

MILITARY ENGINEERS

MALDIVES NATIONAL DEFENCE FORCE  
MALE' REPUBLIC OF MALDIVES

TECHNICAL SPECIFICATIONS

Project     **CONSTRUCTION OF 08-STOREY ACCOMODATION BUILDING**  
Location    BANDAARA KOSHI, MALE'  
              Republic of Maldives  
Client       Ministry od Defence and National Security  
              Male'

Item #	MATERIALS & WORKMANSHIP	Remarks
	<p><i>The following description of materials, workmanship and general conditions shall apply to the whole of the works regardless of the trade heading under which they have been described and are to be read in conjunction with accompanying Bills of Quantities. The term "approved " shall mean approved by the Engineer. In the following description of materials, the letter BS refer to the British Standards as issued by the British Standard Institution, British Standard House, London. The letter CP refer to the British Standard Code of Practice. The latest amendment is implied in each case.</i></p>	

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1	<p><b><u>Excavation</u></b>  Generally all excavation is measured net and no allowance has been made for increases in bulk after excavation. The Contractor shall report to the Engineer when the excavations ready to receive concrete and no concrete shall be laid until after the excavation have been inspected and approved by the Engineer. If the contractor excavate below the levels shown on the drawings without written order, he shall fill up to the part excavated with concrete as described for foundation at his own expense. In all cases the finish excavations shall be approved by the Engineer before any further work is carried out.</p> <p><b><i>Nature of Soil</i></b>  The Contractor must judge for himself the nature of the soil. Excavation shall include excavation in any material whatsoever in countered except in rock defined hereinafter. No allowance nor extra payment shall be made to the Contractor for dealing with water mains, sewers, culverts, drains, electric or telephone cables etc. encountered during excavation.</p> <p><b><i>Protection of Side of Excavation</i></b>  The Contractor shall ensure that at all times the sides of the excavation are maintained in a safe and stable condition, and shall be responsible for the adequate provision of all timbering, starting and/or steel sheet piling, etc. required for this purpose. He shall comply with any instructions which maybe issued by the Engineer in this respect.</p> <p><b><i>Disposal of Excavated Materials</i></b>  Surplus excavated materials shall be deposited in spoil heaps in designated areas to be located as directed by the Engineer. The term load and cart away shall loading and removing surplus earth from site to a tip provided by the Contractor and to the approval by the Engineer.</p> <p><b><i>Pumping</i></b>  During the period when the excavation are open, the Contractor shall provide pump of sufficient capacity to remove any surface or subterranean water which may enter the excavation.</p>	

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	<p><b><i>Filling and Backfilling</i></b>  All earth used for filling shall, unless otherwise stated, be selected hard dry material from the excavation. The backfilling of the excavation, unless otherwise described, shall be done with selected material deposited, compacted and watered in layer not exceeding 6" in depth. Each layer shall be rammed solid before the next is added. Proper allowance shall be for subsidence and shrinkage. The Contractor shall at his own expense make up any subsidence that may occur when directed.</p> <p><b><i>Hardcore</i></b>  Hardcore unless otherwise described shall consist of broken rock, concrete, to pass a 2 1/2" ring, deposited, spread and levelled in layers not exceeding 6" thick, mechanically well rammed and consolidated and blinded with sand and watered. The hardcore shall be to the full thickness as stated in the Bills of Quantities after ramming and consolidating.</p> <p><b><i>Works to be Kept Clear of Water</i></b>  The contractor shall keep the whole works well drained throughout the contract period by constructing temporary drains, dams, watercourses pumping, etc. and shall be held responsible for the sufficiency of such method in use.</p> <p><b><i>Rates</i></b>  Excavation rates shall include for:</p> <ul style="list-style-type: none"> <li>a) Clearing of all vegetable matter, rubbish, debris and contaminated earth, grubbing up old roots, loose rubble from old foundations, etc.</li> <li>b) Excavating in whatever type of soil encountered.</li> <li>c) Keeping all excavation free from all water ( storm, running water, and ground water). The Contractor has to ascertain himself the water table, as no claims will be entertained on the ground of ignorance.</li> <li>d) Levelling or grading, ramming and preparing bottoms and trimming sides.</li> <li>e) Planking and strutting.</li> <li>f ) Additional excavations required for planking and strutting, formwork, working space and return, filling and ramming.</li> </ul>	

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2	<p><b><u>Concrete Works</u></b>  In general, unless otherwise stipulated, all concrete works and materials shall comply with the recommendations contained in the BS 8110 Code of Practice CP 110:1972.</p> <p><b><u>Cement</u></b>  Unless otherwise required in some areas, use Ordinary Portland Cement complying with BS 12. The Engineer shall have the right to require the Contractor at any time to draw a samples of cement as per Clause 10, BS 12 and from location to be specified by the Engineer and tested in accordance to these clause of relevant specifications. Tests results shall be submitted with each consignment. Cement shall be supplied by an approved manufacturer from a single source and shall be delivered to site thoroughly dry condition in the manufacturer's sealed containers. Storage shall be water-tight and well ventilated building with raised platform not less than 150mm from the ground. Sufficient quantity of cement shall be maintained in store to ensure continuity of the work. Each consignment of cement shall be identified with a serial number and date of delivery, and stored separately. Cement which has deteriorated or failed to comply with the specified requirements or contains hardened lumps or cakes of cement shall be rejected and remove from the site at the Contractor's own expense.</p> <p><b><u>Aggregates</u></b>  Course and fine aggregates shall comply with BS 882 except that other aggregates may be fresh water or pit sand from an approved source. Aggregates shall be stored on a clean, well paved and drained areas which shall be free from flood water. Various sizes shall be stored separately and procedures shall be submitted to the Engineer for approval. The Contractor is require to conduct a test in accordance to Part 1 of BS 812 in an approved laboratory. Graded aggregates for concrete and mortar, the limits of sizes shall be in accordance with BS 882 and 1201. For cement grouts, the aggregates shall pass the test defined in Table 6 of BS 1198. The maximum size of course aggregates for various grade of concrete shall not exceed the limits specified for each class of concrete. Once the grading zone for fine aggregates required by trial mixes has been determined &amp; samples approved, the samples of fine aggregates shall be provided for comparison against all future deliveries.</p>	

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	<p><b>Water</b>  Water to be used for mixing concrete and mortar shall be clean and free from deleterious matter, acids or alkaline substances in solution or suspension, which are likely to affect the strength or durability of the concrete and shall comply with the requirements of the BS 3148. Samples of water shall be subject to analysis from time to time as required by the Engineer. Measurement; water shall be added direct to the mix from an automatic feeder fitted with accurate gauges. The tank shall be calibrated as directed.</p> <p><b>Admixtures</b>  No admixture shall be used other than those stated in the specifications or where called for in writing by the Engineer.</p> <p><b>Steel Reinforcement</b>  Mild steel and High Tensile steel reinforcing bars shall comply with BS 4449. Reinforcing fabric shall comply with MS 7.8 or its equivalent and shall be delivered to site in flat sheet and shall at no time be rolled. Manufacturer's test certificates shall be produced by the Contractor as and when required by the Engineer. Further test shall be conducted as required at an independent laboratory approved by the Engineer and test certificate of such shall be produce to the Engineer. All reinforcement shall be clean and stored under cover until it is required to be used in the works. All binding wires used for steel reinforcement shall be 16 SWG soft pliable annealed steel wire.</p> <p><b>Mix Design and Proportioning</b>  Before commencing the placing of any structural concrete, the Contractor shall submit to the Engineer full details of the trial mixes and the mixes he proposed to use, with their anticipated average strength, which must be based on the satisfactory results of the preliminary tests. At least 6 weeks before the commencement of any concreting works, trial mixes shall be conducted using samples of aggregates and cement typical to those use in the works. The concreting plant and the means of transport to be employed in the work shall be used to make the trial mixes and to transport them a representative distance. A clean dry mixer shall be used and the first batch discarded. Preliminary cubes shall be taken from the proposed mixes and shall be made, cured, transported and tested in compression in accordance to BS standard.</p>	

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	<p><b>Workability</b> The concrete shall be of such consistency that it can be readily worked into the corners and angles of formwork and around reinforcement without segregation of materials or bleeding or free water at the surface. On striking the formwork it shall present a face which is uniform, free from honey-comb, surface crazing or excessive dusting. The Contractor shall carry out a series of workability test to satisfy the requirement of the work.</p> <p><b>Plant</b> Concrete shall be mixed in a batch-type mixer manufactured in accordance with BS 1305. Where appropriate, the batch capacity, method of loading, mixing time and drum speed shall conform to the details furnished in accordance with the requirements of BS 3963 for the mix which corresponds most closely to the mix being used. The mixing blades of pan mixer shall be maintained within the tolerance specified by the manufacturer. The weighing and water-dispensing mechanism shall be maintained in good order and accuracy within the tolerance of described in BS 1305 and checked against accurate weight and volumes.</p> <p><b>Batch</b> Cement and aggregates shall be batched by weight. Aggregates shall be weighed on the actual densities of surface dry determined by loose weight method and in accordance with Clause 25 of BS 812. Water shall be measured with calibrated containers. The amount shall be adjusted from time to time to compensate the variations in the moisture content of aggregate. Alternatively, the water content shall be controlled by slump tests or compacting factor tests where the batch plant is of type in which cement and aggregates are weighed in the same compartment, the cement shall be sandwiched between the fine and coarse aggregate.</p>	

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	<p><b>Mixing</b> The mixer shall be operated at the manufacturer's recommended rate of revolution. The cement, aggregates and water shall be fed into the drum while the mixer is in action and the concrete shall be mixed to a uniform colour and consistency. The minimum mixing time shall be 1 1/2 min. for a 1.0 cu.m. batch, plus 1/2 minute per each additional 0.5m<sup>3</sup>. Mixer which have been out of use for more than 30 min. shall be thoroughly cleaned before any fresh concrete is mixed. Hand mixing of concrete will not be allowed, but where the quantity of concrete is small, and at the discretion of the Engineer, hand mixing may be permitted.</p> <p><b>Sampling and Testing</b> Samples of concrete for tests shall be taken and cubes made as directed by the Engineer. Eight ( 8 ) cubes shall be made for every 15 cu.m. of concrete of part thereof in each day's work. Test cubes shall be made, cured and stored under same conditions as the work to which they relate and transported for compression test to laboratory approved by the Engineer. Every test cubes shall be properly marked with its code number and date of casting together with the part of the work to which it relate.</p> <p><b>Transporting, Placing and Finishing</b> Transporting and placing of concrete should be done as quickly as practical during hot weather. Sufficient labour and equipment must be available at the jobsite to handle and place the concrete immediately upon delivery. Prolonged mixing, even at agitating speed should be avoided. If delays occur, the heat generated by mixing can be minimized by stopping the mixer and agitating intermittently. The discharge of concrete be completed within 1 1/2 hours or before the drum revolved 300 times, whichever occurs first. In hot weather the time limit can be reasonably reduced to 1 hour or even 45 min. Extra care must be taken with placement techniques to avoid cold joints. Floating shall be done promptly after the water sheen disappears from the surface or when the concrete can support the weight of the finisher.</p> <p><b>Vibration</b> All compaction shall be by means of approved power-driven vibrators which shall be inserted vertically to the full depth of layer being placed. It should be withdrawn vertically and not dragged through the concrete. The vibrator shall be inserted quickly and withdrawn slowly, and should be operated continuously while being withdrawn so that no holes will be left in any stiff concrete.</p>	

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	<p><b><i>Curing and Protection</i></b>  Fresh concrete shall be protected from heavy impact, storage of construction materials, restoring of upper floors and by operation of construction equipment are in many cases, the most severe loads that will be imposed on the structure. Curing; the proffered method of curing is by use of continuous sprays: flowing or ponded water; or continuous saturated of sand, burlap, or other absorbent material. Water should be applied to uniform surface as soon as it will not damage the finish, and to formed surfaces immediately after forms are stripped. Curing shall be done constantly in 7-days. Membrane curing is applicable with prior approval from the Engineer.</p> <p><b><i>Records and Reports</i></b>  The Contractor is required to prepare and submit all records and reports of concrete activities and shall furnish to the Engineer in standard forms showing all necessary information required by the Engineer.</p> <p><b><i>Rates</i></b>  Concrete Works are inclusive of :  1) Batching, transport, placing, curing and compaction in place.  2) Formworks: fabrication, construction, removal, shoring and scaffolding required.</p>	



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3	<p><b><u>Formwork and Surface Finish</u></b></p> <p>Generally, the Contractor shall be entirely responsible for the sufficiency, efficiency and accuracy of the formwork's fabrication, erection and safe removal of the same. He shall submit in details to the Engineer the formworks and methods he is going to use, for approval. Such approval shall be in no way relieve him of his responsibility for the sufficiency, efficiency and accuracy of the formwork. It shall withstand the strain imposed by vibrator during placement. Forms shall be so designed and constructed that the concrete can be properly placed and compacted and that the concrete after removal shall adhere to the required shape, level and position. No allowance have been made for construction loads and that the formworks shall remain undisturbed until the concrete bears it own weight. However, in all cases a minimum of at least 50% of design compressive strength should be attained before removal of forms. As general rule, the forms for columns and piers can be remove before those of beams and slabs. The ljected and remove from the site at the Contractor's own expense. the concurrence of the Contractor and the amended rates shall be used for measuring variations. Any error or omission in the rates and calculations of the contractor in the Bill of Quantities submitted by him shall before the signing hereof, be so rectified and adjusted that when correctly calculated , the total amount shall represent the same amount as that entered by the Contr</p> <p><b>Repair of Defective Concrete</b></p> <p>Concrete damaged from any cause honey-comb, fractured shall be repaired only by knowledgeable personnel to assure high quality and satisfactory results. On important structure, repair methods should be planned and demonstrated prior to commencement. This may involve the construction of mock-up demonstration panel for approval by the Engineer. Repair works to newly hardened concrete shall be made as soon as the need of such repair is evident, to ensure compatibility with the original concrete, the greener the base concrete the more receptive the surface is for bonding of the repairs. Simultaneously curing of the base concrete and the repair shall be done.</p> <p><b>Rates</b></p> <p>Fabrication, fixing, striking, strutting, stripping, oil application &amp; scaffolding.</p>	

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4	<p><b><u>Cleaning, Bending and Fixing Reinforcement</u></b></p> <p>All steel bars shall be cleaned free from loose mill scale, loose rust, oil or other coating which is deleterious to bonding with concrete. Reinforcement shall be bent cold in an approved bar bending machine. The bending dimensions and tolerances and the dimensions of end anchorages, hooks, binders, stirrups, links, splice and like shall be in accordance with BS 4466. All steel reinforcement shall be fabricated to the shapes and dimensions and fixed in position shown on the drawing. The overall lengths of bars with multiple bends are accurate and that after bending and fixing to position, the bars remain in place without any warp or twist. The internal radius at the corner of stirrups and binders shall not be less than the radius of the longitudinal bars.</p> <p>The Contractor shall prepare bar bending schedules with calculated weights for the reinforcement shown on the drawing and shall submit to the Engineer for approval, before bar cutting and bending commences. However, this shall not relieve the Contractor of his responsibility for the correct fixing of all reinforcement in accordance with the drawings and specification. The reinforcement shall be fixed in the formwork and held against displacement by approved cover blocks and binding wires to ensure the designed position will be maintained during the process of placing concrete. All tie wires shall be turned inward and no part of it shall be in touched with the formworks. The length of laps shall be calculated in accordance with CP 110 for the full tensile stresses in the bars. All laps shall be so arranged in staggered position.</p>	

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5	<p><b><u>Bricklaying</u></b>  All bricks unless otherwise specified shall be of standard quality low permeability blocks with no defects and sample shall be submitted for approval of the Consultant. Blocks shall be aerated hollow block 150 mm thick for external walls and 100 mm thick for internal walls. The average compression strength should be not less than 2.8N/mm<sup>2</sup> and shall comply with physical requirements of ISO 6073 : 1981</p> <p><b><i>Cement and Sand Mortar</i></b>  Cement shall be Ordinary Portland Cement as described in Concrete. Sand Mortar shall unless otherwise described, a mixture of one part OPC to three parts sand by volume.</p> <p><b><i>Mortar Plasticiser</i></b>  The Contractor shall submit for approval the type of plasticiser to be use, and strictly followed the manufacturer's instructions.</p> <p><b><i>Concrete Hollow Blocks</i></b>  Precast concrete hollow blocks unless otherwise specified shall be a mixture (1:6) OPC and sharp sand. Laid with approved reinforcement 2 1/2" x 22 gauge approved expanded metal or equivalent.</p> <p><b><i>Damp Proof Course</i></b>  Damp Proof Course shall be of the hessian-based foil type and shall comply with the requirements of BS 743, Type 5D ( 8 lbs./yard ). It shall have 9" minimum laps at joints and 4 1/2" laps at angles and shall be laid on 3/4" bed of cement mortar (1:1) and coated with hot bitumen on the upper surface. The Contractor shall submit the specified damp proof course for approval by the Engineer or its equivalent.</p>	

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	<p><b>Rates</b></p> <p>a) Brickwork, block work and facing shall include:</p> <ol style="list-style-type: none"> <li>1) Raking out joint to form key to receive plaster</li> <li>2) Bedding plates</li> <li>3) Cutting of forming chases, holes and mortises</li> <li>4) Cutting and pinning</li> <li>5) Wedging</li> <li>6) Plumbing angle</li> <li>7) Laying reinforcement</li> <li>8) Forming square and rebated reveals, birdsmouth and notches</li> </ol> <p>b) The rates for all screeds and paving shall include for working in a small quantities and narrow width, temporary rules, arises and rounded angels, channels and for fitting &amp; making good up to reveals, steps, around columns, balusters, pipes, grating, fittings and the like.</p> <p>c) The rates for skirtings, riser and other linear items shall include for all short lenghts, stops, formed, cut purpose made angles, junctions, rounded top edges, covers at bottom end and other sundry items of the like.</p>	

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6	<p><b>Roof</b></p> <p>Roofing sheets shall be approved "Trim deck " Lysaght heavy duty roofing sheets and colours as per recommended and selected by the Engineer. All accessories or parts shall be as per manufacturer's requirements and fixed as per their instructions. Roof shall be laid to the pitch indicated on the drawings on galvanized Lip "C" channels. Roof insulation shall be fiberglass with double sided aluminium foil of building grade or 50mm thick. It shall be laid on and include one layer of approved PVC mesh sandwich between the purlins and the roofing sheet. All joints shall be sealed with self adhesive aluminium tapes. Truss and other components shall be hot deep galvanized including bolts and nuts used at joints. No welding works shall be done on any part of the truss unless otherwise directed and with prior permission from the Engineer.</p> <p><b>Rates</b></p> <ol style="list-style-type: none"> <li>1) Fabrication inclusive of welding, cutting, drilling of components.</li> <li>2) Preparation of embedded anchor bolt and wood plates.</li> <li>3) Laying and tying of PVC mesh using approved clips.</li> <li>4) Laying of fiberglass insulation.</li> <li>5) Laying, cutting and fixing of roofing sheets, ridge capping, fascia board and flashing.</li> <li>6) Sealing of joints.</li> <li>7) Allow leakage test.</li> </ol>	

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7	<p><b><u>Carpentry, Joinery and Ironmongery</u></b></p> <p>Generally, all timber works shall be in accordance with the BS Code of Practice CP 112 (1952), Inc CP 112.100 Preservation Treatment of Timber Use in Building. The quality of timber and workmanship in all joinery work shall conform to the relevant requirement of BS 1186. All timber for carpentry and joinery work shall be of best quality suitable for the purpose for which it is intended, well seasoned and sawn square all round, free from excess of wane or discoloured sapwood, loose or dead knots and live insect attacks. Joinery shall be fixed until plaster has completely dried out and should any tucking in or pointing to be undertaken after joinery is in position, this should be kept to a minimum. Any joinery that splits, shrinks or wraps from wants of seasoning, unsoundness or bad workmanship shall be removed or replace without charge. All glued joints shall be tongued. All wrot timbers and, where finishes sizes re shown upon the drawings, shall be of the full dimension shown. Where nominal sizes are shown, jected and remove from the site at the Contractor's own expense. the concurrence of the Contractor and the amended rates shall be used for measuring variations. Any error or omission in the rates and calculations of the contractor in the Bill of Quantities submitted by him shall before the signing hereof, be so rectified and adjusted that when correctly calculated , the total amount shall represent the same amount as that entered by the Contractor on the form of transfer.</p> <p><b><u>Ironmongery</u></b></p> <p>The ironmongery to be used is to be of standard approved by the Engineer. Fixing shall be executed by a skilled workmanlike manner with screws of the same finish. All locks and other fittings shall be oiled and adjusted and left in perfect working order. No locks shall be operated by the same key.</p> <p><b><u>Rates</u></b></p> <p>1) Rates for carpentry shall include for sawn surface, all nailing and spiking required, all cutting, notching, boring, sinking, pelleting, fitting ,trimming, mortising and wedging for all ends.</p> <p>2) Joinery items shall include for wrought surfaces to all faces exposed to view, slightly rounding all arises planting on with panel pins, brads or nails, all cutting notching, holes, housing ends, angles and junction headings and any other sundry items.</p> <p>3) Ironmongery shall include for fixing with screws of the same finish as the fittings, all cutting, sinking, boring, and mortising as required into reinforced concrete or timber.</p>	

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8	<p><b><u>Steel and Ironworker</u></b></p> <p>The steel shall comply with the requirements of BS 15 and shall be used in accordance with the requirements of BS 449. All ironwork other than galvanized, to be entirely free from scales or rust. Preferably all iron rods shall be hot deep galvanized, excess zinc shall be removed and the surface finished smooth and uniform.</p> <p><b><i>Rates</i></b></p> <ol style="list-style-type: none"> <li>1) Inclusive of cutting to required sizes and bends if required and galvanizing.</li> <li>2) All necessary hoisting to the required position and welding in place unless required.</li> <li>3) Rates shall be measured by gross weight.</li> <li>4) Ironmongery as required by the Engineer.</li> </ol>	

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9	<p><b><u>Aluminium Works</u></b>  All aluminium materials shall be free from defects impairing strength, durability or appearance and shall be adequate in every way for their purpose. Surfaces shall be clean, straight and true with sharp defined profiles and smooth finish. All sections, sheets, etc. shall be free from bends or waves or other surface imperfections, true and straight vertically and horizontally with all rises and profiles. The Contractor shall submit a detailed specification describing the sections, method of fixing, necessary weather bars irrespective of whether they are shown on the drawing or not. The frames shall be constructed in square and flat, cut to length, corners mitred and electrically welded and then clean to obtain a smooth finish surface. All joints shall be carefully and accurately assembled and machined so as to provide close smooth connections that is not noticeable. Screws and bolt heads shall be concealed where possible and countersunk finish flush with exposed surface. Finish and colour shall be to Engineer's order and remove f</p> <p><b><u>Glazing</u></b>  The supply and fixing of glass to the aluminium screens, partitions, doors shall form part of this contract. All panels shall be glazed unless otherwise specified and shall conform to BS 952. All glazing to windows unless otherwise specified shall be 6mm thick and shall be free from bubbles and other defects. All internal glazing shall be clear and light reflective glass for exteriors. All glass shall be fixed on non-hardening glazing compound and glazing gaskets. Glazing beads shall be of extruded screw on aluminium of the same finish as the frames. The Contractor shall guarantee for a period of five years commencing from the date of Practical Completion in respect of the following: against discoloration and against water leakage in glazing and aluminium sections, frames etc. Within the specified guarantee period, the Contractor shall replace all items of work that are found defective due to faulty workmanship and/or materials.</p> <p><b><u>Rates</u></b>  Aluminium works shall include for all necessary lugs, fixing straps, stiffeners, bracings, gaskets, ironmongeries, guarantees and necessary scaffoldings required for installation.</p>	



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10	<p><b><u>Plasterer</u></b>  The cement to be used shall be Ordinary Portland Cement described in contract .The sand for plastering shall comply with the requirements of BS 1199 and shall be clean, sharp, fresh water sand free from clay and other impurities and shall be washed and/or screeded if required by the Engineer. Samples shall be submitted prior to commencement. Plasticiser are previously described in bricklayer.</p> <p><b><i>Workmanship</i></b>  Generally, all materials shall be stored, measured, mixed and used in accordance with recognised good practice, as set out in BS Standard Code of Practice CP 211 (1949). In particular, adequate time must be allowed for one coat to dry out before the next is applied. All surfaces shall be cleaned down, wetted and applied with bonding compound if deemed necessary. Mortar mix shall be used within one hour of mixing and no tempering will be allowed. All plastering shall be executed in a proper and workmanlike manner, with true and even surfaces and all arises and angles shall be left perfect. The Contractor is to take full responsibilities and allow in his prices for providing an adequate key for plastering on concrete, brick surfaces.</p> <p><b><i>Application</i></b>  Undercoat shall be ruled between screed at centres not exceeding 10' and brought to an even plumb finish. All external and internal angles shall be true and plumb and provide necessary PVC beads for the corners and flat surface for internal plastering. Scratch undercoat to form key and be prevented from drying, soon cover or wet or spray. Finishing coats shall be applied only after undercoat have set. Mortars for plastering shall be composed of one part cement and three part sand (1:3), mixed with approved plasticiser. Thickness of screed as specified shall be 50mm net thickness and allow filling up for depressions, grooves, joints, indentations, etc. Plaster shall be finally finished with steel floats. Screed shall consist of one part cement and three parts of sand by volume and to be properly finished to receive floor finish required.</p>	

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	<p><b><i>Metal Lathing</i></b>  The expanded metal lath shall be of plain expanded type, complying with BS 1269 and weighing of not less than 3 lbs. per square yard and shall be well lapped.</p> <p><b><i>Rates</i></b>  1) Rates for plaster and screeds shall include for work in narrow widths and small quantities, all necessary scaffolding, platform, etc. working panels, temporary rules, hacking concrete for key where required cleaning and wetting the wall or ceiling surfaces, concrete for key where required cleaning and wetting the wall or ceiling surfaces, raking out joints of brickwork, finishing surfaces with steel trowel or wood float, joints between different type of plastering, between new and old, forming expansion grooves, internal angle, arises and other intersection of curve surfaces, rounded corners and external angles not exceeding 1" radius and mitres, stops, etc. on cornices, moulding enrichment, coves, skirtings, gutters and strings.</p> <p>2) Metal lathing work shall include for laps, cutting holes, notching and other sundry item of a like nature and for painting all cut edges and damaged staples, etc. after erection, with a protective coat of approved bituminous oil paint.</p>	

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11	<p><b><u>Painter</u></b>  Material generally, unless otherwise stated, shall be those from manufacturer approved by the Engineer. All surface shall be cleaned, free from dirt, grease, oil and other deleterious matter. No paint shall be applied on damp surfaces and on adverse weather conditions.</p> <p><b>1) Plaster, Concrete, Brickwork</b>  Allow the surface to dry completely, remove all efflorescence by wiping with dry coarse cloth and then with damp cloth. The surface shall then be left for 48 hours to see if further efflorescence occurs. No paint shall be applied until efflorescence has ceased totally.</p> <p><b>2) Woodwork</b>  Clean to remove, grease and rub down smooth and dust off. Apply knotting to all knot and allow to harden. Apply primer as per manufacturer's instructions and followed by the required coatings.</p> <p><b>3) Metalworks</b>  Unprimed surfaces shall be thoroughly cleaned to remove dirt, grease, etc. and scraped off and wire brushed to remove all rust and loose scales back to clean metal. Immediately the surface after cleaning.</p> <p><b>Rates</b>  All paint work shall include all the surface preparations, painting in any colour or tint (including mixing), all necessary scaffolding, platform and provision of sample panels, painting all opening edges of doors and windows, painting holder bats and brackets, etc. for pipe and for protecting, cleaning down and touching up decorations and leaving perfect and satisfactory results.</p>	

Item #	MATERIALS & WORKMANSHIP	Remarks
12	<p><b><u>Plumber</u></b>  <b><i>Water Supply</i></b>  The whole of the water supply plumbing and installation shall be executed by licensed plumber. The work shall be executed to comply with appropriate by-laws and regulations. The Contractor shall at his own cost shall employ a qualified personnel for this job. He shall arrange the necessary formalities in regard to inspection and testing. All pipes, fittings and apparatus use for water supply plumbing and installation shall be of the type and make approved by the relevant State Water Authority; not withstanding any approval given by the Engineer.</p> <p><b><i>Pipeworks</i></b>  Pipeworks for water supply and plumbing shall be to the dimension shown or as specified hereinafter and shall be complete with all bends, tees, sockets, plugs, reducing pieces, brackets, supports and everything else to complete the installation. All pipe and fittings unless otherwise specified shall be an approved PVC to conform with BS Standards Code of Practice or equivalent. All screwed joints shall be made by using Teflon type jointing compound. The Contractor shall make any provisions for mounting horizontal and vertical piping in order to meet the required gradient at his own expense and approval by the Engineer. Sleeves where pipes penetrate through beams, walls, floor etc. Shall be provided without charges. All valves and fittings necessary for the correct control, operation and maintenance of all services shall be provided and installed where easy access for maintenance and operating purposes.</p> <p><b><i>Fiberglass Water Tanks</i></b>  The Contractor shall supply, deliver, and install fiberglass water tanks as per approval by the Engineer. Fiberglass construction shall be in compliance with the current BS 4213: 1975 and the Local Requirement By-Laws.</p>	

Item #	MATERIALS & WORKMANSHIP	Remarks
	<p><b><i>Sanitary Plumbing</i></b></p> <p>The Contractor shall give notice to the Local Authority when connection are to be carried out from the house to the municipality junctions. All pipes shall be running accordance with the layout and sizes shown on the drawings. Soil waste pipes shall be approved UPVC heavy duty grades. the Contractor shall take every possible precaution in protecting all sanitary fittings once they have been installed to ensure that they are not used during the process of work. All toilet fixtures and fittings shall be approved by the Engineer prior to procurement. The Contractor shall submit at least three types for selection by the owner.</p> <p><b><u>Rates</u></b></p> <p>Shall include all cuttings, running joints, sockets, connectors, brackets, clips, hangers, plugs. Testing and commissioning of the service up to the satisfaction of the Engineer. Toilet fixtures, fittings and etc.</p>	

Item #	MATERIALS & WORKMANSHIP	Remarks
13	<p><b><u>Electrical Installation</u></b></p> <p>All electrical installation shall conform to the drawings and complying with the local Electricity Board (STELCO).The work shall be executed by a licensed electrician endorsed by the relevant authority.</p> <p><b><i>Rates</i></b></p> <p>1) conduiting, wiring, fixing of fixtures, boxes, trays and hacking of concrete if deem necessary.</p> <p>2) testing, termination and commissioning with local authority.</p>	

Item #	MATERIALS & WORKMANSHIP	Remarks
14	<p><b><u>Fire Fighting Facilities</u></b>  Hosereels, hand extinguishers, dry risers (twin breaching and outlets), wet riser and 1 no. each diesel engine pump and motor driven pumps all with control panels. All piping shall be high grade galvanized pipes and fittings, in conformance to Local Fire Regulation.</p>	