the drawings shall be followed in preference to scaled dimensions and drawings to a large scale shall be followed in preference to those of a smaller scale except for reinforced concrete drawings and details in which case only figured dimensions shall be followed.

A.9 Drawings

Before tendering the Contractor should examine the drawings which may be seen at the offices of the Architect during normal office hours, and shall satisfy himself regarding their detail as no claim by reason of ignorance in this connection will be entertained.

A.10 Shop Drawings

Shop Drawings of all fabricated work to be done by the Contractor shall be submitted to the Architect for approval, and no work shall be fabricated by the Contractor, save at his own risk, until approval has been given. These shop drawings shall be submitted in quadruple.

The Contractor shall submit 4 copies of shop drawings sufficiently in advance of requirements to afford the Architect ample time for checking them; including time for correcting, resubmission and rechecking if necessary, and no claim for extension of the Contract period will be granted to the Contractor by reason of his failure in this respect. Two final corrected, certified copies shall be filed with the Architect.

All shop drawings submitted must bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractors for proper resubmission.

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Generally

A.10 Shop Drawings (Cont'd)

If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if accepted, suitable action may be taken for proper adjustment, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though such shop drawings have approved.

Where a shop drawing as submitted by the Contractor indicates a departure from the Contract which the Architect deems to be a minor adjustment in the interest of the Employer not involving a change in the Contract Sum or extension of time, the Architect may approve the drawing.

The approval of shop drawings will be general and shall not relieve the Contractor from the responsibility for adherence to the Contract, nor shall it relieve him of the responsibility for any error which may exist.

A.11 Preambles to Sections

To avoid long description and repetition, certain descriptions of measured items refer to the preambles by quoting the clause prefix or by using the words "as described". Whether so referred to or not all instructions and information contained in the preamble clauses shall be deemed to have been taken into consideration in pricing the whole of these bills.

A.12 Pricing

A pricing or rate is to be entered against each item where provision is made in the Bills of Quantities whether quantities are stated or not. Items against which no rate or price is entered shall be deemed to be covered by other prices or rates in the Bills and no other adjustment will be made in respect of such omission.

A.13 Examination of rates and Prices

The priced Bills of Quantities will be examined prior to the appointment of the Contractor and the signing of the Contract in order to ascertain that the quantities are correctly extended and that the summations are in order.

In the event of any error being found in the computation of the tender Sum, such error will be notified to the tenderer, who will then have the opportunity of confirming or withdrawing his tender. If the tender as submitted is confirmed, all rates and prices (excluding preliminary items, contingencies, prime cost sums and any profit and attendance added thereto by the tenderer and Insurance and Surety costs) inserted therein are to be considered reduced or increased or increased in the same proportion as the corrected total of priced items exceeds or falls short of the original total of such items.

A.14 Abbreviations etc.

Words importing the singular only also include the plural and vice versa where the context requires.

The term "and the like" used in these bills shall mean analogous work to that described in accordance with the groupings indicated in the Standard Method of Measurement.

The term "the works" shall mean the whole of the works envisaged by this Contract, including, unless expressly stated otherwise, the works of Nominated Sub-Contractors, Nominated Suppliers, Local Authorities and Public Undertakings.

The followings have been used in the description of items in these bills:-

B.S.	British Standard Specification
B.S.C.P.	British Standard Code of Practice
SMM	Standard Method of Measurement of Building Works for East Africa (First Edition) Metric October 1970
CI	Preamble clause number
P.C.	Prime Cost
(m.s.)	(measured separately)

A.15 Queries during tendering

Any doubt or obscurity as to the meaning or intention of the Contract Documents, or any question arising, shall be taken up in writing, before the Tender is submitted, with the Architect who will upon request, set out the intent and meaning of any Part.

A.16 Preparation of Tender

No claim will be allowed for traveling or other expenses which may be incurred by the Contractor in visiting the site or preparing the Tender for Works.

A.17 Bills of Quantities not to be used for ordering

The Quantities stated in these Bills of Quantities shall not be used for the ordering of materials.

EXCAVATION AND EARTHWORK
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EXCAVATION AND EARTHWORKS

DEFINITIONS

B.1 Removing trees, hedges and the like

The removal from site of trees, stumps and roots, hedges, bushes, scrub, undergrowth and the like shall be deemed to be included with the items for cutting down and grubbing up roots.

B.2 Surface level

The term "Surface level" shall mean the ground level after clearing site.

B.3 Clearing site

The description of clearing site shall be deemed to include clearing and removing from the site of all loose debris and rubbish, bushes, scrub, undergrowth, vegetation and small trees (i.e. not exceeding 600 mm girth), and grubbing up their roots.

B.4 Rock

The term 'rock' shall mean any natural material which cannot be dislodged by a pick and which can only be removed by the use of compressors or by blasting or wedging. This classification does not include materials such as loose rock, concrete or other materials that can be removed by means other than drilling and blasting or drilling and wedging, but which for reasons of economy in excavating; the Contractor prefers to remove by drilling and wedging.

Unless specifically stated hereafter, the Contractor must assume that permission to use explosive to remove rock will be refused and he must therefore price for removing rock by compressors etc. only.

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B.5 Level

The levels shown on the various drawings relate to the ground floor finished floor levels.

The Contractor shall be responsible for setting up and maintaining a site datum level accurately ascertained from this work. Immediately following the issue of the Order to Commence, the Contractor shall carry out and record a check level grid of the site which shall be agreed between the Architect and the Contractor within one week of the above Order being given, no alteration of levels shall be undertaken until agreement has been reached and the Architect's instructions has been received.

B.6 Bore holes and nature of the soil

It will be deemed that the Contractor has inspected the drawings and site and has consulted all available information concerning subsoil conditions before submitting the Tender. In making information available on subsoil conditions, the Employer does not in any way absolve the Contractor from his responsibilities, nor is it guaranteed that similar conditions apply to any specific part of the site.

B.7 Unauthorized excavation

The Contractor is prohibited from making excavations other than those approved by the Architect as necessary for the works.

B.8 Borrow pits

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

MATERIALS

B.9 Blinding

Blinding shall be of the same materials as the hardcore be, crushed and graded from 4 mm upwards, free from clay, chemical or other pollution, pests, weed roots and rubbish.

B.10 Hardcore

Hardcore shall be good, clean, hard, broken stone broken placing to pass a 100 mm ring and free from all rubbish.

B.11 Approved filling for filling under floors

Approved filling for filling under floors shall be clean, dry pit or river sand excavated material or subsoil free from clay, roots and any impurities.

B.12 Soil for backfilling around foundations

Soil for backfilling around foundations shall be dry, clean subsoil free from clay, vegetable soil, roots and rubbish.

WORKMANSHIP

B.13 Generally

The Contractor shall control the grading around the building so as to prevent water running into excavated areas and into completed sections of the works.

B.14 Removal of obstructions

In the event of any derelict foundations, walls, slabs, kerbs, etc., being discovered upon the site of the works, they shall, if below new foundations are completely removed to a level of 150 mm below the level of the excavation indicated on the drawings. For graded or planted areas any such obstruction shall be removed to a depth of 600 mm below the finished grade.

Filling voids caused by removal of such obstructions shall be executed in accordance with Clause D.20 herein

B.15 Bottoms of excavations to be approved

The Contractor shall give the Architect at least 48 hours notice (this time shall be doubled if the site of the works is more than 100 kilometres from the nearest permanent office of the Architect or Engineer) when the excavations will be ready for inspection. The bottom of every excavation will be inspected by the Architect and the level thereof agreed between the Architect and the Contractor. If a good bearing bottom is not obtained at the level shown the Architect is to be informed. No concrete is to be laid until the bottom has been approved and the level thereof taken. Any concrete work or other work done before such approval, shall, if so directed be removed and new work substituted after excavations have been approved, all at the Contractors expense.

Notwithstanding such approval, any bottom which becomes waterlogged or otherwise spoilt after approval, shall be cleaned out and reformed to the Architect's approval before any concrete is placed.

B.16 Disposal of excavated material

Vegetable soil shall be spread and leveled where directed by the Architect on site. Surplus excavated material were directed or required shall be removed from the site to a tip, the location of which shall first be approved by the Architect in writing. All fees and charges in connection there with shall be deemed to be included in the Contract Sum.

Specification

Excavation and Earthwork

(2/B/3)

B.17 Excavation below required levels

Should any excavation be taken below the required levels or the depths necessary to obtain a suitable bottom, the Contractor will be required to fill in the excavation to the proper level with concrete of the same specification for the foundations at his own expense.

B.18 Timbering, planking and strutting, etc

The Contractor shall provide all necessary timbering, planking and strutting, etc., to uphold the faces of excavations, which shall only be removed when it is safe to do so.

B.19 Timbering, planking, strutting, etc., left in

Where the Architect instruct or agrees that it is necessary for the safety of the works to leave in certain timbering, planking and strutting, etc., such timber shall be measured and agreed before covering up.

B.20 Filling

Return filling around foundations and filling to make up levels under floors and pavings shall not be deposited until the formation level has been approved by the Architect. In no case shall fill be deposited on a muddy formation. Filling shall be deposited in layers not exceeding 250 mm in depth before compaction and shall be compacted by rolling, pneumatic tamping or other approved means over the whole of the area. If necessary, the filling shall be allowed to dry or be moistened to the correct moisture content before compaction. The finished surface shall be approved by the Architect prior to further Construction work thereon.

The Contractor shall afford every assistance to the specialist executing site sterilization to enable each layer to be treated separately.

Filling around foundations in layers shall not proceed without each layer being so treated.

No excavation or foundation work shall be filled in or covered up until all measurements necessary for the adjustment of variations have been made. Walling shall not be built upon the foundations until four days after depositing of concrete.

B.21 Consolidation of hardcore

Hardcore shall be consolidated with a roller, vibrating roller, or mechanical punner to a compaction equivalent to that obtained with a 2.5 to 3 tone roller, care being taken that no damage is done to the foundation walls.

Hardcore shall be blinded and have the interstices filled to receive concrete beds and the like with blinding as described herein. Before placing concrete hardcore beds shall be well watered through a sprinkler rose, and rolled, to prevent water absorption from the concrete.

Where described as blinded to receive building paper or polythene or any other membrane the blinding shall be finished and compacted with fine material which will not cause the membrane to puncture under wheel or foot traffic or by the placing of concrete thereon.

B.22 Existing services

Active existing services shall be adequately protected from damage. Where active services are encountered but not shown on the drawings, the Architect shall be notified by the contractor.

Where inactive services are encountered upon the site of the works, they shall be removed or sealed off in accordance with the direction of the Architect.

B.23 Protection

The Contractor shall protect all graded and filled areas from the actions of the elements. Any settlement or washing that occurs prior to acceptance of the works shall be repaired and grades re-established to the required elevations and slopes.

B.24 Anti termite treatment

Anti termite treatment shall be carried out using 'Gladiator 1.0%' solution or other chemical approved by the Architect in writing, diluted to a water emulsion containing a minimum of 1.0% of the chemical.

The treatment shall be applied to the whole area of the hardcore bed immediately prior to the placing of the concrete floor slab at the rate of 7 litres per square meter, and to the backfilling on both sides of all perimeter walls at the rate of 80 litres per cubic meter of backfilling on both sides of all perimeter walls at the rate of 80 litres per cubic meter of backfilling. Each compacted layer of backfilling shall be separately treated.

Treatment shall not be applied whilst it is raining or to surfaces of backfilling which are wet.

The Contractor's attention is drawn to the fact that 'Gladiator' is toxic to animal 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 of the building.

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

- (a) that the chemical used complies with this specification and has been used in the concentrations stated herein,
- (b) 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.

B.25 Method of measurement

The prices throughout this Document are to include for digging in any type of ground including loose or compacted hardcore, rubble debris and the like, roots, or normal obstructions, with the exception of rock as defined herein and excluding any existing foundations, walls and similar hard substances. The Contractor must give notification to the Architect or his representatives as soon as he considers rock as defined herein or existing foundations are encountered so that its extent can be agreed with the Architect, Clerk of Works, or Quality Surveyor before the work is carried out or covered up. Payment for such excavation will not be allowed unless this procedure is followed.

The formation and removal of temporary spoil heaps and multiple handling or excavated material shall be deemed to be included in the prices for returning excavated material around foundations, earth filling and removing surplus excavated material from site.

Excavation for plain concrete foundation has been measured to the net sizes required by concrete dimensions. Formwork has been measured to the sides of all reinforced concrete foundations or bases, together with the necessary working space allowance required under the provisions of SMM Clause D5(f). Should the Architect direct or approve the pouring of concrete to reinforced foundations or bases against the face of excavations, such adjustment will be measured and valued in accordance with the Conditions of Contract.

Rates for excavation shall be deemed to include for leveling, trimming and compacting bottoms and any additional excavation required for planking and strutting.

Specification

Excavation and Earthwork

(2/B/5)

CONCRETE WORK

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- C.2 Proportions of concrete mix
- C.3 Testing of materials generally
- C.4 Testing of concrete in the field

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- C.5 Measurement and Mixing
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- C.7 Inspection of reinforcement
- C.8 Formwork
- C.9 Tolerances
- C.10 Placing and compaction

CONCRETE WORK

C.1 Storage of materials

Cement shall be kept dry and used in rotation of deliveries. If delivered in bags these shall be stored off the ground in a well ventilated and weatherproof shed used exclusively for this purpose.

The shed is to be sufficiently large to contain a working stock and provided with partitions or such other means as may be necessary, to ensure the effectual separation of the various consignments and type of cement. Stacking of cement in bags over a height of ten bags will not be permitted. Cement may be delivered in bulk containers provided additional suitable arrangements are made for bulk storage on site to the approval of the Architect/Engineer.

Aggregates shall be stored at mixer positions on drained concrete paved areas, with stout dividing walls between different sizes and types of aggregates. It shall be allowed to stand for at least 24 hours before being used.

Reinforcement shall be stored by type, size and length, either off the ground or on clean surfaced areas, and shall be kept free from rust

C.2 Proportion of concrete mix

The quantity of cement shall be measured by weight and each batch of concrete is to use one or more whole bags. The quantity of fine aggregate and coarse aggregate shall be measured separately by weight batching plant. Volume mixing will not be permitted.

For grading tests the Contractor shall supply and deliver at his own cost to the Nominated Testing Authority, samples of the aggregates which the Contractor proposes to use, consisting of not less than 50 kilograms weight in coarse aggregate and not less than 25 kilograms weighting fine aggregate.

It is the Contractor's responsibility to ensure that the subsequent deliveries of aggregate conform to the grading analysis of the approved samples.

The proportions of materials to be used for the preliminary cube tests, and subsequent batching, shall be ascertained by calculation from the results of the aggregate grading tests carried out by the Nominated Testing Authority.

Preliminary concrete cubes shall be made by the Contractor on site, as required by the Engineer, and tested by the Nominated Testing Authority. As a result of these definite weights of each material for batching shall be ascertained and agreed with the Engineer. Thereafter these proportions shall be adhered to throughout the works and may be varied only by instructions given by the Engineer.

The weights of damp aggregates must be adjusted to take into account the weight of water in the aggregates, and this in turn will affect the amount of water to be added to the mix.

Through the carrying out of the Contract, "Works Cube Tests" are to be made from concrete drawn from newly laid concrete or concrete about to be placed in position, such cubes being made when directed by the Engineer and in his presence. Such cubes shall be made in 150 mm cube steel or cast iron moulds and shall be marked and cured strictly in accordance with the Appendices of the code of practice, and shall be forwarded carriage paid in time for testing at the required age to a testing laboratory to be nominated by the Engineer. Four cubes shall be made on each occasion, concrete for each cube being from a different batch. Two cubes shall be forwarded in time for testing at the age of seven days from casting and two cubes in time for testing in twenty eight days.

Each cubes shall be marked with the date of casting and a distinctive reference number in accordance with a system agreed by the Engineer. A record shall be kept of the position from which the concrete for each set of cubes was drawn, or to which it was about to be placed

C.2 Proportion of concrete mix (Cont'd.)

At least three sets of cubes shall be cast during each week concrete is being cast including sets of cubes for each quality of concrete used during the period

Concrete is required to have the properties and give the strength in Newton per square millimeter as follows:-

Class	Quality	Max. size of coarse Aggregate	Max water cement ration by Weight	Min crushing strength of Works Test Cubes	
				7 days	28 days
31.5/20	1:1:2	20 mm	0.45	23	31.5
26.5/20	1:1.5:3	20 mm	0.50	19	26.5
21./20	1:2:4	20 mm	0.58	15.5	21
21/13	1:2:4	13 mm	0.58	15.5	21
13.5/25	1:3:6	25 mm	0.60	9	13.50
1:4:8	1:4:8	40 mm	0.60	-	-
1:10	1:10	“All – in” aggregate		-	-

The above properties and crushing strengths are to be considered as the minimum standard that will be accepted in the finish at works. The average crushing strengths should be at least 15% higher than the minimum permissible values given in the above table.

If the strength required in the table are not attained and maintained throughout the carrying out of the contract, the contractor will be required to increase the proportion of cement or substitute better aggregates at his own cost so as to give concrete which does comply with the requirements of this clause. The contractor may be required to remove and replace at his own cost any concrete which fails to attain the required strength as ascertained by the works cube tests.

C.3 Testing of materials generally

The Contractor shall include in his Tender prices for the execution of his part of operations specifications specified for testing herein and for supply of the requisite equipment. After specified initial testing and approval of materials, it is the Contractor's responsibility to ensure and to demonstrate by the submission of further similar samples when so required that subsequent deliveries conform to the quality, grading and (where applicable), colour of the approved samples.

C.4 Testing of concrete in the field

(i) Trial mixture

Prior to the commencement of the actual concreting work, a trial mix of the required concrete, as described herein shall be made by the Contractor and tested by an approved laboratory at the Contractor's expense, in order to check and establish the actual working crushing strength of the required concrete mix.

WORKMANSHIP

C.5 Measurement and mixing

All cement is to be measured by weight, the 50 kg bag of cement being used as a unit.

The amount of water shall be the minimum required to produce a dense cohesive concrete of adequate workability, to be determined by trial mixes. This amount shall be accurately gauged and adjusted from time to time to compensate for variations in moisture content of the aggregate by an approved method.

All concrete shall be mixed in a batch type mechanical mixer of approved type having a drum rotating about a horizontal or inclined axis. The speed of the drum is to be not more than twenty and not less than fourteen revolutions per minute.

Each mixer is to be fitted with a water measuring device capable of accurate measurement to five litres for one cubic meter mixers and prorata for smaller sizes and so arranged that the accuracy is not affected by variations in the pressure of the water supply line. The fine and coarse aggregate and the cement shall be mixed for at least four turns, after which the required amount of water shall be added gradually while the mixer is in motion and the concrete mixed for not less than one and a half minutes to uniform colour and consistency.

The volume of concrete mixed in any one batch is not to exceed the rated capacity of the mixer.

The whole of the mixed batch is to be removed before materials for a fresh batch enter the drum.

Concrete as mixed in accordance with the foregoing shall not be modified by the addition of further water or in any other manner. On the cessation of work, including all stoppages exceeding twenty minutes, or any change of type of cement used in the mix, the mixer and all handling plant shall be washed out with clean water.

At least one slump test shall be made each day concreting is in progress, under the supervision of the Engineer.

C.6 Reinforcement

Reinforcement shall be free from all loose mill scale, loose rust, oil, grease or similar defects, immediately before placing the concrete. It shall be bent cold exactly to detail using an approved bending machine. Hooks, bobs, bends, etc. where not, specifically detailed, and are to be in accordance with B.S. 4466 and B.S. 4449. Each bundle of bent bars shall be clearly tagged with the bar list number.

Reinforcement shall be placed in the exact position shown on drawings with all inter-sections tack welded or securely tied with 16 gauge soft iron tying wire. The designated cover shall be maintained by approved spacers, chairs, bolsters or ties fixed to the reinforcement. These shall be dense concrete left with a wire brushed surface or be dipped in grout before fixing. These blocks are particularly important where the surface of the concrete is exposed to the weather or dampness. The contractor must ensure that the bars are securely fixed so as to maintain their indicated positions during the progress of pouring, tamping or vibration of concrete. Six chairs are to be provided around each column to hold top steel in position and chairs are to be made up of mild steel bars of adequate diameter. The cost of providing and fixing these steel chairs must be allowed for by the contractor in his rates for reinforcement generally. No laps or splices in bars shall be made except for those detailed on the drawings without prior approval of the Engineer.

The size and position of the reinforcing bars or mesh shall be approved by the Engineer before concreting commence. The insertion of reinforcement into concrete already placed the lengthening of bars by welding and the rebinding of incorrectly bent bars will not be permitted.

For concrete having exposed surfaces, reinforcement shall be assembled and placed in such a manner as to avoid any damage to formwork faces. (Cont'd.)

C.6 Reinforcement (Cont'd.)

Where reinforced concrete slabs or walls are constructed against tanking, care shall be taken in positioning reinforcement to avoid damage to tanking.

Unless otherwise shown upon the Engineer's drawings, or specified in **BS 8110**, the reinforcement bars shall be given the following cover to concrete.

In floor slabs, walls and similar thin paneling, a cover of **20** mm, or the size of the bar, whichever is the greater. In beams and other such members, a cover of concrete of **30** mm to the main reinforcement, or the size of the bar, whichever is greater.

In columns, a cover of concrete of **35** mm to main reinforcement, or the size of the bar, whichever is greater.

In foundations and column bases, a cover of 50 mm (in dry soil) to main reinforcement or the size of the bar, whichever is greater. Where subsoil water exists a cover of 75 mm to main reinforcement or the size of the bar, whichever is greater.

C.7 Inspection for reinforcement

When the placing of the reinforcement for particular section of the works is completed and before concreting commences, the reinforcement will be inspected by the Engineer and no concrete shall be placed until the Engineer's approval has been given. The contractor shall give the Engineer 48 hour notice of the time when the reinforcement will be ready for inspection. Where the distance of the site of the works is more than 100 kilometers from the nearest office of the Engineer, this time be increased to 96 hours.

C.8 Formwork

Formwork shall be true to line, level, face and profile and be of robust construction adequately framed, braced, strutted, cramped, tied and propped to restrict deformation due to constructional loads to not more than 3 mm, and to entirely eliminate deformation of the form faces by warping or buckling. Wire ties will not be permitted. Formwork shall be grout – tight under all conditions including vibration when specified or used.

Formwork shall be designed to allow prefabrication of conveniently sized elements to facilitate ease of handling and assembly, to permit striking without force shock or any damage whatever to the concrete member or formwork faces and to permit the removal of sides without disturbing soffits and soffits without disturbing necessary props. Propping shall be carried down to an approved bearing, shall not be supported by timber floors and shall be arranged that formwork may be lowered smoothly.

Re-propping will not be permitted. Provision shall be made for cleaning out and draining. Formwork shall be constructed of material or lined with material as may be necessary to achieve the finishes specified herein and in such a manner as to eliminate screw or nail imperfections.

Before each use, form faces shall be treated with the minimum amount of approved mould oil necessary to obtain a clean release. Mould oil shall not come into contact with the reinforcement. The use of cement retarders will not be permitted except where a key for other finishes is required.

Before placing of the concrete, bolts and fixing shall be in position and cores and other devices used for forming openings, holes, pockets, recesses, ducts or other cavities shall be fixed to the shuttering. Immediately prior to concreting, formwork shall be thoroughly cleaned out and re-checked. No placing shall commence until the Engineer has inspected the formwork and given his consent for concreting to proceed, but such consent shall not relieve the contractor of his responsibility for its sufficiency. After striking, formwork shall be cleaned, stacked and protected and before re-use shall be serviced, made good or replaced with new as may be necessary to maintain the finish and standard.

C.9 Tolerances

The maximum tolerances within concrete work shall be constructed are as follows:-

- | | |
|--|-----------|
| 1. All setting out dimensions, and dimensions
Horizontally and vertically | +/- 5 mm |
| 2. Sections of concrete member | +/- 3 mm |
| 3. Levels of floor slabs, beams, lintels etc
(top and bottom) | +/- 5 mm |
| 4. Plumb of columns and walls in storey height | +/- 5 mm |
| 5. Plumb of columns and walls in full building
Height | +/- 20 mm |
| 6. Inside faces of lift shafts in storey height | +/- 5 mm |
| 7. Inside faces of lifts in full building
Height. | +/- 15 mm |
| 8. Concrete cover to reinforcement | +/- 3 mm |

No surface intended to be horizontal or vertical shall slope more than 2 mm in 1 meter.

Any rectification of work not constructed to the tolerance set out above, shall be entirely at the responsibility and expense of the contractor.

C.10 Placing and compaction

No traffic whatsoever, wheeled or foot, shall take place over reinforcement or placed concrete and the contractor shall provide all necessary stools, walkways, platforms and barrow runs. Concrete shall be placed in its final position as rapidly as practicable by methods which preclude segregation or loss of ingredients and in any case, within 30 minutes from the time that water is added to the mix; compaction shall be completed before initial set commences. Partially set concrete shall not be re-worked or used. "Flowing" in formwork shall be avoided by placing and compacting in shallow layers in quick succession.

Concrete shall be placed into the forms as less a height as possible and shall in no case be dropped from a height of more than 1500 mm except with the approval of the Engineer.

When chuting is used, the inclination of the chute must be such as to allow the concrete to flow without the use of excessive water and without segregation or loss of the ingredients. Details of any proposed chuting plant must be approved by the Engineer before the plant is delivered to the site.

If the contractor wishes to distribute concrete by means of pumps, full details of the system must be made available to the Engineer for approval.

Concrete shall be thoroughly compacted and carefully worked, with suitable tools, into formwork and round reinforcement and fixtures so as to avoid displacement. A competent steel fixer shall attend throughout concreting to correct any unavoidable displacement.

Compaction shall be by means of vibrations, these shall be of an approved pattern, of the immersion type, and clamp-on external vibrators in adequate numbers shall be used only where the density of reinforcement precludes immersion.

Attachment to reinforcement is expressly forbidden and accidental contact with reinforcement.

WALLING

LIST OF CLAUSES

GENERALLY

- D.1 Testing
- D.2 Samples and sample panels

MATERIALS

- D.3 Cement
- D.4 Sand for mortar
- D.5 Clay bricks
- D.6 Stone for walling

WORKMANSHIP

- D.7 Storage of materials
- D.8 Wetting blocks and bricks
- D.9 Bonding walling
- D.10 Generally
- D.11 Mortar mixing
- D.12 Laying louver or screen blocks
- D.13 Stone walling
- D.14 Chases
- D.15 Method of measurement

WALLING

GENERALLY

D.1 Testing

The Contractor shall, as and when required by the Architect, submit and deliver samples of any materials for testing in accordance with the relevant current B.S. Specification. Samples of mortars, when required, are to be delivered in water tight boxes provided by the Contractor.

D.2 Samples and sample panels

Samples of all types of blocks, bricks and stone required for the works shall be produced to the Architect for his prior written approval before any orders are placed. The cost of providing samples and sample panels shall be deemed to be included in the Contract Sum.

MATERIALS

D.3 Cement

Cement shall be as described in Concrete Work.

D.4 Sand

Sand for mortar shall comply with B.S. 1200.

D.5 Clay Bricks

All clay bricks shall be obtained from a manufacturing source specified by the Architect in writing, or where not so specified, approved by him in writing, and complying with BS 3921.

All bricks incorporated into the works shall be properly burnt, clean, and hard, of well defined arris, uniform in shape and as near uniform in colour as possible. Bricks to be used for face work shall be selected to the Architect's approval.

D.6 Stone for walling

Stone for walling shall be hard clean and sound local stone from an approved quarry to the approval of the Architect.

WORKMANSHIP

D.7 Storage of materials

Cements and limes shall be stored off the ground, under cover and away from damp, and in such manner to enable them to be used in rotation in order of delivery.

Sands shall be stored separately according to type on clean, hard dry standing and protected from contamination.

Sands for pointing shall be stored separately, away from other sands and shall be obtained in sufficient quantity at one time to enable materials or the approved colour to be used for the whole of the work.

Precast concrete blocks and louver or grille blocks and clay bricks and blocks shall be open stacked to permit ventilation and protected from the sun, rain and rising damp.

D.8 Wetting blocks and bricks

Concrete blocks and louver or grille blocks and clay bricks and blocks shall be wetted as necessary before and after laying. Walls shall be kept wetted for three days after building.

D.9 Bonding walling

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. Sufficient through bonders shall be provided as directed by the Architect. Alternative courses of walling at all angles and intersections shall be carried through the full thickness of the adjoining walls. All walling shall be built up entirely solid in blocks, without voids, allowance being made for joints 10 mm thick only. All perpend; reveals and other angles of the walling shall be built strictly true and square.

D.10 Generally

The Contractor shall provide all setting out rods.

All surfaces on which blockwork or brickwork is to be built shall be clean. All blockwork and brickwork shall be built uniform, true and level, with all perpend vertical and in line. No work shall rise more than 1 metre above adjoining works and all such risings are to be properly racked back in long steps to prevent cracks arising, and all walls shall be leveled around at each floor.

Joints generally are not to exceed 10 mm in thickness. Cutting of blockwork against concrete soffits, etc., shall include for cutting to give normal 10 mm joints and complete filling thereof with mortar.

D.11 Mortar mixing

All materials shall be accurately gauged by gauge boxes and mechanically mixed and used within 30 minutes of first mixing. Proportions shall be cement and sand (1:6) by volume.

Re-tempering of mortar will not be permitted. Gauge boxes and mixers shall be kept clean.

D.12 Laying louver or screen blocks

Louver or screen blocks shall be built in mortar with all joints flushed up, surplus mortar wiped from the face of the blocks and finished fair.

D.13 Stone walling

The stone shall be well bonded with a minimum of one good bond or through stone evenly spaced to each square metre. All cavities and joints in stonework are to be filled in and flushed up solid with mortar.

Jointing and pointing are as detailed or instructed.

D.14 Chases

Where walling is cut, holed or chased for conduits, pipes or the like, all such chases shall be filled in solid with cement mortar mix (1:4) prior to the application of finishes. In no case shall the vertical chase be deeper than one third the thickness of the wall and in no case shall the horizontal chase be deeper than one sixth the thickness of the wall.

D.15 Method of measurement

Prices for holes and chases shall include for cutting or leaving such holes or chases as may be required and the prices shall include for holes being on rake where necessary.

ROOFING
LIST OF CLAUSES

CORRUGATED OR TROUGHED SHEET ROOFING

- E.1 Sheet roofing generally
- E.2 Profiled metal sheet roofing
- E.3 Test for falls
- E.4 Protection

ROOFING

CORRUGATED OR TROUGHED SHEET ROOFING

E.1 Sheet roofing generally

All sheet coverings shall be laid away from the prevailing weather i.e. the exposed edge of the top most sheets to be on its leeward side.

E.2 Profiled metal sheet roofing

- (i) Profiled metal sheets are to comply with BS 4868 and are to be colour coated by the manufacturer after formation and of the gauges specified, laid with one and a half corrugation side laps and 150 mm ends laps. Sheets are to be properly stacked inclined to facilitate run-off rainwater.
- (i) Fixing corrugated steel sheeting is to be by means of 14 gauge drive screws in the case of a timber roof supporting structure, and 6 mm galvanized hook bolts in the case of a steel supporting structure.

Both types of fixing to incorporate a bituminous felt washer backed by a cranked diamond shaped aluminium washer immediately below the screw or nut whichever the case may be.

E.3 Test for falls

To ensure that the finish has been truly laid to falls, (minimum 1:200), the Contractor shall arrange for the roof areas to be flushed with water in the presence of the Architect. Any defects or depressions shall be rectified and retested for approval.

E.4 Protection

The Contractor shall take all necessary precautions to ensure that no damage is caused to be the roofing after completion of laying by further building operations, storage of heavy objects, traffic or any cause whatsoever.

PLUMBING INSTALLATIONS

LIST OF CLAUSES

QUALIFICATIONS OF THE RULES OF THE SMM

- F.1 Jointing pipes
- F.2 Provision of holes

DEFINITIONS

- F.3 Painting
- F.4 Welding
- F.5 Backgrounds requiring plugging
- F.6 Plugging
- F.7 Surface finishes
- F.8 Pipe sizes

GENERALLY

- F.9 Execution of plumbing work

RAINWATER INSTALLATION

- F.10 Plastic pipes and fittings
- F.11 Galvanized steel tubes and fittings
- F.12 Rainwater outlets
- F.13 Testing

PLUMBING INSTALLATIONS

QUALIFICATIONS OF THE RULES OF THE SMM

F.1 Jointing pipes

Notwithstanding the provisions of SMM Clause Q.9 (b), the prices for all galvanized steel screwed pipes shall be deemed to include for jointing with hemp and red lead or 'Boss' white unless otherwise described and the prices for all cast iron pipes shall be deemed to include for jointing with a gasket of hemp and cold caulking compound unless otherwise described.

F.2 Provision of holes

Notwithstanding the provision of SMM Clause Q.1 (g), the provision of holes shall be deemed to be included in the description of fixing.

DEFINITIONS

F.3 Painting

The preparation of surfaces shall be deemed to be included with the description for painting. Specific requirements relating to the preparation of surfaces are given in the WORKMANSHIP section or these Preambles. In the absence of specific requirement surfaces shall be prepared in the manner recommended by the manufacturer of the paint being used.

F.4 Welding

In the absence of specific requirements the techniques and material the work and the metals being connected.

F.5 Backgrounds requiring plugging

The term 'backgrounds requiring plugging' shall mean any or all of the backgrounds described in SMM Clause Q.1 (h)(iv), and shall be deemed to include the associated plugging.

F.6 Plugging

The term 'plugging' shall mean provision and fixing of hardwood or approved proprietary plugs, or, at the Contractor's option, fixing by means of a cartridge operated rivet gun or other approved mechanical means.

F.7 Surface finishes

In the absence of specific requirements, the treatment and finish or pipe fittings shall be appropriate to finish of the pipes with which they are associated."

F.8 Pipes sizes

The sizes of the pipe shall be the diameter of the bore.

GENERALLY

F.9 Execution of plumbing work

All plumbing work shall be executed in accordance with the best principles of modern practice by a firm of fully qualified and registered plumbers. The Contractor shall obtain the Architect written approval to the firm he proposed to employ before the plumbing works are commenced.

RAINWATER INSTALLATIONS

F.10 Plastic Pipes and fittings

Plastic pipes, fittings and accessories shall be obtained from a manufacturing source approved by the Architect in writing to comply with B.S 4576, heavy grade PVC, colour to be selected by the Architect,

fixed true to line with straps, supplied by the manufacturer screwed to hardwood plugs with galvanized screws, and jointed all in accordance with the manufacturer's instruction . Rubber sealing rings shall comply with B.S. 2494 type 2.

F.11 Galvanized steel tubes and fittings

Galvanized steel tubes and fittings shall comply with B.S. 1387 "medium" grade with galvanized reinforced malleable cast iron fittings complying with B.S. 143 and 1256, with B.S. 21 threads.

Jointing - Tubing and fittings shall be seam-jointed using hemp and red lead putty or 'Boss' white.

Fixing - Tubes shall be fixed clear of walls or soffits, with galvanized malleable iron brackets complying with B.S. 1494, (or with hangers or special fixing where so described), spaced at not more than 3 meter centers.

F.12 Rainwater outlets

PVC rainwater outlets shall be manufactured to the sizes and profiles measured herein from heavy grade PVC, with a minimum 75 mm wide flange all round the top for roof surfaces; fully bedded in hot bitumen and jointed to the PVC rainwater pipes.

Fulbora type coated cast iron outlets, with grating, hook bolt and clamping device shall be cast into concrete or built into blockwork in the positions and to the elevations shown on the drawings, and jointed with caulked lead to rainwater pipes.

F.13 Testing

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

ELECTRICAL INSTALLATIONS

LIST OF CLAUSES

GENERALLY

- G.1 Bye – laws
- G.2 Inspection of the site of the works
- G.3 Definitions
- G.4 Earthing
- G.5 Installation

MATERIALS

- G.6 Materials and equipment
- G.7 Conduit and fittings
- G.8 Wires and cables
- G.9 Distribution panel boards
- G.10 Junction and outlet boxes
- G.11 Switches and sockets

WORKMANSHIP

- G.12 Conduit and fittings
- G.13 Switches and convenience outlets
- G.14 Panel boards
- G.15 Lighting fittings
- G.16 Tests
- G.17 Completion and record drawings

GENERALLY

G.1 Bye – laws

The entire installations are to be carried out in accordance with the latest edition of “Regulations for the Electrical Equipment of Buildings published by the Institution of Electrical Engineers (I.E.E.), London and TANESCO special regulations.

The entire installations shall conform in every respect with the regulations and requirements of TANESCO, as applied to the present electrical installation and of the P. & T. and all other Public Authorities having jurisdiction in respect of these installations.

G.2 Inspection of the site of the works

The Contractor shall be deemed to have inspected the site of the works to completely ascertain the nature of, and the particular conditions under which, the Electrical Works shall be carried out and shall be further deemed to have obtained all other information required for the proper carrying out of the said works to the approval of TANESCO.

G.3 Definitions

Definitions of terms used herein: “Work”: labour, materials, equipment, controls, accessories and all other items customarily furnished and/or required for proper and complete installation and testing of work.

“Wiring”: conduit, fittings, wire, junctions, connections, pull and outlet boxes, switches, motor starters, cut-outs and sockets and all items necessary or required in connection with, or relating to, such wiring. “Concealed”: embedded or closed masonry, concrete or other construction as approved.

“Exposed”: not installed underground or “concealed”.

“Noted”: as indicated on drawings and/or specified.

“Indicated” or “Shown”: as revealed on the drawings

“Similar” or “Equal”: equal in kind, quality and function and of approved manufacturer.

G.4 Earthing

Provide earthing for the entire electrical installation as indicated on the drawings and specified herein.

Include, but not necessarily limited to, requiring earthing are the followings:

- (i) Conductor enclosures
- (ii) Panel boards
- (iii) Non-current-carrying metal parts of fixed equipments such as motor starters and instrument cases,

The earthing system shall conform in all respect to sections 4 and 5 of “Regulations for the Electrical Equipment of Buildings” of the I.E.E.

G.5 Installation

The contractor is responsible for marking out the cable route and for the supervision of the backfilling in so far as the prevention of damage to cables in this process is concerned.

MATERIALS

G.6 Materials and equipment

Materials: new, best quality and free from defects were procured by the Contractor as the case may be.

Standard: B.S. 1557 - P.V.C. insulated and P.V.C. sheathed cable

B.S. 31 - Steel conduit and fittings (where conduit is exposed only)

B.S. 731 - Flexible steel conduits and adapters.

G.7 Conduit and fittings

Concealed conduit shall be semi rigid heavy duty P.V.C

Outlet boxes shall be galvanized steel

Where outlet boxes do not have an integral cover, install blank cover plates on all outlet boxes installed for future outlets.

Where conduit is installed exposed such conduit and fittings shall be in galvanized steel.

P.V.C. conduit and fittings shall comply with the regulations for no-metallic conduit of "Regulations for Electrical Equipment of Buildings" of the I.E.E.

G.8 Wires and cables

Insulated conductors for interior wiring shall conform to the latest applicable British Standards and as manufactured by members of Cable Makers Association.

G.9 Distributions panel boards

Automatic circuit breaker panel boards, complete with their enclosing cabinets shall be installed conforming to detailed specifications as hereinafter listed.

The enclosing cabinet shall be manufactured from code gauge, galvanized sheet steel, with corners lapped and riveted, or fastened by other approved standard methods. Trims and doors shall be manufactured from one piece of full finished sheet steel not less than 12 s.w.g. not galvanized. Panel boards shall be surface- mounted or recess- mounted as indicated on the drawings.

Directory card with frame and transparent cover on each panel board to indicate designation or the circuits.

Panel boards shall be of manufacturer's standard design for operation on 400/230V, 3 phase, 4 wire solid neutral system. (Cont'd.)

G.9 Distributions panel boards (Cont'd.)

All automatic circuit breakers shall be quick make, quick break on manual operation, trip free, with inverse time characteristics secured through the use of a bimetallic tripping element supplemented by a magnetic trip. Automatic tripping shall be clearly shown by the operating handle assuming a neutral position midway between the manual "on" and "off" position.

All multi-pole breakers shall be so designed that an overload on one pole automatically causes all poles to open.

G.10 Junction and outlet boxes

Junction and outlet boxes for concealed work shall be galvanized stamped steel or approved plastic type.

All junction boxes shall be of suitable size to avoid undue packing of cable

Outlet boxes shall be of size and type to accommodate structural conditions, size and number of conductors entering the device or fixture for which required.

Covers when required shall be screwed on.

G.11 Switches and sockets

All local wall light switches shall be 10 amps, 250 V, flush single pole, three-way or four-way as required.

All socket outlets shall be 15A, 250 V, flush type, 3 pin (2 pole and earth), unless otherwise noted.

WORKMANSHIP

G.12 Conduit and fittings

Install conduit concealed in walls, floors or ceiling slabs as shown on drawings and herein specified. Conduits of maximum 19 mm diameter may be installed in the concrete topping of the structural roof slab system. Conduit shall not be installed in the roof insulation fill.

Use flexible steel conduit for connection to electric water heater, for short connections where rigid conduit is impractical and were indicated on drawings.

In walls install conduit as nearly as possible vertically or horizontally where necessary, but never diagonally. In concrete slab conduit shall be approved as to locations, proper bends, even pitch and rigidity of support before slab is poured.

Place caps in ends of conduit as soon as located to prevent entry of foreign materials.

Conduit shall be continuous from outlet to outlet, from outlets to cabinets, junctions or pull boxes, and secured to all boxes so that each system is continuous from service to outlets.

Slope conduits continuously toward outlet boxes to drain properly and avoid trapping condensate.

G.13 Switches and socket outlets

Fasten switches and socket outlets to boxes firmly so that they do not depend on cover plates to pull them tight. (Cont'd.)

G.13 Switches and socket outlets (Cont'd.)

Light switches to be located near the door on side opposite hinge except where otherwise indicated. Wherever possible to be grouped in a gang cover plate. Verify final door hinge location in field prior to switch boxes installation.

Socket outlet circuits shall be independent of light circuits.

Mounting height: Unless otherwise noted on the drawings electric devices shall be located with their center line at the following elevations above finished floor:

Light switches	1.20 m
Socket outlets	0.45 m
Water heater switch	1.80 m
Lighting fixtures	as shown on drawings
Wall brackets	2.10 m

G.14 Panel boards

Install where shown on drawings automatic circuit breaker panel boards complete with their enclosing cabinet.

All cabinets shall be painted with one primer coat and at least one finish coat.

All panel boards shall be earthed.

G.15 Lighting fittings

Install lighting fittings complete with lamps as scheduled on drawings. The contractor shall be responsible for all fitting wiring, hanging, connecting up and making ready to operate.

The lighting fittings as shown on schedule are listed by manufacturer's catalogue not for the purpose of indicating by general type, style and quality required. Similar from other manufactures may be provided by the Client.

Where manufacturer's catalogue numbers are not noted the Contractor shall propose lighting fitting, of design shown, for the Client's procurement.

Fluorescent type fixtures shall be provided with single or double lamp ballasts of the high power factor type and low level sound.

Incandescent light fixtures shall be equipped with English bayonet lamp holders, heavy duty type.

Flexi glass and similar plastic diffusing material shall be guaranteed against cracking, marring and discoloration for five years.

G.16 Tests

Upon completion of works, test installation for verification of polarity, insulation and earthing. Test all panel feeders and electrical wiring. If tests indicate faults, these shall be rectified and further tests shall be conducted as required by TANESCO and/or the Architect.

G.17 Completion and record drawings

The Contractor shall arrange for a full set of prints to be kept on the site, showing the progress of all work in connection with the electrical and telephone installations. Such plans must be kept up to date and all tube runs, positions of points, equipment and apparatus etc., are to be coloured in red on the drawings as they are installed. . (Cont'd.)

G.17 Completion and record drawings (Cont'd.)

Upon Practical completion of the Work the Contractor shall provide transparent linen negatives and two black and white prints on opaque linen from each negative of the following record drawings:

- 1 1:100 scale plans showing exact location and sizes of all conduit runs, circuit wiring, sub-main wiring, panel boards, position of equipments, controlling switches, telephone outlet boxes, receptacles, power outlets, lighting points etc.

FLOOR, WALL & CEILING FINISHING

LIST OF CLAUSES

PLASTERWORK

- H.1 Generally
- H.2 Cement
- H.3 Lime putty
- H.4 Sand
- H.5 Storage of materials
- H.6 Testing
- H.7 Preparation of surfaces
- H.8 Dubbing out
- H.9 Mixing of materials
- H.10 Period between coats
- H.11 Finish
- H.12 Junctions of wall and ceiling
- H.13 Arrises

BEDS AND BACKINGS

- H.14 Materials, storage, testing and mixing of materials
- H.15 Light weight roof screed
- H.16 Cement and sand proportions
- H.17 Preparation of surfaces
- H.18 Laying
- H.19 Surfaces of beds and backings

OTHER INSITU FINISHING

- H.20 Materials, storage, testing and fixing of materials
- H.21 Water proofers
- H.22 Integral hardeners
- H.23 Preparation of surfaces
- H.24 Cement and sand paving
- H.25 Granolithic paving

Specification

Floor, Wall & Ceiling finishings

(2/H/1)

H.26 Insitu terrazzo paving

H.27 Washed terrazzo wall finish

H.28 Tyrolean finish

TILE, SLAB AND BLOCK FINISHINGS

H.29 Mortar for bedding and pointing

H.30 Preparation of surfaces

H.31 Glazed ceramic wall tiles

H.32 Concrete tiles

H.33 Terrazzo tiles

FLOOR, WALL & CEILING FINISHINGS

PLASTERWORK

H.1 Generally

Render, both internal and external shall be cement and sand in the proportions 1:4 finished to thickness specified.

Plaster shall consist of an undercoat of 1 part cement to 4 parts sand by volume and 5% lime putty, and a finishing coat of 1 part cement to 1 part sand to 5 parts lime putty. Each coat shall be finished to the thickness specified.

H.2 Cement

Cement shall be ordinary Portland cement and shall comply with B.S 12. White and coloured cements shall comply with B.S 12 and be obtained from an approved manufacturer.

H.3 Lime putty

Lime putty shall be prepared from hydrated lime complying with B.S 890.

Hydrated lime shall be added to water, stirred to a creamy consistency and left to mature for at least 16 hours before use.

Alternatively, ready slaked lime may be obtained from an approved source.

The lime putty shall be protected from drying out.

H.4 Sands

Sand for cement and lime mixes shall comply with B.S 1199. Table I.

Sand for use with white Portland cement shall be silver sand and that for use in coloured cement mixes shall be of a suitable colour.

H.5 Storage of materials

All plasters, lime and cement, shall be stored in a properly roofed, weatherproof, dry, well ventilated shed, use exclusively for this purpose, with a wood floor not less than 150 mm clear above the ground. All sands shall be stored separately, according to type, on clear, hard, dry standing and shall be protected from contamination.

H.6 Testing

Samples of all materials, as directed, shall be taken from time to time as required by the Architect.

All defective materials shall be removed from the site without delay, at the Contractor's expense.

H.7 Preparation of surfaces

Surfaces to receive plastering shall be dry brushed to remove all loose particles, dust, laitance, efflorescence, etc., and any projecting fins on concrete surfaces shall be hacked off. All trace of mould oil shall be removing from concrete surface by scrubbing with water containing detergent and rinsing with fresh water.

Concrete surfaces shall be hacked over to provide adequate key.

Surfaces shall be wetted and re-wetted as required to equalize suction before the plaster coats are applied. In particular, dense hard concrete surfaces shall be wetted and re-wetted as required before bonding plaster is applied.

H.8 Dubbing out

Dubbing out shall be in the same mix as subsequent coats and shall not exceed 10 mm in thickness in one particular applications

H.9 Mixing of materials

All materials shall be thoroughly mixed in the proportions described. No mixes of plasters, other than those described, shall be used.

Bunkers and gauge boxes shall be thoroughly cleaned after each mix and due care and attention shall be given at all times to their cleanliness.

Cement – lime – sand plasters shall be used within two hours of the gauging with cement.

All tools shall be kept clean and fresh plaster shall not be contaminated with set plaster.

H.10 Period between coats

Cement – lime – sand undercoats shall be allowed to dry out thoroughly before a further coat is applied.

H.11 Finish

All undercoats shall be scratched to provide an adequate key for the next coat. Unless otherwise described, all rendering shall be finished with a wood float, as shall all undercoats. All finishing coats shall be finished with a steel trowel.

H.12 Junction of wall and ceiling

A neat definite cut shall be made with the edge of the trowel through all coats of the wall plaster at the junctions with ceilings.

H.13 Arrises

All arises shall be pencil rounded unless otherwise, specified.

BEDS AND BACKIGNS

H.14 Materials, storage, testing and mixing of materials

Cement, sand, water, etc., storage, testing and mixing of materials shall be as described for plasterwork.

Specification

Floor, Wall & Ceiling finishings

(2/H/4)

H.15 Light weight roof screed

Light weight roof screed shall consist of one part cement to eight parts vermiculite aggregate, laid to falls as necessary and shall be covered with a minimum of 12 mm cement and sand (1:4) screed finished to suit the requirements of the particular finishing.

All junctions between horizontal and vertical surfaces to roofs shall be finished with a triangular angle fillet of the sizes described.

Light weight roof screen shall be cured properly for 7 days, and shall be thoroughly and completely dry before any finishing are applied.

H.16 Cement and sand proportions

Cement and sand shall be in the proportions of 1:3 or 1:4, as specified by volume.

H.17 Preparation of surfaces

Walls shall be prepared as described for 'Plasterwork' concrete floors or roofs to receive screeds or paving shall be hacked where necessary to remove concrete mortar or plaster droppings and to expose the course aggregate and well brushed to remove all loose particles and dirt.

Concrete floors and roofs shall be wetted before screeds or paving are laid, with a cement sand slurry (1:1) being scrubbed into the surface in front of the screed or paving laying.

H.18 Laying

Beds and backings shall be laid in bays of suitable lengths and widths and to falls where so shown with proper screeds and shall be kept wet and protected until set hard.

H.19 Surface of beds and backings

Screeded beds for insitu floor finishings or floor finishings bedded in mortar shall be left rough from the screeding boards.

Floated beds for inflexible floor finishings bedded in mastic, shall be left with a plain un-textured surface.

Trowelled backings for finishing by specialists shall be to the approval of the specialist Sub-Contractor

OTHER INSITU FINISHING

H.20 Materials, storage, testing and mixing of materials

Cement, sand, water, etc., storage, testing and mixing of materials, shall be as described for 'Plasterwork'.

H.21 Water roofers

Water roofers shall be 'Sealocrete' double strength premix, or other approved integral waterproofed, used in accordance with the manufacturers' instructions.

H.22 Integral hardeners

Integral hardener shall be 'Febspeed Plus' or other approved, used in accordance with the manufacturers' instructions.

Specification

Floor, Wall & Ceiling finishings

(2/H/5)

H.23 Preparation of surfaces

Concrete surfaces to receive paving without screeds, shall be prepared as described herein.

H.24 Cement and sand paving

Cement and paving shall be in the proportions and to the thicknesses described, and shall be finished with a steel trowel unless otherwise specified and shall be protected and kept wet until hard.

H.25 Granolithic paving

Granolithic paving shall consist of 1 volume of cement to 1 volume of sand mixed with 2.5 volumes of approved local stone aggregate laid to the thickness described.

The base shall be kept wet for 12 hours before laying granolithic paving unless the paving is being laid monolithically with the base.

Immediately after laying the granolithic paving shall be protected and kept damp until thoroughly hard. It shall then be ground and polished by machine. Any holes or pores which become apparent after grinding shall be filled with the same mix as the paving, well worked into the surface and left proud. The portions so treated shall be filled with the same mix as the paving, well worked into the surface and left proud. The portions so treated shall be protected and kept damp until hard when they shall be polished.

H.26 Insitu terrazzo paving

Terrazzo finish shall be carried out by a firm approved by the Architect in writing. It shall be composed of a screed of cement and sand (1:3) and the terrazzo which shall be a minimum of 16 mm thick. Before terrazzo work is commenced, the contractor shall submit sample pieces to the Architect for approval.

The terrazzo shall consist of coloured cement and approved local marble aggregate free from dust in the proportions 1:2. The colour of the cement and the grading of the aggregate shall be as selected by the Architect. The terrazzo shall be laid while the underbed is still plastic and be well compacted and trowelled to produce a non absorbent surface. It shall be divided into bays 1 metre by 1 metre with 3mm aluminium strips for the full depth of the terrazzo and underbed. Immediately after laying the terrazzo shall be protected and kept damp until thoroughly hard. It shall then be ground and polished by machine. Any holes or pores which become apparent after grinding shall be filled with neat coloured cement well worked into the surface and left proud. The portions so treated shall be protected and kept damp until hard when they shall be polished. Dry polishing shall only be carried out with the agreement of the contractor.

H.27 Washed terrazzo wall finishing

Washed terrazzo finish shall be carried out by a firm approved by the Architect in writing and shall be guaranteed for six months from the date of completion of the work. It shall be composed of a screeded underbed of cement and sand (1:4), and terrazzo with both layers of the thicknesses specified.

The terrazzo shall consist of cement and local marble aggregate free from dust in the proportions 1:1.5. The colour and grading of the cement and aggregate shall be as selected by the Architect.

The terrazzo shall be laid whilst the underbed is still plastic and shall be compacted and trowelled to produce a non-absorbent surface. Before the final set takes place the terrazzo surface shall be lightly brushed, with just a sufficient amount of water to expose the surface aggregate to produce an even appearance. Adjoining areas and finishing shall be protected from staining, and any stains produced shall be removed or remedied to the satisfaction of the Architect at the Contractor's expense. The whole surface when hard shall be covered with one coat of approved silicone solution.

Specification

Floor, Wall & Ceiling finishings

(2/H/6)

H.28 Tyrolean finish

Tyrolean finish shall be applied by machine in accordance with the instructions issued by the Cement Marketing Company. The colour of the cement shall be as selected by the Architect. If required to do so by the Architect, the Contractor shall provide a sample panel or panels of Tyrolean finish the cost of which shall be deemed to be included in the Contract Sum. All adjoining areas and finishing shall be masked and protected so as to prevent staining whilst applying the Tyrolean finish.

TILE, SLAB AND BLOCK FINISHING

H.29 Mortar for bedding and pointing

All materials for mortar, their storage, testing and mixing shall be as described in 'Plasterwork'.

H.30 Preparation of surfaces

All surfaces to receive the finishing in this section shall be thoroughly cleaned; screeds to receive finishing bedded in mortar shall be well wetted before laying is commenced.

H.31 Glazed ceramic wall tiles

Glazed ceramic wall tiles shall comply with B.S. 6431 and shall be of the sizes and colours described, and having cushion edges.

The tiles shall be soaked in clean water for at least half an hour before fixing, stacked on edge tightly together and end tiles turned glaze outwards and fixed as soon as the surface water has gone. The tiles shall be bedded in cement and sand, (1:3), with straight joints 1.5 mm wide pointed in white cement, after scratching the surface of the backing screed to form a key.

Alternatively, tiles shall be wiped clean and fixed dry with 'Richafix', or other approved adhesive, all in accordance with the manufacturers' recommendations with straight joints 1.5 mm wide pointed in white cement.

H.32 Concrete tiles

Concrete tiles shall comply with B.S. 1197, shall be thoroughly soaked in water and allowed to drain before laying and shall be bedded and pointed in cement and sand (1:3), laid true and level or to even falls as specified.

H.33 Terrazzo tiles

Terrazzo tiles shall be laid by a specialist approved by the Architect in writing, and shall be supplied from an approved source. The precast terrazzo shall consist of a backing of Portland cement and washed sand graded from coarse to fine in the proportions of 1:3 and a terrazzo finish not less than 12 mm thick consisting of coloured cement and marble aggregate free from dust in the proportions of 1:2. The colour of the cement and the colour and grading of the aggregate shall be as selected by the Architect.

Tiles shall be hydraulically pressed during manufacturing to produce a non-absorbent surface and shall be polished on the exposed surface.

Tiles shall be thoroughly soaked in water and drained off so that no free water remains on the surface before laying and shall be bedded in cement and sharp sand (1:3) with straight joints 3 mm wide and pointed in coloured cement, to match the colour of the tile, and sand (1:2). The surface of the paving shall finish true and level. All cement stains shall be carefully removed. Sawdust shall not be used as a protection before joints are set.

PAINING AND DECORATING

LIST OF CLAUSES

MATERIALS

- J.1 Colour range
- J.2 Approval of brands
- J.3 Quality of products
- J.4 Oil paints
- J.5 Polyurethane lacquer

PREPARATION OF SURFACES

- J.6 Approval
- J.7 Stopping

WORKMANSHIP

- J.8 Standard of workmanship
- J.9 Stirring of materials
- J.10 Manufacturers instructions
- J.11 Brush work
- J.12 Priming of joinery
- J.13 Condition of priming
- J.14 Coatings to be dry
- J.15 Cleanliness
- J.16 Removal of ironmongery, etc.
- J.17 Method of measurement

PAINING AND DECORATING

MATERIALS

J.1 Colour range

Painting and decorative schemes shall be carried out in colours selected by the Architect from the approved range of colours.

J.2 Approval of brands

The Contractor shall seek, in writing, approval from the Architect for all brands of paint he wishes to use.

J.3 Quality of products

Where a type of paint is produced by the manufacturer in more than one quality, only paints and materials of the first or best quality shall be used in the works. The Container label shall indicate clearly the quality of the paint used.

Where it is not evident that the first or best quality of paint is being used, the Architect will order the removal of such materials from site and rectification of any work executed with those materials, all at the Contractors expense

J.4 Oil paints

Hard gloss, semi-gloss matt and flat oil paints, and respective undercoats, shall be of approved brands.

J.5 Polyurethane lacquer

Polyurethane lacquer shall be an approved single or two pack lacquer described as of interior or exterior quality, as appropriate.

PREPARATION OF SURFACES

J.6 Approval

The preparation of all surfaces must be seen and approved by the Architect before any coatings are applied.

J.7 Stopping

Stopping referred to in the following clauses shall be the appropriate stopping hereinbefore described.

WORKMANSHIP

J.8 Standard of workmanship

Prior to the commencement of internal or external decoration, areas not exceeding 50 square metres in total area, and designated by the Architect, shall be completely decorated, and after approval shall be used as a standard for the whole of the works. Any additional cost involved in carrying out such decoration in advance of the general work shall be deemed to be included in the Contract Sum. Such decorated surfaces shall be made good and touched up as necessary prior to the handing over of the works.

J.9 Stirring of materials

The contents of all cans and containers of all materials must be properly and thoroughly stirred before and during use and shall be suitably strained as and when necessary.

J.10 Manufacturers instructions

All materials shall be used strictly in accordance with instructions, issued by the manufacturers concerned. The addition of thinners, driers or other materials will only be permitted when specially required by the maker and as when the procedure is approved by the Architect.

J.11 Brush work

Unless otherwise described, all coatings shall be applied by brush. Written permission must be obtained from the Architect for the application of coatings by spray or roller where not so described, and if permission is granted, such application shall not result in extra cost to the Employer.

J.12 Priming of joinery

Joinery shall be delivered to the site unprimed and is to be protected from rain and damp during transit. It is to be stored in clean, dry, ventilated structures and no primer shall be applied while the timber is in any way damp. The store and drying room shall be of adequate size to allow for proper coating and storage of primed work. Primers shall be applied as soon as possible after inspection and acceptance of the joinery by the Architect.

J.13 Condition of priming

If, by the time that the work is to receive the first undercoat, the priming coat has in any way deteriorated, or has been damaged, the affected portions or the whole, if necessary, shall be rubbed down and re-primed.

In the case of articles primed at works, the priming shall be touched up where required with a similar primer.

J.14 Coatings to be dry

All coatings shall be allowed to dry thoroughly before succeeding coats are applied.

J.15 Cleanliness

All brushes, tools and equipment shall be kept in a clean condition and surfaces shall be clean and free from dust during painting.

Painting shall not be carried out in the vicinity of other operations which might cause dust.

The contractor shall provide a suitable moveable receptacle, into which are to be placed all the liquids, slop washings, etc., which are on no account to be thrown down any of the gullies, manholes, sinks, lavatories, W.C.'s or any other sanitary fittings. All solid refuse or inflammable residues must be removed from the site, or burned.

J.16 Removal of ironmongery, etc.

All surface fixed ironmongery fittings, etc., except hinges, shall be removed before painting and re-fixed on completion.

J.17 Method of measurement

One coat of lead based pink primer has been measured to the backs of all timber frames, etc., which will ultimately be fixed in contact with concrete, block work, rendered or plastered surfaces.