

10 PLUMBING

10.1 General

- 10.1.1 The materials used and workmanship shall be of highest quality and grade unless otherwise specified shall conform to the latest specifications of British Standards and Codes of Practice for " Water Supply "Sanitary, Pipe Work "Building Drainage " Surface Water and Sub- Soil Drainage" and applicable to details and work indicated on the Drawing and Bill of Quantities. In case of any discrepancy / ambiguity the decision of the Consultants shall be final, and the contractor will act and perform accordingly.
- 10.1.2 The work shall be executed strictly in accordance with the rules and regulations set by the relevant local authority of the
- 10.1.3 The Contractor shall be responsible for obtaining the necessary approvals and test certificates from the concerned departments of
- 10.1.4 Plumbing work shall be carried out by licensed plumbers and shall produce the copy of the license along with the tenders, or approved by the Consultant.
- 10.1.5 Any damage done by the Contractor to any existing work during the course of execution shall be made good by him at his own cost. Failing which it shall be get done by the Consultants at Contractor's risk and cost.
- 10.1.6 The Contractor shall be responsible to connect the drainage and water supply to the mains and to obtain the necessary approvals and certificates from the relevant authorities of the
- 10.1.7 All connections to mains and meter installation shall be arranged by the Contractor and payment of fees thereof, if any, shall also be made by him.
- 10.1.8 The Contractor shall be responsible for the watch and ward of all fittings until the Works is fully completed and handed over to the owner.
- 10.1.9 The levels, measurements and other information concerning the existing site as shown on the drawings or as described as are supposed to be correct. The Contractor shall, however, verify them by himself and no extra claim whatsoever shall be entertained on account of the errors or omissions in such matters or on account of the descriptions turning out to be different from what was accepted.
- 10.1.10 The Consultant shall instruct the Contractor to purchase and use such materials of particular make or from particular source as may in his opinion be necessary for proper and reasonable compliance with the specification and execution of the Works.
- 10.1.11 After all plumbing fixtures and equipment have been set ready for use, and before the Contractor leaves the job, he shall thoroughly clean all fixtures installed by him, removing all plaster, stickers, rust stains and other foreign matter of discolouration on fixtures, leaving every part in acceptable condition and ready for use to the satisfaction of the Consultants.

10.2 Drawings and Information Required

- 10.2.1 The Contractor shall submit shop drawing for the entire installation including installation details for all items required or asked for approval of the Consultant.
- 10.2.2 Approved by the Consultant of shop drawing for any material, apparatus, devices and layout, shall not relieve the Contractor from the responsibility of furnishing same of proper dimension, size, quantity and all performance characteristic to efficiently perform the requirements and intent of the Contract Documents. Such

approval shall not relieve the Contractor from responsibility for errors of any sort in the shop drawing.

- 10.2.3 If the shop drawings deviate from the contract Documents the Contractor shall advise the Consultants of the deviations in writing accompanying the shop drawings including the reasons for the deviations. At the start of the Project the Contractor shall periodically and thereafter submit to the Consultants list of all shop drawings which will be submitted in the course of the project. The list shall show the disposition of each item including date of submission approval etc. The list shall be kept up to date through the entire course of construction.

10.3 Record Drawing

- 10.3.1 During Construction the Contractor shall keep an accurate record of all deviations between the work as shown on the Contract Drawings and that which is actually installed.
- 10.3.2 The Contractor shall secure from the Consultants after approval of his Shop Drawing a complete set of drawing and note changes thereon in ink.
- 10.3.3 The Contractor shall make a complete record of all changes and revisions in the original design which exist in the completed work.
- 10.3.4 The cost of furnishing above prints and preparing these for record " shall be deemed to be include in the tendered cost and its effects spread over other items of work, and as such item shall not be a subject to payment". When all revisions showing the work as finally installed the corrected Original Transparencies shall be submitted to the Consultants before final payment for the completed work will be made.

10.4 Operating and Maintenance Instructions

- 10.4.1 Three sets of operating and maintenance instruction covering completely the operation and maintenance of all plumbing equipment, controls, heaters, pumps and the like shall be furnished to the Owner, by the Contractor.

10.5 Tests

- 10.5.1 The entire system of drains, waste and vent piping inside and outside the building shall be tested by the Contractor under a water test, which shall include the entire system from the lowest point to the highest pipes above the roof.
- 10.5.2 The water test shall be made in accordance with all local requirements. Every portion of the system shall be tested to a hydrostatic pressure equivalent to latest 15 feet head of water. After filling, the Contractor shall shut off water supply and shall allow it to stand 2 hours under test during which time there shall be no loss or leakage.
- 10.5.3 The Contractor shall furnish and pay for device, material supplies, labour and power require for all tests. All tests shall be made in the presence and to the satisfaction of Consultant.
- 10.5.4 Defects disclosed by the test shall be repaired or if required by the Consultant defective work shall be replaced with new work without any extra charge to the Owner. Test shall be operated as directed until the work is proved satisfactory.
- 10.5.5 Fixture shall be tested for soundness, stability of support and satisfactory operation.
- 10.5.6 The Contractor shall notify the Consultant at least one week in advance of making the required test, so that arrangements may be made for their presence to witness the test.

10.5.7 Equipment shall be tested in service and the Contractor shall demonstrate that the equipment performs the work intended for it and that it complies with the requirement of these specifications for such equipment, to the satisfaction of Consultants.

10.5.8 The rates shall include for all costs associated with tests

10.6 Work in Common Piping

10.6.1 Material

10.6.1.1 Piping and fitting material shall be PPR (Polypropylene Random Copolymer) or equivalent and approved by the Consultant.

10.6.1.2 Piping material shall comply with requirements of water supply and sewerage and other relevant authorities.

10.6.1.3 Materials for the piping and service requirements shall basically conform to the service pressures encountered.

10.6.2 Providing Drawings and Manuals

10.6.2.1 The Contractor shall submit one set of originals and further two copies of layout drawings to the Consultant after completion of the Works. These drawings must give the following information:

- Run of all piping and diameter on all floors and the vertical stacks.
- Location and sizes of all control valves, access panels and other equipment.
- Location of all manholes and their sizes.

- 10.6.2.2 No completion certificate will be issued until the drawings are submitted.
- 10.6.2.3 The Contractor shall submit to the Consultant for approval, samples, shop drawings, manufacturer's drawings, equipment characteristics and capacity data etc. of all equipment, accessories devices etc. that he proposes to use in the installation.

10.6.3 Samples

- 10.6.3.1 The Contractor shall provide samples of all sanitary fittings, pipes and specials man-hole cover and frames, gratings and water supply pipes and fittings etc. and shall be deposited with the Consultant (which will be returned to the Contractor at the completion of the Works) and shall obtain approval from the Consultant before using in the Works. Any material rejected by the Consultant shall be removed from the site within 24 hours of rejection.

10.6.4 Drawings

- 10.6.4.1 The work shall be done in conformity with the plans and within the requirements of the general architectural, electrical and structural plans. This work shall be properly coordinated with the work of the other trades. Hangers and sleeves shall be furnished in time for their installation as other work proceeds.
- 10.6.4.2 The plumbing drawings are diagrammatic, but shall be followed as closely as actual construction. All deviations from drawings required to conform to the building construction shall be made by the Contractor at his own expense.
- 10.6.4.3 The architectural drawings shall take precedence over the plumbing drawings as to all dimensions.
- 10.6.4.4 Large size details shall take precedence over small size drawings. The special dimensions in the specifications or schedule of quantities or instructions of the Consultant shall supersede the drawings. The Contractor shall verify all dimensions at site.
- 10.6.4.5 The recommend position of the fittings, fixtures, control valves, tanks etc. as shown on the drawings will be adhered to as far as practicable.
- 10.6.4.6 Should there be any discrepancy due to incomplete description ambiguity or omission in the drawings and other documents, whether original or supplementary, forming the contract, either found on completion or during the currency of the installations work, the Contractor shall immediately, on discovering the same, draw the attention of the Consultants and the Consultants decision in final and binding on the Contractor.

10.6.5 Existing pipes

- 10.6.5.1 The site shall be examined for field drains and those, when found, shall be either entirely removed or diverted, trenches filled with dry earth in 200 mm to 300 mm layers and consolidated as directed by the Consultant.

10.6.6 Spare Parts

- 10.6.6.1 Necessary spare parts of the plumbing equipment for the one (1) year operation shall be supplied by the Contractor.

10.6.7 Excavation

- 10.6.7.1 All excavations shall be timbered to the satisfaction of the Consultant and the type of timber shall be suitable to the kind of earth encountered. Fixing of timber and removal after completion of work shall be done as directed by the Consultant.
- 10.6.7.2 Should any water accumulated in the trenches, headings or other excavation, the Contractor shall do such work as may be necessary to drain away the accumulated water and shall install pumps as may be required to keep the

excavation and trenches dry. The Contractor shall ensure that the flow water in trenches or excavation does not injure or remove cement or aggregate of any concrete that has not set. No subsoil water shall be discharged into open drains or sewer at the site.

- 10.6.7.3 In refilling trenches after excavation this should be done in layers of 150mm after consolidating each layer. Special care shall be taken that the earth is packed uniformly and there is damage to the piping.
- 10.6.7.4 Rates for excavation should include for backfilling in consolidated layers where necessary and as directed by the Consultant.

10.6.8 Piping

- 10.6.8.1 The Contractor shall, as soon as possible after the award of the contract, prepare and submit to the Consultant for approval, working drawings showing exact locations and pipe runs for all pipe-work, the layout and setting up of equipment and the connection of piping to the equipment. Such drawings shall include details and methods of supports, anchors and sleeves etc.
- 10.6.8.2 Pipe runs shown in the drawings are approximate and intended to indicate the general run and locations only. The exact locations of all pipe-work shall be determined on Site.
- 10.6.8.3 All pipes, fittings etc. shall be kept closed against moisture and foreign matters when stored at site and during installation.
- 10.6.8.4 All pipes shall be fixed clear of one another and be so arranged as to provide easy access for maintenance and repair.
- 10.6.8.5 All plumbing work shall be carried out by suitably qualified plumbers in accordance with the British Code of Practice and Regulations and requirements of related Authorities.
- 10.6.8.6 Materials for the piping and service requirements shall basically conform to the service pressures encountered.
- 10.6.8.7 Each part of the installation of the plumbing work shall be completed in all details as shown in the drawings or as specified and provided with all necessary control valves, etc. that will be necessary for their satisfactory operation.
- 10.6.8.8 All piping shall be run plumb, and straight and parallel to walls, except drain line which shall pitch 6 mm per 300 mm in the direction of flow.
- 10.6.8.9 Pockets, unnecessary traps, turns and off-sets shall be avoided. When traps or pockets are unavoidable they shall be valve drains.
- 10.6.8.10 Piping installed on the concrete slab shall be firmly fixed or anchored to the floor with packing to prevent damage to pipes. Pipes shall not be bent with bender where cross with other pipe or change to upward.
- 10.6.8.11 Where pipes are to be laid directly in the ground, bed shall be sufficiently compacted; necessary protection for piping shall be taken.
- 10.6.8.12 Backfill shall be done after the approval of the Consultant in such a manner not to damage the pipe line and shall be restored to the original stage.
- 10.6.8.13 Where pipes penetrate through waterproof part or fire partition or fire wall, pipe sleeves shall be provided and clearance between pipe sleeve and pipe shall be filled with caulking material approved by the Consultant.
- 10.6.8.14 Pipes, fittings, valves and accessories shall be thoroughly cleaned, both internally and externally before installation and shall be cleaned before putting into service.

- 10.6.8.15 Plumbing work shall be completed in accordance with the details shown on the Drawings or as specified and provided with all necessary control valves, etc. that will be necessary for their satisfactory operation.
- 10.6.8.16 All pipes shall be cut square and true to the pipe axis by means of suitable tools without reducing pipe diameter and cut ends shall be finished smooth. Before making connections, chips, dirt and other foreign matter shall be removed from the interior of each pipe. Fixing of hangars and embedding of pipe sleeves shall be carried out without delay along with the progress of the work where required.
- 10.6.8.17 Pipe connections for the water supply system shall be by PPR (Polypropylene Random Copolymer) high pressure. Jointing shall be generally by means of solvent cement according to manufacturer's instructions
- 10.6.8.18 Vertical pipe shall be braced at more than 2 point in every story.

10.7 Water Supply Work

10.7.1 Materials

- 10.7.1.1 Pipes, joints and fittings for water supply work shall be PPR (Polypropylene Random Copolymer).
- 10.7.1.2 Materials and workmanship shall comply with the local water supply authority requirements.

10.8 Water Pumps

- 10.8.1.1 The specifications herein stated are basic guides only. Other items not so indicated but which are obviously necessary for the proper operation of the system as intended shall be supplied and installed, in accordance with accepted Consulting standard.
- 10.8.1.2 Manuals of operation and maintenance and list of spare parts shall be supplied together with the equipment.
- 10.8.1.3 The contractor shall submit at least four copies of pump performance curves showing among others, the pump rating and efficiency, properly marked out.
- 10.8.1.4 A metal name plate indication in indelible letters for the correct specification of the pump and motor shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.
- 10.8.1.5 Well water pump and Fresh water pump: Flow rate = 60L/min, Head = 70m, Type: End suction Hydro pneumatic pump, 220/440V, 3-Phase, and 50 Hz. Alternate and parallel operation. Fire pump: 50L/min, 70m head, Vertical multistage pump with alternative operations.

10.9 Spacing of supports

- 10.9.1.1 Support spacing for PPR (Polypropylene Random Copolymer) pipes shall be as follows

| Nominal Dia. | Up to 40 | more than 50 |
|--------------|----------|--------------|
| Space (m) | 1.2 | 1.5 |

10.10 Drainage Work

10.10.1 General

10.10.1.1 High Pressure HDPE (high-density polyethylene) pipe and fittings shall be used for all drainage work including vent pipes.

10.10.1.2 Joints shall be made as per the manufacturer instruction and as approved by the consultant.

10.10.1.3 Where horizontal drain branch joints the main, such branch shall be connected to the main in a substantially horizontal position and at an acute angle of not more than 45 degree to the main in all cases.

10.10.2 Vent stack pipes

10.10.2.1 Vent pipe shall be vertically branched out upward from a horizontal drain branch pipe or other appropriate point. Horizontal branching of the vent pipe shall be done on approval of the Consultant.

10.10.2.2 Where vent pipes on each floor are to be connected to the vent stack, all connections shall be made at least 150mm above the respective overflow edges of fixture on that floor.

10.10.2.3 The provision of the preceding item shall also apply to the connection of vent stack vent pipe.

10.10.2.4 Vent stack shall be connected to the waste stack or soil stack at the lowest part to stack pipe.

10.10.2.5 Where vent pipe is to be connected to the horizontal drain pipe, such angle shall be more than 45 degree to upward.

10.10.2.6 Vent stack shall be extended 600 mm from the top of the roof or lead to the wall and top of pipe shall be covered with vent cap.

10.11 Laying of Pipes

10.11.1 The pipes shall be laid to proper lines and levels as shown in the plans and directed by the Consultant, as the main is laid, the front pipes in the trench shall always be closed with a plug either of iron or wood and security fastened. The plug shall not be removed except when pipe laying is resumed or for purposes of testing.

10.12 Laying of sewer water Mains

10.12.1 All mains shall be laid on a good solid, bottom to prevent subsidence and consequent fracture.

10.12.2 Mains running under buildings, if unavoidable, shall be completely surrounded by 150 mm of concrete.

10.12.3 In case of mains passing through a well, the weight of the latter shall be carried by a lintel or a suitable relieving arch.

10.12.4 All rising mains shall be properly plugged to all wall brackets at regular intervals as given in the drawings.

10.12.5 All mains shall be concealed inside wall as far as possible except for vertical sewer mains, cleaning doors shall be provided in the walls whenever necessary and as directed by the Consultant.

10.13 Sewers

10.13.1 After the cement has had time to set, the pipes shall be tested in length between manholes in following manner.

10.13.2 In the lowest manhole/intercepting trap as the case may be, a plug shall be inserted in the pipe. The disc in the pipe at the upper manhole shall be fitted with a filling pipe with a right angle bend and an air cock. The pipe line shall then be filled with water by means of the pipe connection on the upper disc. The air cock on the upper disc shall be kept open while the pipe line is being filled to permit the escape of air. When the pipes are filled with water and air excluded, the air cock shall be shut and the water shall be poured into conical filler, attached to the filling pipe until the water remains in the filter. The filling pipe shall then be raised and fastened so that the height of surface of the water in the filler above the invert of the pipe is 1828 mm which will be usual test pressure for S.W pipes. If the water level does not fall more than 16 mm (12 mm) in a length of 91.4 meter the test may be considered satisfactory.

10.13.3 The Contractor shall make good all defective work at his own expense

10.14 PPR (Polypropylene Random Copolymer)

10.14.1 15.14.1 Manufacturer's instruction should be followed in pipes to be used for water mains. Sufficient number of expansion/contraction joints shall be incorporated in the length of mains to allow for variation of temperature to the recommendation of the pipe manufacturers.

10.14.2 15.14.2 These pipes shall be effectively protected from the direct rays of sun immediately after they are laid and until permission is given for the trenches to be refilled by the Consultant. Subject to such permission being obtained, trenches shall be refilled without delay. Final connection at a fixed point shall be deemed unto the majority of the length of the pipe line has been covered by backfill in order to reduce the effect of expansion and contraction caused by temperature variations.

10.15 Bends and other Specials

10.15.1 In fixing bends care shall be taken to see that the axis of the bend is truly vertical or horizontal as the case may be and the spigot of the bend is well in the socket of the pipe with which a joint has to be formed. The Contractor shall be called on to replace any faulty work at his own expense.

10.16 Flanged Joints

10.16.1 15.16.1 All flanged joints shall be made by painting the faces of the flanged with red lead freely and bolting the flanges evenly on all sides. A thin fiber of lead wool may be used in making the joints water tight when facing of the flanges is not true. Rubber insertions may be used with approval. Sewage resistant rubber insertion has to be used for sewer lines.

10.17 Support for U.P.V.C Pipes

10.17.1 When U.P.V.C pipe lines incorporate metal valves or other heavy fittings, it is essential to support the valves directly rather than allowing their weight to be carried by the uP.V.C pipe and support shall be placed on either side of the fittings mentioned above. Moulded plastic fitting also should be supported.

10.17.2 Maximum allowable horizontal support distance for uP.V.C are given below.

10.17.3 For vertical installation supports, distances shall be doubled.

| | | | | | | |
|------------------|-------------------|-------------------|------------------|-----------------|------------------|------------------|
| Nominal bore | 12 mm (1/2") | 18 mm (3/8") | mm (1") | 32 mm (1¼") | 38 mm (1½") | 50 mm (2") |
| Support distance | 533 mm 1'9" | 616 mm (2'0") | 686 mm (2'3") | 764mm (2'6") | 840 mm (2'9") | 915 mm (3'0") |
| Nominal bore | 75 mm (3") | 100 mm (4") | | | | |
| Support distance | 1220 mm (4'0") | 1290 mm (4'6") | | | | |

10.18 Sewer pipes

10.18.1 All 'P', 'S', 'I' junctions bends etc. required shall be furnished and set without extra charge and shall conform to the pipe specifications as to quality

10.19 Air Valves

10.19.1 These valves to be fitted as per drawings and Bill of Quantities shall be tested and accompanied by a certifying their efficiency.

10.19.2 The floating ball in the valve shall be suitable metal or vulcanite or rubber specially manufactured for tropical conditions.

10.20 Scour Washout Valve

10.20.1 These shall be provided at portions shown in place and shall contain in one unit a flanged scour valve with short connection pieces, cast iron bend and T pieces for connection to main pipe.

10.20.2 The rate shall also provide for short length of straight pipe to a convenient as per details complete with covers and surface boxes

10.21 Foot valves and Strainers

10.21.1 Foot valve and strainers should be of reputable manufacture approved by the Consultant and shall be fitted with flushing lever attachment where specified.

10.22 Pressure Reducers

10.22.1 Pressure reducing valves shall be of the equilibrium type of approved manufacture and capable of reducing the pressure to the valve required as per plan and Bill of Quantities.

10.23 Water Meter

10.23.1 The water meters shall be from a reputed manufacture and shall be approved by the consultant before installation.

10.24 Equilibrium Ball Valves

10.24.1 These should be of reputable manufacture approved by the Consultant and be of the angle pattern with gun metal valve seats guide bush, copper float with wrought iron lever and links with bronze pins.

10.25 Fittings

10.25.1 All sanitary pipes, gullies, water closets/bidets, squatting basins, sinks bath tubs etc. to be of approved design and to be obtained from approved Manufacture and to be of the best stoneware, glazed inside and outside, with burnt hard and sound,

free from flaws, blisters, cracks and other imperfections and best quality commonly called 'Firsts'.

10.25.2 Rates should include for all bends, junctions, traps, cleaning, painting, fixing clear of wall etc. complete as specified as per Bill of Quantities.

10.25.3 All pipes, fittings, flushing cisterns, valves, stop cocks, taps, tanks, surface boxes etc. to be of the best of their kinds and in addition to complying with previous clauses to be from approved Manufacturers and all taps, cocks, valves etc. to be screwed down pipe. Taps have to be of brass/nickel coated and valves have to be of gun metal. All tanks have to be made fly-proof and to the complete satisfaction of the Consultant.

10.25.4 Rates should include for all cutting and waste, bends, taps junctures, cleaning eyes, tees.

10.26 Manholes, Manhole covers and Frames

10.26.1 Concrete cover slabs or top rings of manholes shall provide a suitable seating for a rectangular cover.

10.26.2 The frame shall have a clear opening of 0.61m x 0.61m or alternatively a circular or double triangular cover depending on the type of cast iron manhole cover to be used. The rate for manholes shall allow for such provision.

10.26.3 Where the supply of cast iron manhole cover and frames is payable separately the cost of setting, surrounding, painting and materials for same shall be allowed for in the rate for manholes.

10.26.4 Suitable lifting rings, hooks or brackets shall be provided in the pre-cast manhole sections. Box holes shall be separately grouted with 1:2 cement mortars.

10.26.5 The contractor shall supply two manhole keys for each pattern of cover without additional charge over the rate for covers (or manholes).

10.26.6 Heavy duty (grade a) cast iron manhole cover and frames shall be of the double triangular type to bs and having a clear opening of 550mm dia.

10.26.7 Medium duty (grade b) cast iron manhole covers and frames shall be of the circular type having a clear opening of 550mm dia or the rectangular type having a clear opening of 0.61m x 0.61m and conform to bs. They shall be of the single seal type, the weight of cover frame being approximately 127.00 kg.

10.26.8 Light duty (grade c) cast iron manhole cover and frames shall be of the double seal flat type having a clear opening of 0.61m x 0.61m conforming to bs. Weight of cover and frame approximately 50.75kg.

10.26.9 All manhole covers and frames shall be supplied, coated with a black bituminous composition and be given two coats of bituminous paint after bedding.

10.26.10 No extra rate is payable for drop and/or junction manholes but piping in and surrounds of drop lines are payable at that relevant rates for s.w piping and manholes.

10.26.11 In drop manholes where the difference in level between the incoming drains and the sewer does not exceed 0.610m in 75mm and there is sufficient room in the manhole, the connecting pipe may be brought directly through the manhole wall, and the fall accommodated by constructing a ramp in the benching of the manhole. The ramp shall be of concrete and finished equal to that of the benches. No extra rate is payable.

10.27 Interceptor Manhole

10.27.1 All gravity sewer lines should be, connected through an intercepting inspection chamber before connecting to the main sewer line, and the dimensions of the manhole and trap to be in conformity with the Maldives Water and Sanitation Authority.

10.28 Fixtures and Accessories

10.28.1 All sanitary wares shall be manufactured by the following manufacturers & shall comply to finishes schedules stated on drawings.

- (a) Rapetti (Eight Floor)
- (b) Duravit (Eight Floor)
- (c) Cotto (Other Floors)

10.29 As built Drawings

10.29.1 The Plumbing Contractor shall mark down with red pencil on two sets of plumbing plans all the revisions, omissions and/or additions to the various plumbing installation drawings as the construction progress. One set of the plans as marked shall be submitted to the Consultant after completion of the work.

10.29.2 Before the final payment is made to the Contractor, he shall submit to the Owner through the consultant, all As-Built Drawings incorporating the changes made and noted in the marked plans retained by him. The As-Built Drawing incorporating all the changes made and noted in the marked plans retained by him. The As-Built Drawings shall be prepared on reproducible form

10.29.3 The Plumbing contractor shall prepare and submit the As-Built Drawings without extra cost to the Owner.

10.30 Miscellaneous

10.30.1 Throughout the construction period, open ends of all installed pipelines shall be kept closed by temporary plugs. Drainage lines shall not be used to conduct dirty construction wash-washer, especially, those with cement, to avoid possible clogging.

10.30.2 A temporary fire protection system at each building shall be provided by the Contractor during the construction period. This shall be of sufficient capacity to put out any fire that may break out at any of the building floors due to construction period. This in addition to temporary fire extinguishers required.

10.30.3 A temporary potable water supply shall be available to construction workers at each building floor as construction work progresses.

10.30.4 A temporary human Excrete Disposal System shall be provided by the Contractor to serve the workers during the construction period.

10.31 Height of Fixture Installation

Height of fixture shall be as follows unless otherwise specified on the Drawings

| Fixture | | Height (mm) |
|-------------------|---|-------------|
| Wash Basin | Floor finish to front top edge - Male | 700 |
| | Floor finish to top of mirror - Male | 1675 |
| | - Female | 1660 |
| Lavatory | Floor finish to front top edge | 760 |
| Shelf | Floor finish to top of shelf - Male | 1005 |
| | - Female | 990 |
| Cistern | Floor finish to bottom of cistern | |
| | Floor mounted Japanese type | 500 |
| | Western type | 550 |
| Drinking fountain | Floor to front top edge | 765 |
| Flush valve, WC | Floor to center of valve | 600 |
| Paper holder | Floor to center of holder - Japanese type | 400 |
| | - Western type | 750 |
| Faucets | | |
| Sink | Sink floor to top of faucet | 300 |
| Lavatory | Lav. top to top of faucet | 150 |
| Bath room | Floor finish to top faucet | 300 |
| | | |