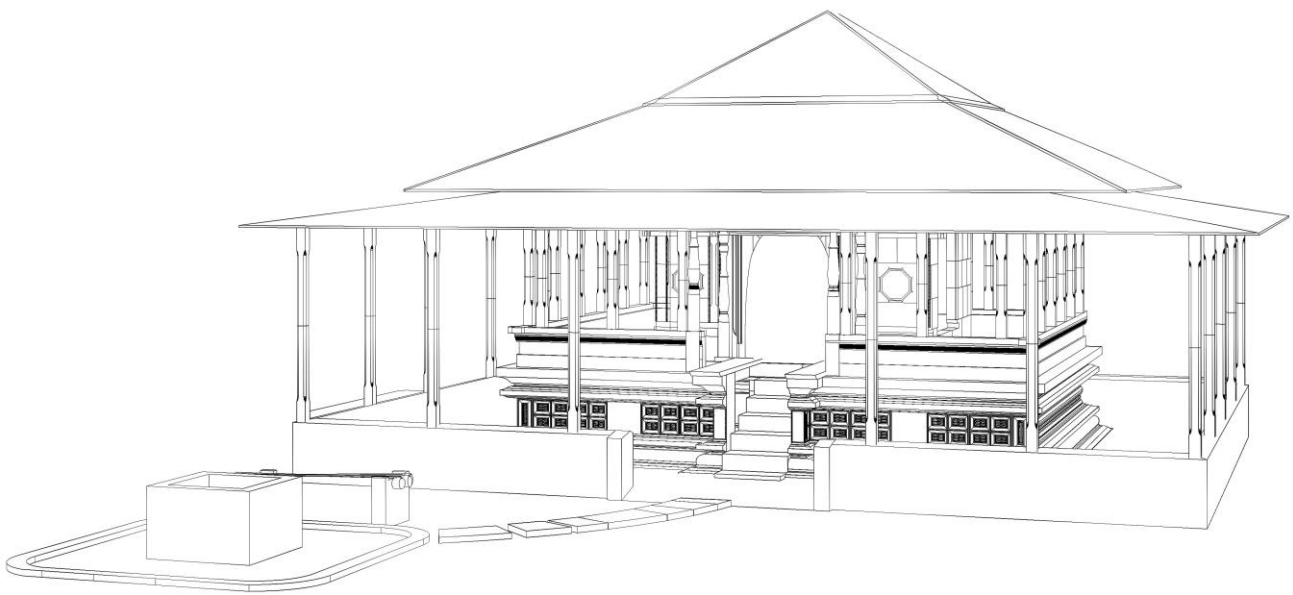

KALHUVAKARU MOSQUE RELOCATION PROJECT

TECHNICAL SPECIFICATION AND SCOPE OF WORK



DEPARTMENT OF HERITAGE
MINISTRY OF ARTS, CULTURE AND HERITAGE

Contents

| | | |
|-----------------------------|--|----|
| 1. | GENERAL AND PRELIMINARIES..... | 4 |
| 2. | EXCAVATION AND EARTHWORKS..... | 11 |
| 3. | CONCRETE WORKS | 17 |
| 4. | BLOCKWORK | 26 |
| 5. | ASSEMBLY OF MOSQUE, WELL AND PATHWAY | 30 |
| 6. | FIRE-FIGHTING WORKS..... | 32 |
| 7. | ELECTRICAL INSTALLATIONS | 34 |
| 8. | LANDSCAPING WORKS..... | 36 |
| 9. | FINISHING WORKS | 38 |
| APPENDIX I SUMMARY | | 39 |

| | |
|---|----------|
| 1. GENERAL AND PRELIMINARIES | 4 |
| 1.1. GENERAL | 4 |
| 1.2. STANDARDS, MATERIALS, GOODS AND WORKMANSHIP | 4 |
| 1.3. APPROVED MANUFACTURERS..... | 4 |
| 1.4. SAMPLES..... | 4 |
| 1.5. MANUFACTURER'S INSTRUCTIONS | 5 |
| 1.6. ORDERING MATERIALS | 5 |
| 1.7. SCAFFOLDING | 5 |
| 1.8. CUTTING AND PATCHING | 5 |
| 1.9. PROTECTION | 5 |
| 1.10. SITE HOARDING..... | 5 |
| 1.11. WATER FOR THE WORKS | 6 |
| 1.12. ELECTRICITY FOR THE WORKS | 6 |
| 1.13. EXISTING SITE SERVICES..... | 6 |
| 1.14. PRICING GENERALLY | 6 |
| 1.15. SITE OFFICES..... | 6 |
| 1.16. CONTRACTOR'S SITE AREA | 6 |
| 1.17. SAFETY ON-SITE..... | 7 |
| 1.18. SITE PROGRESS MEETINGS | 7 |
| 1.19. SETTING OUT | 8 |
| 1.20. NOTICE BOARDS | 8 |
| 1.21. DEFECTIVE WORK..... | 8 |
| 1.22. ERECTION EQUIPMENT OR OTHER PLANT..... | 8 |
| 1.23. LOADING IN EXCESS OF DESIGN LOAD | 8 |
| 1.24. BUILDING PERMIT | 8 |
| 1.25. PERMANENT DRAINAGE, WATER AND ELECTRICITY CONNECTIONS | 9 |
| 1.26. HANDING OVER | 9 |

1. GENERAL AND PRELIMINARIES

1.1. GENERAL

The Conditions of Contract, Bill of Quantities and the Drawings shall be read in conjunction with the Specifications and matters referred to, shown or described in the former are not necessarily repeated in the latter.

Notwithstanding the subdivision of the Specifications into various headings, every part is to be deemed supplementary to every other part and the various parts are to be read with each other, so far as it may be practicable to do so, or when the context so permits.

1.2. STANDARDS, MATERIALS, GOODS AND WORKMANSHIP

In various places throughout this specification and the Bills of Quantities reference is made to the Standards, Specifications and Bye-Laws issued by the British Standards Institution and other similar organisations. These references shall in every case be deemed to include the latest edition or issue of such Standards, Specifications and By-Laws including all revisions, amendments and addenda subsequently issued. Where materials are not specified to be to a particular British Standard and a British Standard exists in respect of such materials, then the materials shall in all respects comply with the relevant and current British Standard. In such cases where British Standards do not exist, the materials used shall be of the best type available and shall generally be to the Employer's satisfaction.

Materials, goods and workmanship shall be of the best quality of their respective kinds and, as far as applicable, shall comply in every respect with the requirements of the quoted Standards, Codes of Practice and Specifications or any other National Standard approved by the Employer. Preambles and descriptions of materials, goods and workmanship given in any one section of the Specifications shall apply throughout the whole of these Specifications unless otherwise described. The substitution of materials, goods, workmanship and the like from that specified shall only be permitted with the written approval of the Employer.

The Contractor shall submit for the approval of the Employer a list of names and addresses of the manufacturers and trademarks or names of all the various types of materials and goods they propose to use in the Works. This list shall include reference to the Specifications Clause or Article to which the materials and goods apply.

All materials used in the Works shall be new and of the appropriate quality all to the Employer's approval.

Materials shall be obtained from approved sources and used in accordance with the manufacturer's printed instructions. In the absence of a specification all materials shall comply with a relevant standard. The Employer shall order the removal of any materials, which they have not approved.

No orders for materials and goods shall be placed until approval has been obtained for the materials and goods from the Employer.

The Contractor shall note that it is their responsibility to include in their price for the cost of the materials and products as specified and no adjustment will be allowed should the alternatives be rejected by the Employer.

1.3. APPROVED MANUFACTURERS

Reference to proprietary items or approved manufacturers shall be construed as establishing a standard of quality and not as limiting competition.

The Contractor may offer alternatives to the materials specified provided that such materials meet or exceed the required minimum standards. The final decision on this matter rests with the Employer.

1.4. SAMPLES

The Contractor shall furnish for approval with reasonable promptness, all samples as directed by the Employer. The Employer shall check and approve such samples with reasonable promptness only for conformance with the design concept of the Works and for compliance with the information given in Contract Documents. The work shall be in accordance with the approved samples.

All samples shall be delivered to the Employer's office with all charges in connection therewith paid by the Contractor and deemed to be included in the Contract price.

Duplicate final approved samples, in addition to any required for the Contractor's use, shall be furnished to the Employer, one for office use and one for the Site.

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

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

1.5. MANUFACTURER'S INSTRUCTIONS

All items or materials shall be delivered to the Site in the manufacturer's original unopened containers with the manufacturer's brand and name clearly marked thereon.

All items or materials shall be assembled, mixed, fixed, applied, or otherwise incorporated in the Works in accordance with the printed instructions of the manufacturer of the items or materials unless specifically instructed otherwise by the Employer.

1.6. ORDERING MATERIALS

The Bills of Quantities shall not be used as a basis for ordering materials and the Contractor is entirely responsible for assessing the quality of materials to be ordered. Upon receipt of the Employer's order to commence the Works, the Contractor shall immediately place orders for all required materials and will be held responsible for any delays occurring due to the late placing of such orders. Prior to finalising material orders, the Contractor shall advise the Employer and await the Employer's written approval to complete the same.

The Contractor shall pay all expenses, taxes and dues etc. incurred on the procurement of materials from abroad.

1.7. SCAFFOLDING

The Contractor shall provide, erect, maintain, dismantle, and clear away at completion proper and adequate scaffolding including that required for Sub-Contractor and Suppliers. The Contractor shall be entirely responsible for all safety precautions in connection with the scaffolding including the provision of all bracing, scaffold boards, toe boards and the like and for its entire sufficiency for the work. The Contractor shall ensure no damage is done to the historic fabric of the Mosque, all scaffolding shall be erected with adequate distance from the Mosque. Putlog scaffolds shall not be used as unnecessary damage is caused by cutting holes for the bearing of the putlogs. If in the Employer's opinion scaffolding is considered dangerous then the Contractor shall rectify the same at their own expense. All work utilizing scaffold shall be halted until the scaffold is corrected all to the Employer's written approval.

1.8. CUTTING AND PATCHING

The Contractor shall be responsible for all cutting and patching and making good required for all trades for all work and their prices will be deemed to include for all such cutting and patching and making good.

1.9. PROTECTION

The Contractor shall cover up and protect the Works from the weather and from damage by their own or other workmen performing subsequent operations. They shall provide all necessary dust sheets, barriers and guard rails and clear away same at completion.

The Contractor shall take all reasonable and proper steps for the protection of all places on or about the Works, which may be dangerous to their workmen or any other persons or to traffic. The Contractor shall provide and maintain warning signs, red warning lamps and barricades as necessary in all such places.

1.10. SITE HOARDING

The Employer shall provide a site hoarding at the boundary of the Site as required by the City Council By-Laws and to the entire satisfaction of the City Council. The Site hoarding shall be maintained by the Contractor during the progress of the Works and shall be dismantled and cleared away upon completion.

The Contractor shall be responsible for ensuring the security of the Site, for protecting same from trespass and providing all necessary watching and lighting in connection therewith.

1.11. WATER FOR THE WORKS

The Contractor shall make all necessary arrangements and provide all water for the proper execution of the Works, together with all transport, temporary plumbing, storage and distribution, pay all charges and alter, adapt and maintain temporary work as necessary and remove and make good at completion.

1.12. ELECTRICITY FOR THE WORKS

The Employer shall provide the power required, however the Contractor shall make all necessary arrangements to provide all temporary lighting for the proper execution and security of the Works and its protection, with all meters, temporary wiring and fittings, alter adapt and maintain the temporary work as necessary and remove and make good at completion.

1.13. EXISTING SITE SERVICES

The Contractor shall follow up and obtain all the required information relating to any existing site services, telephone, electrical, water, drainage and the like on the site before commencing excavation or piling. The Contractor shall be responsible for the protection of all existing services within the site and shall make good at their expense any damage to existing services resulting from their carrying out of the Works to the satisfaction of the Employer and relevant authority. The Contractor shall be responsible for giving notice to the relevant authority where temporary or permanent re-routing or diverting of existing services is found to be necessary and shall complete same at their own expense to the Employer's and respective Authorities' approval.

Where diversions of services as aforementioned are not required in connection with the permanent Works, the Contractor shall uphold, maintain and keep same in working order in existing locations.

1.14. PRICING GENERALLY

The Contractor shall satisfy themselves as to the scope of the Work shown on the drawings and described in these Contract Documents and their price shall be deemed to cover all their obligations under the Contract and all matters and things necessary for the proper construction, completion and maintenance of the Works. The price shall include for all material, labour and plant - whether mechanical or non-mechanical - required for the completion of the Contract in accordance with the Drawings and Specifications, and removing at completion and making good any surfaces disturbed and if not included in any prices inserted in the Preliminaries for the insurances and bonds required; for the costs of preparing a tender; for the work in connection with measurements and the final account; for profit; and for all other establishment charges and on costs of whatever nature. No claim for additional payment will be allowed for any error or misunderstanding by the Contractor in these respects.

1.15. SITE OFFICES

A temporary shed shall be allocated on-site by the Employer for storage of the existing components of the Mosque. A supervisor appointed by the Employer shall be present in the temporary shed at all times where any works are on-going in relation to the existing mosque components. The temporary shed shall be dismantled and cleared away upon completion.

1.16. CONTRACTOR'S SITE AREA

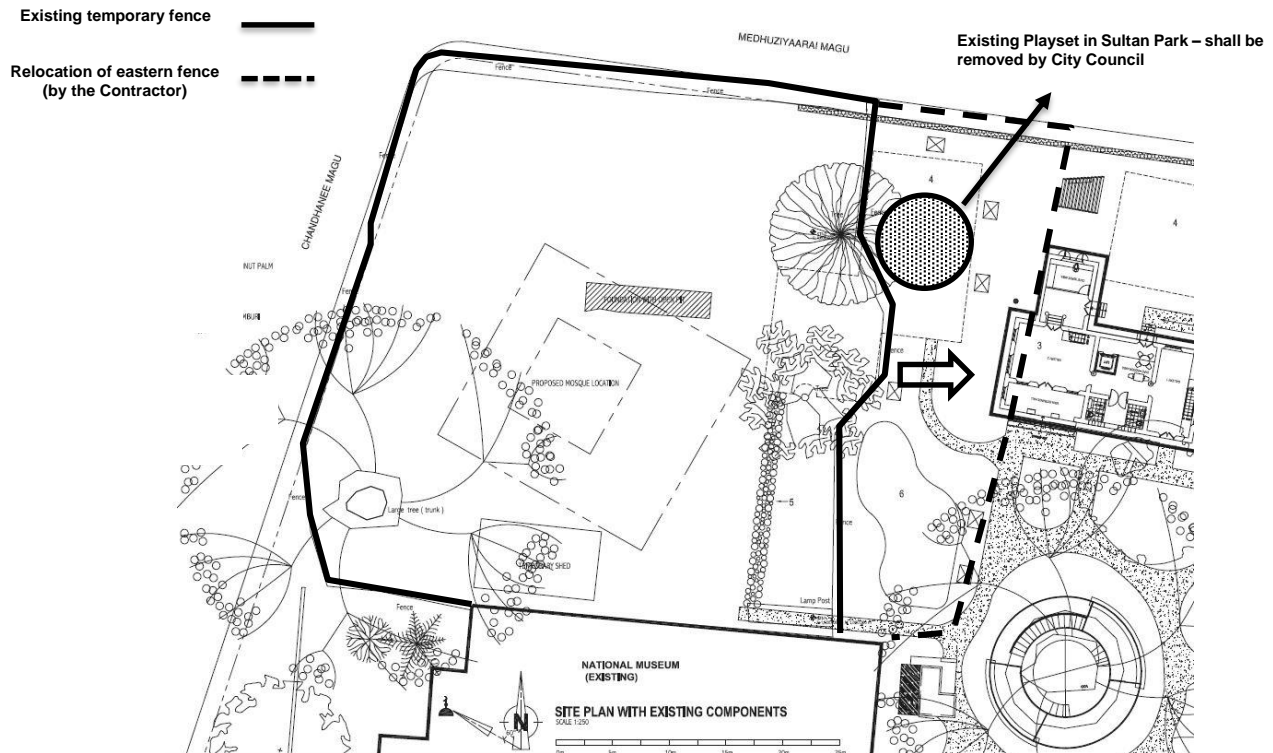
Throughout the period of the Contract the Contractor shall maintain the area of their operation within the limits of the Site in a clean, tidy and safe condition by arranging materials and the like in an orderly manner. All rubbish, debris, waste materials and the like shall be systematically cleared from the Site as it accumulates.

The Contractor shall take all steps necessary as directed by the Employer to minimise or eliminate dust, noise or any other nuisance which may occur. Plant emitting dust, smoke, excessive noise or other nuisance shall not be permitted.

The Contractor shall satisfy themselves as to the means of access to the Site and other relative items affecting same for both themselves, their Sub-Contractors and Suppliers.

A temporary security fence has been installed covering the site area for preparations works. However, the fence on the eastern side towards Sultan park shall be relocated as shown in the figure

below. The playset that falls within the boundary shall be removed by the City Council and the Employer shall coordinate and assist to ensure the removal.



Architectural drawing reference no: K3-11-101R02 Site plan with existing components

1.17. SAFETY ON-SITE

The Contractor shall be responsible for all safety measures on Site for all the materials, labourers and the works and shall comply to the National Standards set out by the Ministry of National Planning and Infrastructures, Male' City Council and the Environment Protection Agency

1.18. SITE PROGRESS MEETINGS

The Contractor shall prepare and submit to the Employer an estimated work schedule for the whole of the works before starting work on site.

During the course of the Works, Site progress meetings shall be held at weekly intervals or as required by the Employer, for the purpose of coordinating the Contractor's works and to ensure that full compliance is maintained. Minutes of such Site meetings shall be recorded by the Contractor, copies shall be distributed to all persons concerned and full effect shall be given to all instructions contained therein.

Prior to such meetings the Contractor shall give to the Employer's Representative details in writing of that portion of the Works they propose to construct during the coming two weeks with details of the plant and method they propose to employ. These proposals shall be discussed at the meeting and no work based on such proposals shall proceed without the approval of the Employer's Representative.

The Contractor shall submit all reports as instructed by the Employer in connection with Site progress meetings and the day to day management of the Works.

1.19. SETTING OUT

The Contractor shall be responsible for accurately setting out the Works to the specified positions, dimension, levels and Building Lines and also checking the site surveys for dimensional and level accuracy and reporting any discrepancies before building work commences.

The Contractor shall provide the Employer with all facilities, equipment and labour to enable them to check the setting out and levels of the Works at all times. The checking of any setting out point, line or level by the Employer shall not in any way relieve the Contractor of their responsibility.

All setting out points, benchmarks, site rails, pegs and other survey points shall be clearly marked and protected from damage or disturbance during the execution of the Works.

1.20. NOTICE BOARDS

The Contractor shall provide and maintain one notice board for the Site each consisting of a timber framed board size 1.8 m x 1.3 m.

The board shall be lettered in English and Dhivehi by skilled sign writer to include:

- ◆ The Project name
- ◆ The Employer's name
- ◆ The Contractor's name and address

A large scale layout shall be prepared and submitted for the Employer's approval before fabrication. No advertising material other than the above will be permitted. The siting and layout of Sub-Contractors or Manufacturer's sign boards, if allowed, must be submitted for the Employer's approval.

1.21. DEFECTIVE WORK

Any defective work materials and also deviations from the working details in respect of setting out, correct lines and levels, verticality, sizes, thicknesses of members and/or any other dimensional variation of any kind whatsoever, shall be removed and reconstructed or otherwise rectified without undue delay to the approval of the Employer and the Contractor shall be responsible for all additional costs incurred.

1.22. ERECTION EQUIPMENT OR OTHER PLANT

If cranes or any other type of plant which places any load on the structure are proposed, all details of such plant shall be submitted to the Employer for approval before the work is actually commenced. If approved by the Employer and Architecturally acceptable, permission may be given for the structure to be strengthened, in order to carry out loads, and the Contractor shall be responsible for any resulting additional costs.

The Contractor shall be responsible for making good to the satisfaction of the Employer any damage to the permanent structure which may be caused by their plant and equipment.

1.23. LOADING IN EXCESS OF DESIGN LOAD

No loading in excess of the design loading shall be placed on any portion of the structure without the written permission of the Employer.

If such permission is granted, all beams or other members of the structure which are subjected to loading other than the designed loading shall be strengthened and supported to the satisfaction of the Employer, and the Contractor shall be responsible for any resulting additional costs. The Contractor shall be responsible for making good to the satisfaction of the Employer any damage to the permanent structure which may be caused by such excess loading.

1.24. BUILDING PERMIT

The Employer shall obtain the building permit and all the necessary permits required by the Authorities and shall be made available to the Contractor.

The Employer shall obtain the necessary details and documentation on the required Qibla orientation of the Mosque and shall be made available to the Contractor.

1.25. PERMANENT DRAINAGE, WATER AND ELECTRICITY CONNECTIONS

The Contractor shall allow for arranging and obtaining the permanent drainage and water connections to the proposed development and they shall be responsible for making all payments in connection therewith.

Permanent electricity connection point shall be provided by the Employer, however the necessary materials, equipment, wiring and workmanship shall be provided the Contractor. (**Note:** Please refer Chapter 7 of this document for further instructions on *Electrical Installations*)

1.26. HANDING OVER

Prior to handing over the proposed development the Contractor shall gain the approvals and respective Completion Certificates from all the local government authorities and the like that the work has been completed in accordance with their requirements. Any payments in connection therewith shall be paid by the Contractor.

| | |
|---|-----------|
| 2. EXCAVATION AND EARTHWORKS..... | 11 |
| 2.1. EXCAVATION | 11 |
| 2.2. FINISH OF EXCAVATION AND INSPECTION | 12 |
| 2.3. PESTICIDE TREATMENT OF THE GROUND | 12 |
| 2.4. REMOVAL OF WATER | 12 |
| 2.5. SHEETING AND SHORING | 12 |
| 2.6. STORAGE AND DISPOSAL OF EXCAVATED MATERIAL | 12 |
| 2.7. FILLING AND BACKFILLING..... | 13 |
| 2.8. DISPOSITION OF EXISTING UTILITIES..... | 14 |
| 2.9. SAFETY OF ADJOINING EXISTING BUILDINGS..... | 14 |
| 2.10. DEWATERING..... | 14 |
| 2.11. SITE CLEARANCE | 15 |

2. EXCAVATION AND EARTHWORKS

2.1. EXCAVATION

The Contractor shall perform all excavation as required for all work under this Contract as indicated on the Drawings.

Excavation shall be carried out in all materials and by whatever means are necessary accurately to the lines and levels shown on the Drawings, or as ordered by the Employer.

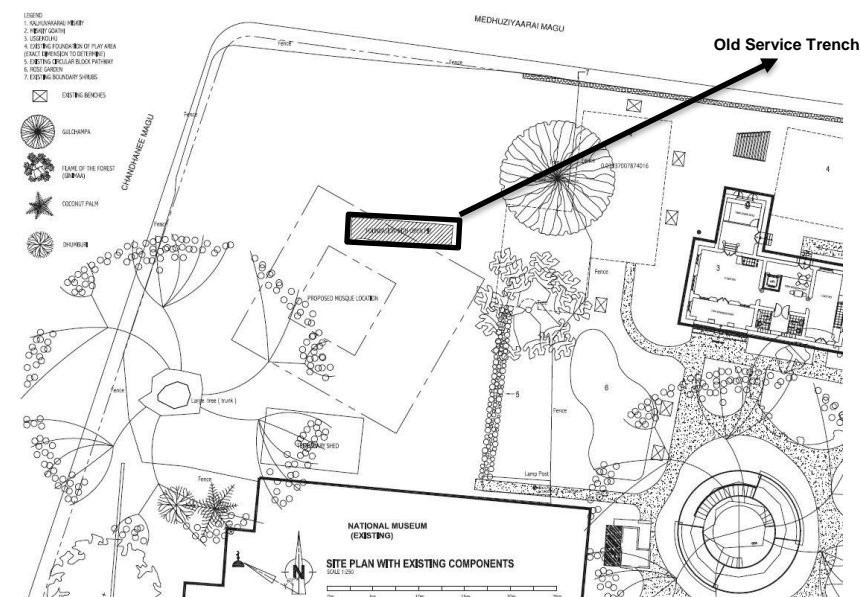
A service trench previously used by Dhiraagu has been identified on site. The Contractor shall remove a part of the service trench as required for the foundation based on the Drawings. As the trench is not being demolished, the following steps should be under taken to allow the water to pass through it:

A minimum of 50mm - 75mm, perforations to be provided at the bottom and sides of the trench.

The trench to have a 100mm gravel layer at the bottom before carrying out the backfilling (For backfilling: Please refer chapter 2.7)



Old Dhiraagu Service Trench identified on-site



Architectural drawing reference no: K3-11-101R02 Site plan with existing components

No blasting of any kind will be permitted.

Except where indicated on the drawings to remain undisturbed, the Contractor shall remove all topsoil, plants, roots, vegetation, rubbish, rocks, etc. from areas lying within limits of structures and from areas to receive fill, embankment, surfacing, road construction, concrete or other construction.

Footings and foundations shall rest on firm undisturbed soil free from loose materials.

Excavation shall extend a sufficient distance from walls, footings, etc. to allow space for placing and removing shoring and formwork, for performing all work in the excavations and for the inspection of same.

Slopes and formation surfaces shall be trimmed true to line and the required profiles shall be left well consolidated, neat and smooth.

Any additional excavation occasioned by slips, falls, wash-ins, etc., shall be made good at the Contractor's expense with mass concrete or approved filling materials as ordered by the Employer's Representative.

2.2. FINISH OF EXCAVATION AND INSPECTION

The Employer's Representative shall inspect all the excavations before commencement of further work and the Contractor shall notify the Employer's Representative when excavations are ready for inspection.

The Employer's Representative may instruct the Contractor to test the bearing capacity of the soil in the bottom of excavations. Upon receipt of such instructions, the Contractor shall forthwith carry out such tests as the Employer's Representative may instruct at the Contractor's expense.

Should the bottoms of excavation be found to be unsuitable as bearing surfaces as a result of such tests or inspection by the Employer's Representative, the Contractor shall excavate further as directed until a satisfactory bearing surface is achieved.

No excavation shall be refilled nor any permanent work commenced until the formation has been inspected by the Employer's Representative and their permission to proceed given. If required by the Employer's Representative the bottom 150mm of excavation shall not be removed until just before the commencement of construction of permanent work.

2.3. PESTICIDE TREATMENT OF THE GROUND

The Contractor shall allow access to the sub-contractor assigned by the Employer, for them to provide the necessary pesticide/termite treatments required for the ground.

2.4. REMOVAL OF WATER

The excavations shall at all times be kept free from storm water, percolating water or subsoil water by any means necessary. The Contractor shall provide, maintain and clear away on completion any equipment necessary together with temporary drains and the like. Under no circumstances shall concrete be poured, fill placed, pipes laid or appurtenances installed in excavations containing water.

2.5. SHEETING AND SHORING

Sheeting and shoring shall be provided at excavations to ensure complete safety against collapse of soil at sides of excavations, to provide protection of any and all existing mosque components, workmen and to prevent damage to adjacent property, structures, paving and utilities.

2.6. STORAGE AND DISPOSAL OF EXCAVATED MATERIAL

Excavated material shall not be piled along sides of excavations in a manner that will overload or increase danger of collapse of excavation sides. All excavated material shall be neatly piled in stock piles but where this is not practicable the excavated material shall be removed from site.

Excavated material shall be separated into those suitable for fill and those unsuitable for fill as directed by the Employer's Representative. Materials unsuitable for fill shall, as soon as practicable, be removed from site.

Material suitable for fill shall be put to immediate use or stockpiled at the option of the Contractor. Under no circumstances shall material declared to be suitable for fill be stored next to materials declared to be unsuitable for fill. Stockpiles of materials suitable for fill shall be located in areas as approved by the

Employer's Representative in the vicinity of the work, located so as not to interfere with the progress of the works. Stockpiles shall be kept in a neat, well drained workable condition at all times.

2.7. FILLING AND BACKFILLING

The excavated material arising from all excavations declared by the Employer's Representative to be suitable for fill is to be used as filling. All other filling material shall be. Filling material shall contain no perishable or organic rubbish and no particles in excess of 150mm in diameter. The maximum dry density of the material shall be not less than 1600 kg/m³.

Care shall be taken when filling or backfilling to avoid any wedging action or eccentric action upon or against the structure of the work. Before placing of fill, the surface of the sub-grade shall be compacted at optimum water content to the same percentage of maximum dry density required of subsequent layers.

Filling and backfilling shall be placed in layers not exceeding 150mm thick (after compaction). Each layer shall be uniformly spread and shall be moistened or dried by aeration when required to ensure the optimum water content and shall be compacted uniformly by hand or machine methods of specified density as follows: -

| | |
|--|----------------------------------|
| Filling under footings, water tanks, concrete beds, sidewalks and other bearing situations | At least 98% maximum dry density |
| Fill within 300mm, measure horizontally, of foundation walls, retaining walls, edges of footings, and other below grade vertical surface. When machine compacted, compaction shall be by means of a 6 ton smooth wheeled roller. | AT least 95% maximum dry density |

The Employer's Representative shall have the right to disapprove any compacting device of inadequate capacity or in their opinion, of type unsuited to the character of the material being compacted. Heavy equipment for spreading and compacting fill and backfill shall not be operated closer to walls than a distance to the difference in height between the top of the footings and the layer being compacted

Testing to determine the density of in place soil shall be by means of ASSHO Standard Method of Test T147 or in accordance with BS 1377: 1975. The number of density tests per layer shall be as instructed by the Employer's Representative.

When backfilling behind retaining walls, basement walls and the like the said structures shall be kept propped during the complete operation. The hydraulic compaction of fill shall not be permitted and the backfilling shall be carried out in layers not exceeding 150mm thick. Each layer shall be compacted to 90% of the modified compaction. No backfilling shall be carried out until the wall concrete has achieved its full works cube strength and care shall be exercised so as not to damage the external tanking membrane and its protection.

Trenches shall not be backfilled until all required pressure tests have been performed and until the utility systems, as installed, conform to the requirements of the Specifications governing mechanical, electrical, and utility work.

Where, in the opinion of the Employer's Representative, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place. The trenches shall be carefully backfilled with approved backfilling materials, as hereinbefore specified, deposited in 150mm layers and thoroughly and carefully hand tamped until the pipe has a cover of not less than 300mm for electric ducts, and 600mm for sewers and water mains. Where the pipe is specially coated for protection against corrosion, care shall be taken not to damage the coating. The remainder of the backfill material shall then be placed in 150mm layers, and compacted by hand hammers or mechanical tampers to at least 90% maximum dry density. Settling the backfill with water will be permitted, and will be a requirement, when so directed by the Employer's Representative. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for compaction, then refilled and compacted, with surface restored to the required grade and compaction, mounded over and smoothed off.

Trenches under buildings, open trenches across parking areas and trenches at other areas to be paved shall be backfilled as specified above, except that the entire depth of the trench shall be backfilled in 150mm layers and each layer shall be moistened and compacted to at least 98% of maximum dry density, to provide the required bearing value, so that construction or paving over the area can proceed immediately after backfilling is completed. Along all other portions of the trenches, the ground shall be graded to a reasonable uniformity and the mounding over of the trenches left in a uniform and neat condition to the satisfaction of the Employer's Representative.

2.8. DISPOSITION OF EXISTING UTILITIES

Before commencing any construction work, the Contractor shall obtain from the various utilities Departments, Companies or Employer the location of any existing utilities on the Site. Active utilities on the Site shall be carefully protected from damage, relocated or removed as required by the work. When an active utility line is exposed during construction, its location and elevation shall be plotted on the Record Drawings and both the Employer's Representative and the utility owner notified in writing.

Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utility shall be noted on the Record Drawings and reported in writing to the Employer's Representative.

Active utility lines damaged during the course of construction operations shall be repaired or replaced as determined by the Employer's Representative at the Contractor's expense. Immediately an active utility line is damaged the Contractor shall notify the Employer's Representative and the utility owners by telephone and in writing.

2.9. SAFETY OF ADJOINING EXISTING BUILDINGS

The Contractor shall take all necessary precautions during the excavation for the Works particularly those excavation which are adjoining existing buildings and shall protect such buildings from the damage or collapse by means of temporary or permanent shoring, strutting, sheet piling or underpinning or excavation in short lengths and/or other methods as they deem fit also they shall properly support all foundations, trenches, walls, floors, etc. affecting the safety of the adjoining existing buildings.

The Contractor shall alter, adopt and maintain all such works described above for the whole period of the Contract and shall finally clear away and make good all damages done.

The construction and efficiency of the shoring, underpinning, strutting and the like for the purpose for which it is erected shall be the responsibility of the Contractor, should any subsidence or any other damage occur due to the inefficiency of the shoring, underpinning, strutting and the like or any other support provided, the damage shall be made good by the Contractor at their own expense and responsibility.

The shoring, strutting, piling and the like, shall be executed in such a manner as to cause as little inconvenience as possible to adjoining owners or the public and the Contractor shall be responsible for negotiating with the adjoining owners the means to safeguard their property and for the use of any portion of their land for the purpose of executing the excavations and no claims submitted on this ground will be entertained.

The Contractor shall be held solely responsible for the safety of the adjoining existing buildings, the sufficiency of all temporary or permanent shoring, underpinning, piling, and the like. The Contractor shall keep the Employer informed as to manner in which they intend to proceed with the execution of the excavations and obtain their approval, such approval if given shall not absolve the Contractor of their responsibility under this Clause.

The Contractor shall save harmless and indemnify the Employer in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such matters in so far as the Contractor is responsible under this Clause.

2.10. DEWATERING

Where the excavation level is below the natural water table and it is necessary to pump continuously from the excavation or to install a specialist form of dewatering equipment around the perimeter of the site or excavation, the Contractor shall be responsible for ensuring the safety and stability of all adjoining structures and services or utilities above or below ground level. It will also be the responsibility

of the Contractor that the equipment installed shall ensure that the excavation and subsequent construction is carried out in dry conditions.

Continuous or permanent dewatering of the excavation or Site may not be undertaken without the written approval of the Employer to the work and the methods to be employed which shall also comply with Codes of Practice and Local Authority requirements.

The water pumped from the excavations or well points shall be pumped to disposal points or sumps as approved by the Employer and/or Local Authority and if so required be passed through settling tanks before disposal. Under no circumstances must water be disposed of in the City Council's sewer systems.

2.11. SITE CLEARANCE

All areas of the Site specified for clearance or from which material is to be excavated or upon which filling is to be deposited shall be cleared of all obstructions, walls, and the like and bushes, hedges, trees and the like. Material so cleared shall be removed from Site by the Contractor.

| | |
|--|-----------|
| 3. CONCRETE WORKS | 17 |
| 3.1. CONCRETE | 17 |
| 3.1.1. Cement..... | 17 |
| 3.1.2. Normal Weight Aggregate..... | 17 |
| 3.1.3. Water..... | 17 |
| 3.1.4. Storage..... | 17 |
| 3.1.5. Mix Proportions..... | 18 |
| 3.1.6. Batching and mixing of concrete | 18 |
| 3.1.7. Placing..... | 19 |
| 3.1.8. Testing..... | 20 |
| 3.1.9. Curing..... | 21 |
| 3.1.10. Formwork..... | 21 |
| 3.2. CONSTRUCTION JOINTS | 22 |
| 3.3. REINFORCEMENT | 22 |
| 3.3.1. Admixtures | 23 |
| 3.3.2. Concrete Below Ground..... | 24 |
| 3.3.3. Tolerances..... | 24 |
| 3.3.4. Watertight | 24 |
| 3.4. MORTAR..... | 24 |
| 3.4.1. Description | 24 |
| 3.4.2. Materials..... | 24 |
| 3.4.3. Mixing | 24 |

3. CONCRETE WORKS

3.1. CONCRETE

3.1.1. Cement

Cement shall, unless otherwise stated, be Portland cement of an approved brand and shall comply with the requirements and shall satisfy the tests contained in British Standard No.12 or ASTM C-150 for cement Type 1.

Cement shall be of recent manufacture and shall be used within a period of 6 months of manufacture.

The Contractor shall with each fresh consignment of cement delivered to the site furnish the Employer with a copy of the Manufacturer's statement of compliance with the above Standard Specifications together with the date of manufacture, certified by an independent agency in the country of origin and its date of delivery to Site.

Check tests will be required by the Employer. These tests shall be carried out at the Contractor's expense. Any cement failing to meet the required standards will be rejected and replaced at the Contractor's expense.

3.1.2. Normal Weight Aggregate

Fine aggregate for use in the production of concrete shall be of river sand and shall conform to the requirements of BS 882. Its grading shall be to Zones 1, 2 or 3 as defined in BS 882 and shall have not more than 10% retained on the 5 mm sieve.

Course aggregate for use in the production of concrete shall be composed of crushed gravel or stone. It shall conform to the requirements of BS 812 and shall have not more than 10% passing the 5 mm sieve.

Sources of aggregate shall be to the approval of the Employer and samples of aggregate from the proposed sources shall be submitted to the Employer at least 28 days before intended use. No new sources of aggregate will be permitted without prior approval of the Employer.

Aggregates shall be sampled and tested in accordance with the appropriate Standards. They shall be free from salt and other organic impurities and shall contain no more than 0.03% by weight of chlorides nor 0.4 % by weight of sulphates.

Any aggregates which fail to meet these requirements shall be rejected and removed from the site, following which the Contractor's sources of supply shall be re-examined for suitability.

3.1.3. Water

Fresh water or MWSC water containing not more than 10 parts per million dissolved solids shall be used for all reinforced concrete work. It shall not contain vegetable matter, acid, sulphates, chlorides or other salts in such quantities as to cause efflorescence on the face of the concrete nor to effect adversely the setting time or strength of the concrete nor to instigate electrochemical corrosion of the reinforcement.

3.1.4. Storage

Storage accommodation for materials for use in concrete shall be subject to the approval of the Employer and shall afford easy access for inspection and identification of each shipment in accordance with test reports.

1. Cement: The cement shall be delivered to site in the original sealed bags or containers from the manufacturer and shall be stored in a dry, weather-tight, properly ventilated structure, with adequate provisions for preventing the absorption of moisture and raised at least 15cm off the ground to prevent deterioration.
2. Coarse aggregate: Shall be stockpiled in separate gradings and protected against the inclusion of windblown dust, sulphates and other foreign matter.

When aggregates of different gradings are stockpiled close together the stockpiles shall be separated by bulkheads. The stockpiles are to be on concrete or other hard surface sufficiently sloped so that water is not retained in the base of the stockpiles. All aggregates are to be handled from the stockpiles in such a way as to secure a typical grading of the

material, care being taken to avoid crushing the aggregates and contamination with extraneous matter.

3. Sand: Sand shall be stored under cover and sheltered from windblown dust, sulphates and foreign matter.

3.1.5. Mix Proportions

The Contractor, having knowledge of the source and type of cement, aggregates, plant and method of placing they intend to use for the aggregate/cement ratios and water/cement ratios which they considers will achieve the strength requirements specified and will produce a workability which will enable the concrete to be properly compacted to its full depth and finished to the dimensions and within the tolerances shown on the Drawings, shall be responsible for designing their concrete mixes within the following limitations. The aggregate/cement ratios and the water/cement ratio shall not exceed the upper limits specified below. Furthermore, the quantity of cement per cubic metre of concrete shall in no case be less than the minimum specified: -

| Normal weight concrete grades | Characteristic compressive strength of cubes at 7/28 days | | Maximum aggregate size (mm) | Maximum free water cement ratio | Kg of cement per cubic metre of compacted concrete | |
|-------------------------------|---|---------|-----------------------------|---------------------------------|--|-----|
| | 7 days | 28 days | | | Max | Min |
| 30 for on land structures and | 21 | 30 | 20 | 0.42 | 450 | 350 |
| 40 for on water structures | 28 | 40 | 20 | 0.42 | 450 | 350 |

As soon as possible after commencement of the Contract, the Contractor shall prepare such trial mixes as required to satisfy the Employer that the specified concrete strengths will be obtained using the materials and mix proportions in accordance with the above clauses. The proportion of cement shall be increased if necessary to obtain the strengths required.

From each trial mix, six Preliminary Test Cubes shall be made and tested two at 7 days and four at 28 days, the test at 7 days being intended to give an early indication of possible variation from the required strength. If the difference between the highest and lowest results from any one trial mix is more than 15 per cent of the average of the strength test results, the test is to be discarded and a further trial mix made, unless all test results so obtained are above the required strength.

In TRIAL MIX the average compressive strength of the three cubes tested at 28 days shall exceed the specified characteristic strength by at least 10 N/sqmm

3.1.6. Batching and mixing of concrete

Concrete may be batched either by weight or by volume. It may be batched and mixed on Site or outside the Site and transported thereto.

When mixed outside the Site and transported to it, batching and mixing shall be in accordance with ASTM Specification C94 "Standard Specification for Ready Mixed Concrete".

When mixed on Site, batching and mixing shall be as follows;

Batching by Weight: The cement and each size of aggregate shall be measured by weight. The water may be measured by weight or volume. The weight batching machines used shall be of an approved type, and shall be kept in good condition while in use on the Works. Checks are to be made as required to determine that the weighing device are registering correctly.

Batching Aggregate by Volume: When batching aggregates by volume is allowed, the cement shall be batched by weight and the aggregate and water by weight or volume. Each size of aggregate shall be measured in metallic containers the depth of which is at least equal to their greatest width. The containers shall be of such shape that their volume can be easily checked by measurement.

Mixing Concrete: The location of the batching and mixing plant shall be approved by the Employer.

Concrete shall be mixed in a batch mixer of an approved type and in good condition having a drum rotation about a horizontal or inclined axis. A continuous mixer shall not be used. Each mixer is to be fitted with a water measuring device having an accuracy within one percent (1%) of the quantity of water required for the batch.

The water measuring device shall be such that its accuracy is not affected by variations in the water supply pressure.

The batch shall be so charged into the mixer that some water (about 10%) enters the drum in advance of the cement and aggregates, water shall then be added gradually while the drum is in motion such that all required water shall be in the drum by the end of the first quarter of the mixing time. The concrete shall be mixed until a mixture of uniform colour and consistency is obtained.

The amount of concrete mixed in any one batch is not to exceed the rated capacity of the mixer. The whole of the batch is to be removed before materials for a fresh batch enter the drum.

On cessation of work, including all stoppages exceeding 20 minutes, the mixers and all handling plant shall be washed with clean mixing water. If old concrete deposits remain in the mixer drum, it shall be rotated with clean aggregate and water to clean out the drum prior to production of new concrete.

Concrete mixed as above is not to be modified by the addition of water or in any other manner to facilitate handling or for any other reason.

3.1.7. Placing

Concrete shall be conveyed from the mixer to its final position in any suitable manner, provided there is no segregation, loss of ingredients or contamination. It shall be placed in its final position before initial setting takes place and within 20 minutes of the addition of the water to the mixer. However, when agitating equipment is used to convey concrete such as in ready-mixed concrete, the elapsed time between the addition of the water and placing may be increased to 45 minutes.

The order of placing concrete shall be such as to prevent water from collecting at the ends, corners and along the faces of forms. It shall not be placed in large quantities at any given point and allowed to run or be worked over a long distance in the form. Whenever possible concrete shall be placed and compacted in even layers with each batch adjoining the previous one.

The thickness of each layer shall be between 15 and 30 cms as agreed with the Employer. The layer thickness will depend on the width of forms, the amount of reinforcement and the need to place each layer before the previous one stiffens.

Concrete shall not be allowed to drop freely for more than 1.50 m. To convey the concrete as near as possible to its final positions, drop chutes of rubber or metal shall be used for small sections and bottom dump buckets or other suitable vessels for large sections.

Concrete shall be carefully compacted when placed to ensure a dense and uniform mass free from air holes and cavities. Concrete shall be compacted by vibrations. Vibration shall be performed by mechanical or electromechanical vibrators. The vibrators shall be of the plunger (poker) type for insertion in the concrete.

The poker type vibrators shall have a diameter compatible with spacing of reinforcement, a sufficiently high frequency and be properly handled by experienced personnel. They shall be immersed at regular intervals close enough to vibrate all the concrete, but not so close as to affect previously vibrated and partially set concrete. Each immersion shall continue until shortly after air bubbles cease to appear on the surface of the concrete, but shall not last more than 30 seconds. The vibrators shall be withdrawn gradually to ensure that no air pockets are formed.

All vibrations, compaction and finishing operations shall be completed within 15 minutes from the time of placing the concrete in its final position.

Concreting for any one part or section of the work shall be carried out in one continuous operation, and no interruption of concreting work will be allowed. Where beams and slabs together form an integral part of the structure, they shall be poured in one operation, unless provision is made to form a construction joint. A record is to be kept by the Contractor on Site of the time and date of placing

the concrete in each portion of the works and the number and identification of the Works Tests Cube corresponding to these portions.

3.1.8. Testing

The frequency of testing shall be as noted in the clauses of this section. The Works Test Cubes shall be made at least once for each individual part of the structure as agreed with the Employer.

At least six cubes shall be made at one time. Two of the six cubes are to be tested at 7 days. The remaining four cubes are to be tested at 28 days, and their average strength must not fall below the minimum strength specified and the lowest test result shall not be more than 20% below the average of the four cubes.

When the result of the 7-day test is unsatisfactory, The Contractor may elect to remove and replace the defective concrete without waiting for the 28-day test. If the result of the 28-day test is unsatisfactory, all concreting shall be stopped at the Contractor's expense and shall not proceed further without written permission from the Employer.

If concrete is unsatisfactory, and where requested by the Employer, the Contractor shall remove and test cores or conduct in-situ load tests from/on suspect portions of the works. Concrete found to be defective shall be cut out, removed and replaced by the Contractor at their own expense.

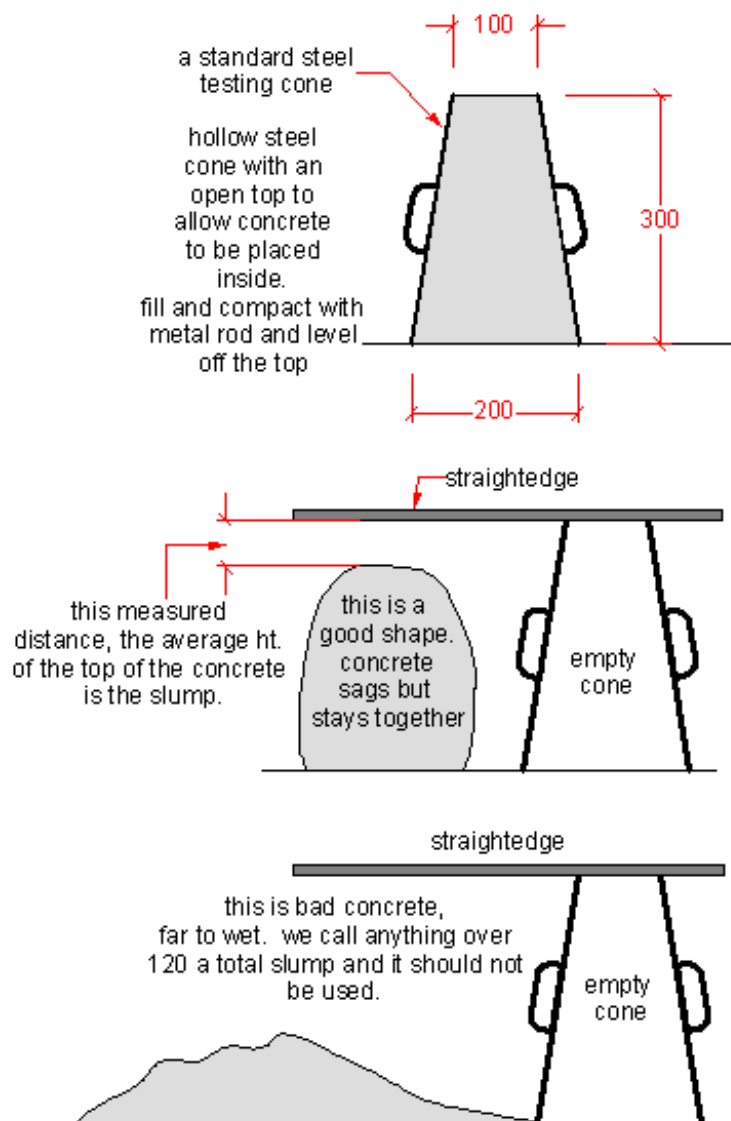
Slump Test

This test is vital for determining the consistency of concrete by filling a conical mold with a sample of concrete, then inverting it over a flat plate and removing the mold; the amount by which the concrete drops below the mold height is measured and this represents the slump. Recommended Slump is not more than 70mm

Below graphics describes how a simple test of slump test can be done on site

Procedure to determine workability of fresh concrete by slump test.

- i. The internal surface of the mould is thoroughly cleaned and applied with a light coat of oil.
- ii. The mould is placed on a smooth, horizontal, rigid and nonabsorbent surface.
- iii. The mould is then filled in four layers with freshly mixed concrete, each approximately to one-fourth of the height of the mould.
- iv. Each layer is tamped 25 times by the rounded end of the tamping rod (strokes are distributed evenly over the cross section).
- v. After the top layer is rodded, the concrete is struck off the level with a trowel.
- vi. The mould is removed from the concrete immediately by raising it slowly in the vertical direction.
- vii. The difference in level between the height of the mould and that of the highest point of the subsided concrete is measured.
- viii. This difference in height in mm is the slump of the concrete.



3.1.9. Curing

Freshly placed concrete shall be protected from rain, dust, chemical attack and the harmful effects of heat, wind, flowing water, vibrations and shocks. This protection shall continue until the concrete is sufficiently set such that it can no longer be damaged by these factors which shall not be less than 24 hours after the time of placing.

Concrete shall be cured for at least 7 days or longer if instructed.

Timber formwork covering the concrete shall be moistened with water at frequent intervals to keep it from drying during the curing period. Metal formwork exposed to the sun must be shaded from its direct rays, painted white or otherwise protected during the curing period.

3.1.10. Formwork

The Contractor shall supply, design, erect, strike and remove the formwork and be entirely responsible for its stability and safety so that it will carry the wet concrete and all incidental loadings and preserve it from damage and distortion during its placing, vibration, ramming, setting and curing. The materials of the formwork shall be completely new and shall not be recycled/reused materials. It shall be so constructed as to leave the finished concrete to the dimensions shown on the Drawings and of a material capable of providing the surface finish specified. In any event, the maximum

permissible deflection under all load shall not exceed 2mm or 1/600 of the free span, whichever is less.

Formwork shall be constructed so as to prevent the loss of any liquid from the wet concrete and to be removable without shock to the partially set concrete. When the concrete is to be vibrated, all wedges must be nailed so as to prevent slipping or distortion.

Formwork shall be of timber and/ or metal and shall include all temporary concrete moulds and their supports.

For concrete surfaces which are to be plastered, clean sawn boards should be used.

For concrete surfaces which are to remain exposed wrought formwork shall be of timber framing lined with 12mm thick smooth polyurethane faced plywood or an equal approved lining or of metal, suitable to obtain a fair-faced finish on the concrete. Where columns or beams are shown as chamfered wrought hardwood fillet shall be planted in the angles of the formwork. Except where shown otherwise on the drawings, all exposed concrete corners and arises shall have a 15 x 15mm chamfer.

All formwork is to be thoroughly cleaned of any concrete or any other deposits. Immediately before concreting, formwork shall be thoroughly hosed down with water, temporary openings being provided to permit the escape of sawdust, shavings etc., with the water.

Wherever required and prior to placing of the reinforcement the internal surfaces of all formwork shall be treated with an approved mould oil.

Unless otherwise specified, the minimum period before striking formwork shall be as follows.

| | |
|--------------------------|---------|
| Columns | 2 days |
| Beams, sides | 2 days |
| Beams, soffits | 21 days |
| Beam props | 21 days |
| Suspended slabs, soffits | 21 days |
| Slab props | 21 days |

Any work showing signs of damage through premature loading is to be entirely reconstructed at the Contractor's expense.

The Contractor is entirely responsibility for the safe removal of formwork and all other temporary works.

3.2. CONSTRUCTION JOINTS

Whenever placing of concrete is discontinued within a bay or prior to completing a member, a construction joint shall be formed. Construction joints are to be made only along a horizontal or vertical plane except that in the case of inclined or curved members they shall be at right angles to the principal axis. Care shall be taken to prevent off-setting of the joint and to ensure water tightness.

Unless otherwise shown on the Drawings, construction joints will not be allowed in the unsupported sections of slab, beams and beamlike members. At construction joints the laitance film and porous layer of the already set concrete shall be removed and the surface keyed by hacking and then wire-brushed and thoroughly cleaned. Immediately before adding the fresh concrete, the surface is to be thoroughly wetted and a 10 mm thick coating of a fresh cement/sand mortar (having the same proportion of cement/sand as concrete in the mix) applied to the surface. The new concrete is then to be well compacted against the old.

3.3. REINFORCEMENT

Reinforcement shall be high yield deformed bars or mild steel complying with B.S. 4449 or welded wire fabric complying with B.S. 4483, except that the characteristic strength for mild steel reinforcement shall be 250N/mm² and for high yield steel shall be 415 N/mm².

High yield bars will be shown on drawings with T prefix. Mild steel bars will be shown on drawings with R prefix.

Reinforcing bars are to be stored clear off the ground and shall be truly straight. Suitable covering shall be provided to protect against windblown sulphates, chlorides and other deleterious matter.

Manufacturer's test certificates for all classes of reinforcement shall be supplied when required. Specimens sufficient for three tensile tests and three cold-bending tests per ten tonne of bars or fraction

thereof and for each different size of bars shall be sampled. Testing shall be in accordance with B.S.4449 and batches shall be rejected if the average results for each batch is not in accordance with BS4449.

All steel is to be totally free from dirt, paint, loose rust or scale and is to be thoroughly brushed and cleaned after positioning and immediately prior to concreting.

The bars are to be accurately bent to the shapes indicated, and the bending must, wherever possible, be completed before the steel is fixed in position. Straight portions of bars must be true and bends must be kept out of winding. The internal radius of bends shall not be less than four times the diameter of the bar, except for stirrups and column binders. Great care is to be taken to bend stirrups and column binders to fit closely around the main bars. In the absence of reinforcement bending schedules the bending requirements of B.S. 4466 "Bending Dimensions of Bars for Concrete Reinforcement" or other similar approved standard shall govern.

Except where agreed by the Employer all bars are to be bent cold.

Lengthening of bars by welding and rebending of incorrectly bent bars will not be permitted.

Unless otherwise stated splices in reinforcing bars shall be formed by lapping. Such laps in bars in any member shall be staggered. Except as otherwise indicated on the Drawings, the minimum overlap of lapped splices shall be 40 bar diameters or 30cm, whichever is greater.

The steel is to be fixed in position exactly as indicated and the bars are to be securely wired together with 1.6 or 1.4mm soft iron wire or approved spring steel slips wherever necessary to prevent any displacement during concreting. Spacers, chairs and the like, temporary or permanent, are to be used as required to ensure that the steel has the exact amount of cover indicated. No permanent spacers may show on a surface where a fair faced concrete finish or brushed aggregate finish are required.

Unless otherwise indicated, the minimum cover to the reinforcing bars and to binding wire shall be as follows:

| POSITION | COVER mm |
|--|----------|
| Main bars in columns | 40-45 |
| Main bars in floor slabs and soffits of roof slabs | 30 |
| Main bars in top of roof slabs | 30-35 |
| Bars in top ground slabs | 30-35 |
| Bars at faces in contact with soils | 50-55 |
| Clear cover in beams | 35-40 |

The Contractor is to ensure that no steel is displaced from its position during the placement of concrete.

All reinforcement to be sprayed with water two hours before concreting commences.

3.3.1. Admixtures

Admixtures shall be used as specified by the Employer. Prior approval of the admixture is required if the proposed admixture is different from what is specified in the drawing. Dir. The rates and methods of application shall be strictly in accordance with the manufacturer's written instructions.

3.3.2. Concrete Below Ground

All concrete faces below ground are to be protected as specified in the drawing and according to the manufacturer's written instructions or as approved by Employer.

3.3.3. Tolerances

Except where otherwise noted on the Drawings, concrete surfaces shall be cast with the following tolerances:

| | |
|--|---|
| Sizes of beams, thickness of walls | +/- 3mm |
| Setting out dimensions, horizontal or vertical | +/- 6mm |
| Surface slabs | +/- 5mm |
| Verticality of columns, walls and straightness of beam faces | +/- 2mm in 3m (but not more than +/- 5mm overall) |

3.3.4. Watertight

The Contractor shall include in their rates for such waterproof additives as they deem necessary, subject to the prior approval of the Employer, or as instructed on the drawings.

When in the opinion of the Employer, damp patches or leakage of water in the finished work are due to failure of the Contractor to comply with the specification, the affected work shall be made good at the Contractor's expense.

Water bars shall be provided as shown on the drawings and at all construction joints and the type of water bar will be as specified or to the approval of the Employer. All water bars shall be jointed and supported strictly in accordance with the manufacturer's instructions.

3.4. MORTAR

3.4.1. Description

Mortar for bedding kerbs, channels, cover frames etc shall be 1:4 cement: sand mortar.

Mortar for grouted stone pitching shall have 5% by weight of hydrated lime added to it.

Mortar for use with blockwork and rendering shall be 1:5 cement: sand mortar, and shall have a trial strength at 28 days of 7N/mm², (when tested in a 100 x 100 test cube).

3.4.2. Materials

Cement shall be Portland cement to BS12 and sand shall be a natural sand or crushed natural stone or a combination of both as specified in BS 1200.

3.4.3. Mixing

Mortar shall be mixed thoroughly either by hand or mechanically until its colour and consistency are uniform. The consistent materials shall be accurately gauged, allowance being made for bulking of sand. Mortar shall be made in small quantities only as and when required. Mortar which has begun to set or which has been mixed for a period of more than one hour shall be discarded.

Mortar plasticisers may be used with the Employer's approval, but in no circumstances shall calcium chloride be permitted.

| | |
|--|-----------|
| 4. BLOCKWORK..... | 26 |
| 4.1. MATERIALS | 26 |
| 4.2. MORTAR | 26 |
| 4.3. WORKMANSHIP | 26 |
| 4.4. LOAD-BEARING WALLS..... | 27 |
| 4.5. NON LOAD- BEARING WALLS..... | 27 |
| 4.6. PROTECTION OF FINISHED BLOCKWORK..... | 27 |
| 4.7. COMPRESSIBLE JOINT FILLERS..... | 27 |
| 4.8. POLYSULPHIDE SEALANT | 27 |
| 4.9. LINTELS..... | 27 |
| 4.10. REINFORCEMENT | 27 |
| 4.11. SOURCE OF MATERIAL | 28 |
| 4.12. STORAGE OF MATERIALS..... | 28 |
| 4.13. BLOCKWORK BELOW GROUND LEVEL | 28 |

4. BLOCKWORK

4.1. MATERIALS

Cement: Ordinary Portland Cement shall be used as described under concrete work. White or coloured cement shall comply with the physical requirements of B.S 12.

Lime: Lime shall be hydrated lime complying with B.S 890 Class B to be soaked in water for not less than 16 hours before use.

Water: Water shall be as described under Concrete Works.

Sand: Sand shall be as described under Concrete Works.

Concrete Blocks: Blocks shall be manufactured of cement and sand 1:5 mix (300 Kg cement to one metre cube of sand) made in vibrated pressure machines. They shall be hard, sound, square and clean with well-defined arises and shall be 400 mm (± 5 mm) long x 200mm (± 5 mm) high unless otherwise shown on the Drawings. The tolerance of thickness shall be (± 3 mm).

Unless otherwise shown on the Drawings blocks shall be hollow blocks and shall be of approved design.

Immediately after moulding, blocks shall be placed on clean, level, non-absorbent pallets. Blocks shall not be removed from the pallets until they have been inspected and approved by the Employer. Blocks shall be steam cured for 14 days.

Blocks shall be tested for compressive strength whenever required by the Employer. For each test twelve blocks will be selected by the Employer. The average compressive strength for the gross area of hollow blocks shall be not less than 25 kg/cm² and the minimum block shall be 20 kg/cm².

Should a test not meet the above requirements, the batch of blocks from which the sample was taken, will be rejected and shall be removed from the Site.

Aerated Concrete Blocks: Shall conform to BS 8110 Part 2:1985 and BS 6073 Part 1:1981 for method of casting, density, thermal conductivity and strengths. Density of block shall guarantee good resistance to rain penetration as unprotected single leaf wall

4.2. MORTAR

Mortar shall consist 1-part cement to 5 parts of sand by volume. For work not in contact with earth or sand, 1-part lime may be added to the mix. Mortar for pointing facing concrete blocks shall be prepared using white cement. When blockwork is constructed below ground level sulphate resisting cement shall be used.

Should the Contractor wish to use a plasticiser with mortar, then the mortar shall consist of 1-part cement to 5 parts sand with plasticiser added and used strictly in accordance with the manufacturer's instructions. The plasticiser must be approved by the Employer before use.

Mixing shall be carried out by means of an approved mechanical batch mixer. The mortar shall be mixed dry until a uniform mix is obtained. Sufficient water shall then be added and the mixing continued until a homogenous mix is obtained. Excess water shall not be used in the mix.

All mortar shall be used before the initial set has taken place and on no account shall mortar which has commenced to set be remixed with water or new batches and used.

4.3. WORKMANSHIP

Generally, workmanship shall be in accordance to BS 8000.

Blockwork shall be set out and built to the respective dimensions, thicknesses and heights shown on the Drawings and/ or as instructed in writing by the Employer.

Unless otherwise ordered, hollow blocks shall be used in all closures, end blocks such as at door jambs, window openings, etc., and blocks of special lengths or size, shall be solid. The blocks shall be well soaked before being used and the tops of walls left off shall be wetted before work is recommenced.

Blocks shall be laid in true and regular courses on a full bed of mortar of 10 mm average thickness, exclusive of any key in the jointing surfaces of the blocks. Sufficient mortar shall be used in bedding and jointing to ensure that all keys are solidly filled. Where blocks abut against concrete each third course shall be tied thereto by means of approved galvanised steel ties.

All horizontal joints shall be properly level. The Vertical joints shall be properly lined and quoins, jambs and other angles plumbed as the work proceeds.

All walls shall be plumbed vertical.

Standard sized block shall be used wherever possible. Broken blocks shall not be used except where required for bonding purposes. Walls and partitions shall be bonded to one another at angles and junctions.

Joints of faces of block walls which are to be rendered or plastered shall be raked out for depth of 10 mm as the work proceeds.

Walls shall be carried up regularly without leaving any part more than one metre lower than another unless the permission of the Employer is first obtained. Work which is left at different levels shall be racked back.

The Contractor shall cut and fit blockwork as required, leave or form chases for edges of concrete slabs, steps, ends of partitions, etc. cut chases for pipes, conduits, etc., and generally perform all cutting away for all trades.

4.4. LOAD-BEARING WALLS

Load-bearing walls shall be constructed in accordance with B.S.C.P 111 Part 2.

Where a horizontal or vertical joint is not solidly filled or where it is found that the Contractor has used blocks other than the blocks specified the whole panel of wall will be considered suspect and will be removed and rebuilt at the Contractor's expense.

4.5. NON LOAD- BEARING WALLS

Non load-bearing walls shall not be constructed at the same time as the load-bearing walls but built at least two weeks after the roof or upper floor structure is completed. Toothing into load bearing walls will not be permitted.

4.6. PROTECTION OF FINISHED BLOCKWORK

The Contractor shall ensure that the finished blockwork walling is not damaged by subsequent operations.

The Contractor is to protect newly or partially built walling against it being dried out too rapidly by the sun's heat or from any other adverse climatic effects and is to follow the Employer's instructions in this matter.

The Contractor shall in all cases cover all newly erected walling with hessian or other material approved by the Employer and shall keep the same wet for at least three days.

4.7. COMPRESSIBLE JOINT FILLERS

Compressible joint fillers shall be used where specified at joints on drawings or requested by the Employer. Filler shall be cut to exact widths and shall have all edges neatly trimmed. All fixing shall be strictly in accordance with the manufacturer's printed instructions.

4.8. POLYSULPHIDE SEALANT

Gun quality sealant shall be used where specified on the drawing or where requested by the Employer including external joinery and metal work bedded against blockwork or concrete. The colour shall be to the approval of the Employer.

The primer shall be supplied by the same manufacturer as the sealant. The joints will first be thoroughly cleaned to the satisfaction of the Employer and shall be primed before sealing with sealant. Application of these materials shall be strictly in accordance with the manufacturer's printed instructions.

4.9. LINTELS

Prefabricated lintels shall comply with the requirements of B.S 5977, Part 2. All lintels shall be bedded on cement and sand mortar and the Contractor shall allow for a minimum bearing at each end of 150 mm.

4.10. REINFORCEMENT

Plastic mesh reinforcement shall be used every connection to concrete.

4.11. SOURCE OF MATERIAL

All blocks for use in the works shall be obtained from a source approved by the Employer. The Contractor shall not change same source without the written approval of the Employer.

4.12. STORAGE OF MATERIALS

Cement shall be stored in a weatherproof ventilated housing off the ground and away from any source of water and dampness. These materials shall be stored in such a manner that they are used in rotation in order of delivery.

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

Blocks shall be delivered to Site stacked and stored to permit ventilation and protected from rain, dampness and the like.

In the event that any materials for use in this Section deteriorate and become unusable due to inadequate and poor storage they shall be removed from Site as instructed by the Employer and replaced at the Contractor's expense.

4.13. BLOCKWORK BELOW GROUND LEVEL

All blocks used in construction below ground level shall be solid.

| | | |
|-----------|--|-----------|
| 5. | ASSEMBLY OF MOSQUE, WELL AND PATHWAY..... | 30 |
| 5.1. | MATERIALS | 30 |
| 5.1.1. | Mosque..... | 30 |
| 5.1.2. | Well | 30 |
| 5.1.3. | Pathway..... | 30 |
| 5.1.4. | Roofing | 30 |
| 5.2. | LABOUR WORKS | 30 |
| 5.3. | SPECIAL INSTRUCTIONS..... | 30 |

5. ASSEMBLY OF MOSQUE, WELL AND PATHWAY

5.1. MATERIALS

5.1.1. Mosque

All the components of the Mosque, including the coral stone blocks, wooden pillars, sliding door panels, window panels, wooden gate are pre-existing components and shall be provided by the Employer.

5.1.2. Well

The stonewall of the well which is above the ground is an existing component and shall be provided by the Employer.

5.1.3. Pathway

The pathway (coral stone steps) leading from the ablution floor to the Mosque entrance are pre-existing components and shall be provided by the Employer.

5.1.4. Roofing

The Employer will provide the wooden framework of the three-tier roof. The Contractor shall supply the corrugated roofing sheet according to the Drawing including fittings and accessories with Manufacturers specification. The colour of the roofing sheets shall be approved by the Employer. The Contractor shall supply the insulation, aluminum foil backing and insulation net as shown in the Drawings.

5.2. LABOUR WORKS

The Contractor shall provide labour works required to complete the assembly of the Mosque, the well and the pathway from the ablution floor to the entrance of the Mosque.

5.3. SPECIAL INSTRUCTIONS

The Contractor shall educate and instruct all the labourers involved in the assembly works with the following instructions;

- The Contractor shall ensure that all personnel involved at this stage of work plan are fully aware of the significance of preserving all the pre-existing materials at its present condition and must be handled with utmost care and diligence.
- During all assemble works an Employer's Representative shall be allocated and present on-site, and he/she shall be providing guidance, supervision and monitoring the works at all times. Under no circumstance, shall the Contractor work without the presence of the Employer's Representative on-site.
- Any form of handling including touching, lifting, moving from one place to another or assemble works of the existing components/materials of the Mosque shall be explicitly under direct supervision of the Employer's Representative.
- The Mosque is uniquely structured with grooves and pinions in the coral stone blocks that requires a specific sequence of layering during assemble works, hence the Contractor shall explicitly follow the direction and guidance provided by the Employer.

6. FIRE-FIGHTING WORKS.....32

6.1. MATERIALS32

6.2. LABOUR WORKS32

6. FIRE-FIGHTING WORKS

6.1. MATERIALS

The Contractor shall supply all the materials, fittings and accessories required as per the Drawings.

6.2. LABOUR WORKS

The Contractor shall provide all labour works and supervision to place the portable extinguishers as shown in the Drawings

7. ELECTRICAL INSTALLATIONS.....34

7. ELECTRICAL INSTALLATIONS

The Employer shall provide all the Light Fittings as specified in the Electrical Schedule and the Socket Outlets, ALL other materials, equipment, wiring and workmanship shall be provided by the Contractor and shall comply to the National Standards set out by the Maldives Energy Authority.

The Contractor shall supply and install the Main Panel Board, the Distribution Boards, the Electrical Works testing/commissioning and the Electrical Wirings. The Contractor shall provide labour works, equipment and supervision in installing the light fittings.

| | | |
|-----------|-------------------------------|-----------|
| 8. | LANDSCAPING WORKS..... | 36 |
| 8.1. | BOUNDARY WALL..... | 36 |
| 8.2. | MUSEUM BOUNDARY WALL..... | 36 |
| 8.3. | LEDGE WALL..... | 36 |
| 8.4. | GARDENING WORKS..... | 36 |
| 8.5. | BENCHES AND JOALI..... | 36 |
| 8.6. | GROUND SURFACES | 36 |
| 8.7. | DUSTBINS | 36 |

8. LANDSCAPING WORKS

8.1. BOUNDARY WALL

The Contractor shall supply materials, labour works, equipment and supervision to construct the boundary wall on the periphery of the landscape as indicated on the Drawings. The Contractor shall refer to the Landscape Plan, Detail Drawings, Specifications and other relevant documents.

8.2. MUSEUM BOUNDARY WALL

The Contractor shall supply materials, labour works, equipment and supervision to construct the Museum boundary wall which is separating the Museum property and the site as indicated on the Drawings. Finishing of the Museum Boundary Column and the metal sliding gate must be consistent with existing gate/column of Museum. The Contractor shall refer to the Landscape Plan, Detail Drawings, Specifications and other relevant documents.

8.3. LEDGE WALL

The Contractor shall supply materials, labour works, equipment and supervision to construct the ledge wall surrounding the existing foundation edge as indicated on the Drawings. The Contractor shall refer to the Landscape Plan, Detail Drawings, Specifications and other relevant documents.

8.4. GARDENING WORKS

The Contractor shall complete the ground levelling and the earth preparations as required.

The Contractor shall supply the list of trees identified in the Landscape Plan and plant them in the indicated locations. The Contractor shall ensure that the plants are in a good condition and free from plant diseases and pests. The Contractor shall immediately remove plants containing any diseases and/ or pests from the Site. All plants supplied by the Contractor shall be healthy, well formed, and well rooted. Roots shall not show any evidence of having been restricted or deformed at any time. The potting materials used shall be weed free. There shall be sufficient topsoil around each plant to prevent desiccation of the root system. Where plants are stored on site prior to planting they shall be maintained to ensure that the root systems remain moist.

Grass sods/carpets supplied by the Contractor shall be clean of invasive plants or weeds. Sods shall be delivered in healthy conditions and be free from weeds and disease. The soil shall be compatible with that removed from the area to be revegetated and shall not have been compacted by heavy machinery.

8.5. BENCHES AND JOALI

The Contractor shall supply materials, labour works, equipment and supervision to make the number of benches and *Joali* as shown on the Drawings and placing them on the indicated locations on the landscape. The Contractor shall refer to the Landscape Plan, Specifications and other relevant documents.

8.6. GROUND SURFACES

The Contractor shall supply materials, labour works, equipment and supervision to make the concrete pavement as shown on the Drawings. The Contractor shall refer to the Landscape Plan, Specifications and other relevant documents.

The Contractor shall supply materials, labour works, equipment and supervision to apply white dry sand inside the low wall (Veranda-2) as shown in the Drawings. The Contractor shall refer to the Landscape Plan, Specifications and other relevant documents.

The Contractor shall supply materials, labour works, equipment and supervision to apply white dry sand on the existing foundation of the play area as shown in the Drawings. The Contractor shall refer to the Landscape Plan, Specifications and other relevant documents.

The Contractor shall supply materials, labour works, equipment and supervision to apply coarse sand "*kashi veli*" right outside the edge of the low wall boundary as shown in the Drawings. The Contractor shall refer to the Landscape Plan, Specifications and other relevant documents.

8.7. DUSTBINS

The Contractor shall supply and place the dustbins as shown in the Drawings

9. FINISHING WORKS.....38

9.1. MOSQUE.....38

9.2. MOSQUE COMPOUND.....38

9. FINISHING WORKS

9.1. MOSQUE

The Employer shall provide the reed mat "*thundu kuna*" which is to be laid on the main prayer area, the southwest veranda-1 and the northeast veranda-1. The Contractor shall install the reed mat "*thundu kunaa*" provided by the Employer as shown in the Drawings.

9.2. MOSQUE COMPOUND

The Contractor shall supply and apply the exterior paint on the surface of the low wall of inside the Mosque compound as per the instructions of the Employer.

The details of the paint shall be provided by the Employer and must be approved by the Employer before purchase.

APPENDIX I

SUMMARY

| WORKS | MATERIAL PROVIDED BY | LABOUR WORKS PROVIDED BY | SPECIAL INSTRUCTIONS |
|-----------------------------------|-------------------------|--------------------------|--|
| Relocation of Security Fence | Contractor | Contractor | |
| Excavation | Contractor | Contractor | |
| Pesticide Treatment | Sub-Contractor | Sub-Contractor | Coordinate with Employer to allow Sub- Contractor access to the work-site for treatment works. |
| Foundation of Well and Mosque | Contractor ¹ | Contractor | ¹ Lime/"Uva" will be provided for the damp proofing method by the Employer |
| Electrical Installations | Contractor ² | Contractor | ² Light fittings and socket outlets shall be provided by the Employer |
| Concrete Works of Well and Mosque | Contractor | Contractor | |
| Assembling of Well and Mosque | Employer ³ | Contractor ⁴ | ³ Corrugated Roofing Sheets, fittings and accessories shall be provided by the Contractor ⁴ Direct guidance and supervision by the Employer |
| Landscaping | Contractor | Contractor | |
| Fire-Fighting Works | Contractor | Contractor | |
| Finishing Works | Contractor ⁵ | Contractor | ⁵ "Thundu Kunaa" shall be provided by the Employer |