

(7) Curing and Protection

Damp curing shall begin as soon as the mortar has hardened sufficiently to prevent injury and water applied in a fog spray to keep the plaster damp throughout without soaking. The period for damp curing shall be specified for each coat. Protect the plaster from uneven and excessive evaporation during hot or drying weather conditions.

(8) Cleaning

After the completion of plastering work, all scaffolding surplus materials, debris and plaster daubs and stains in floors, windows and other surface shall be removed to the satisfaction and approval of the Project Manager.

9.5 Cement Finish on Concrete Floor Slabs

9.5.1 General

This work includes plain cement finish with or without red cement, and plain cement finish as bed for tiles, including all labor, materials, equipment and other facility to complete the work in accordance with the plans and specifications.

9.5.2 Finishing Requirements

Floors and slabs shall be sloped uniformly to the drains. In areas where tiles are to be laid, the concrete base slab shall be depressed to not less than 50 mm, when not indicated. Floor and slab finishes, where not indicated, shall receive a single steel trowling. Dry cement shall not be placed directly on the new concrete surface to absorb excess moisture.

9.5.3 Finishing Procedures

Finishing procedures for floors and slabs, where not indicated on the drawings, shall be as follows:

Finish	Description	Uses
Screened	Rough, free from	Slab and concrete
	Ridges and holes	surfaces under
		Earth fill
Floated	Medium rough with	Light storage
	Texture finished	areas, base slabs
		and heavy machine pads
Trowelled	Fine and texture	All surfaces:
	To glossy glass	1) under floor- 1 pass
	finish depending	2) normal wearing

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upon the number surface – 2 passes
of passes of 3) Dense wearing surfaces-3
passes

9.5.4 Screened Finish

Concrete shall be placed, consolidated and immediately struck off to bring the top surface of the slab to proper grade. Floors shall be leveled with a tolerance of 3mm in 3.0 m, except where drain occurs, in which case the floors shall be pitched to the drains. Striking off and bull floating shall be completed before water appears on the surface of the freshly-placed concrete. If water is still visible by the time floating is to start, the excess water shall first be scrubbed off the surface by appropriate means.

9.5.5 Floated Finish

Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to support a man without indenting the surface. Floating shall be performed by hand with a wood float. During the floating, the surface shall be checked with a 3.0-m straight edge applied at different angles. The surface shall be floated to a true plane within 3 mm in 3.0 meters.

9.5.6 Trowelled Finish

Upon attaining proper set, the floor shall first be given a floated finish as specified herein above and then hand trowled. The first trowling should produce a smooth surface, free of defects. The finished surface shall be free of trowled marks, uniform in texture and true to a plane within 3mm in 3.0 meters.

9.5.7 Broomed Finish

The floor shall first be given a floated finish and a steel trowled finish as specified herein above and then surface shall be broomed with flexible bristle broom. The topping mixture shall be spread evenly over the roughened base before the final set has taken place. At the time of brooming, the trowled surface shall have hardened sufficiently to retain the scoring on ridges. The brooming shall be in a direction transverse to that of traffic or at right angles to the slope of the floor.

9.5.8 Mixing of Red Cement

Red cement shall be thoroughly dry, mixed with fresh Portland cement using dry and clean equipment. The proportion shall be three (3) parts red cement to one (1) part Portland cement. Cement top finish shall be one (1) part Portland cement – red cement mix and one (1) part sand, mix with minimum water content.

9.5.9 Application of Cement Finishes

The concrete slab to receive cement top finish shall be roughened before the concrete has set. Before applying the cement top finish, the concrete surface shall be further roughened with a pick of a similar tool remove laitance, loose particles, plaster and anything that would prevent bond and then cleaned by an approved method or device. After cleaning, the slab shall be thoroughly wet before top finish is applied. The cement top finish shall have a minimum thickness of 19 mm and shall be poured continuously until the entire section is complete. Cement top finish shall be floated either manually or machine, struck off with straight edge, steel trowled to a hard smooth surface, and graded to drain where required. Where the floor is to be hardened, ½ of the pre-mixed floor hardener shall be spread over the freshly poured cement top finish after screening and removing any excess water from the mixture and the floor shall then be floated. The balance of pre-mixed floor hardener shall be evenly spread over the surface at the right angles to the first application. The floor shall then be floated and care shall be taken to embed the floor topping with hardener firmly in surface of the concrete floor. The treated cement

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- top shall be allowed firmly in surface of the concrete floor. The treated cement top shall be allowed to set sufficiently so that the surface may be steel trowled to a hard-scaled surface.

9.6 Other Cement Finish

9.6.1 Patching of Surface Defects

All surface defects shall be repaired with cement mortar of the same composition as used in the concrete. Part of the cement in the mortar may be white cement, for patching exposed areas to match the color of the surrounding concrete. Patching shall begin as soon as the forms are removed and areas to be patched are cleaned thoroughly. Minor defective areas shall be cut out of the solid concrete to a depth of not less than 25 mm. And edges of cuts shall be perpendicular to the surface of the concrete. Area to be patched and about 150 mm of the adjacent surrounding areas approximately one (1) hour before placing and remix occasionally during this period without adding water. An initial grout of cement and water mixed to the consistency of paint of the required color shall be applied into the surface to which the mortar is to be bonded.

9.6.2 Repairing of Structural Defects

Concrete with excessive honey-comb, exposed reinforcing bars and other defects which affect the structural strength of the members shall be removed and repaired by the Contractor to the satisfaction of the Project Manager.

9.6.3 Finishing of Formed Surfaces

Finishing of formed surfaces, where not indicated in the drawings, shall be as follows:

- (1) Surfaces exposed to public view shall be smooth form finished. No plastering work shall be done on exposed surfaces to correct imperfections. Form facing materials shall be used to produce a smooth, hard and uniform texture on the concrete. Tie holes and defects shall be patched and all fins shall be completely removed.
- (2) Surfaces not exposed to public view shall be rough form finished. Tie holes and defects shall be patched and fins exceeding 6 mm in height shall be chipped off or rubbed off.
- (3) Finishing of formed surfaces shall be accomplished after removal and repair of surface defects.

9.7 Tile Works

9.7.1 General

The work consists of furnishing all materials, labor and performing all operations in connection with tile finishing of floors and walls, complete including mortar beds for the tile. Tile work shall not be started on portions where embedded lines crossed – over the area until roughing-ins for plumbing and electrical work has been completed and tested. The work of all other trades in the areas where the work is to be done shall be protected from damage in a workmanship manner as directed by the Project Manager.

9.7.2 Mortar for Tiles

A scratch coat for wall tile shall consist of one part Portland cement, ¼ part lime putty and 3 parts sand by volume. Scratch coat shall have a minimum thickness of 9mm. the buttering mortar for setting wall tiles and mortar setting bed for floor tiles shall have the same proportion as that of scratch coat.

9.7.3 Floor Tiling

(1) Preparation of Surfaces

Before tile is applied with a dry-set mortar bed, the structural floor shall be tested for levelness or uniformity of slope by flooding it with water. Areas with ponds shall be filled, leveled and resetting before the setting bed is

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applied. The slab shall be soaked thoroughly with clean water on the day before the setting bed is applied. Immediately preceding the application of the setting bed, the slab shall again be wetted thoroughly but, no free water shall then be applied not more than 1.5 mm thick. The mortar shall be spread until its surface is true and even and thoroughly compacted, either level or sloped uniformly for drainage, where required. A setting bed, as far as can be covered with the tile before the mortar have reached its initial set, must be placed in one (1) operation, but in the event that more setting mortar has been placed that can be covered, the unfinished portion shall be removed and cut back to a clean leveled edge.

(2) Application of Floor Tile

All tiles to be soaked in clean water to a minimum of one (1) hour before they are installed. Placing tile on a wetted cloth in a shallow pan before installing shall damp absorptive mounted tile. Before the initial set has taken place in the setting bed, a skim of Portland cement mortar 75 mm to 1.5 mm thick may be hand over the setting bed plain Portland cement. 75 mm and 1.5 mm thick may be hand dusted uniformly over the setting bed and worked lightly with a trowel or brush until thoroughly damp. The tiles shall then be pressed firmly upon the setting bed, and carefully tapped into the mortar until true and even with the place of the finished floor base. Tapping and leveling shall be completed within one (1) hour after placing tiles. Borders and defined lines shall be laid before the field or body of the floor. Where floor drain is provided, the floor shall be sloped properly to the drains. Cutting of tiles, where necessary, shall be done along the outer edges of the tile against trim, base, thresholds, pipes, built-in fixtures and similar surfaces and shall be geared and joined carefully. Tiles shall be secured firmly in place, and loose tiles or tiles sounding hollow shall be removed and replaced to the satisfaction of the Project Manager. All lines shall be kept straight, parallel and true all finished surface brought to true and even planes.

9.7.4 Wall Tiling

(1) Preparation of Surfaces

Scratch coat shall be applied on prepared surface to serve as backing for wall tiles, not less than 24 hours or more than 48 hours before starting the tile setting. Temporary screeds shall be applied to the scratch coat to provide a true and plumb surface to the proper distance back from the finished wall. The setting bed shall be applied, rotted and floated flushed with the screeds over an area n greater than will be covered with the tile while the bed remains plastic. The thickness of the setting bed shall not exceed 20 mm and the mortar shall not be tempered.

(2) Application of Wall Tile

Tiles shall be soaked in clean water for a minimum of one (1) hour before they are installed. A skim coat Portland cement mortar mixed with water to the consistency of thick cream. 75 mm thick shall be applied to the mortar setting bed, or to the back of each tile. The tiles shall then be pressed firmly upon the setting bed and tapped until flush and even plane of the other tiles. The tiles shall be applied before the mortar bed has taken its initial set. Intersections and returns shall be formed accurately. All lines shall be kept straight and true; and all finished corners rounded. Horizontal joints shall be maintained level and vertical joints plumb alignment.

9.7.5 Jointing

Joints shall be parallel and uniform in width, plumb, level and in alignment. End joints in broken-joint shall be made, as far as practicable, on the centerline of the adjoining tiles. Joint widths shall be uniform and measured to accommodate the tiles in the given spaces with a minimum curing.

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9.7.6 Grouting

Grouting shall be done using the approved materials of the Project Manager. Grouting shall be done as soon as the mortar beds have sufficiently set. All cement shall be Portland cement, colored or white, as required. Where light colored mortar is required in joints, mixture of white cement and non-fading mineral oxide shall be used to produce the desired color. The quantity of mineral oxides shall not exceed 10% of the volume of the cement in any case.

9.7.7 Cleaning

Upon completion of grouting, the tile shall be thoroughly cleaned and maintained in this condition until completion of the contract.

9.8 Painting

9.8.1 General

The work covered by this section consists of furnishing all labor, equipment, tools and materials in performing all operations in connection with painting and finishing, including protective coating of metal surfaces, complete in accordance with the specifications and the applicable drawings.

9.8.2 Color and Samples

The Project Manager shall in accordance with the color schemes shown in the drawings or as direct all colors.

Sample panels of selected colors, as least (1) meter square in area shall be prepared for approval by the Project Manager prior to the application.

9.8.3 Workmanship

Skilled workers shall do all work in a workmanlike manner. Paints shall be evenly applied and free from sags, runs, crawls and other defects. All coats shall be of proper consistency and well brushed out or rolled on so as to show a minimum brush or rolled marks. Brushes or rollers shall be clean and in good condition.

All coats shall be thoroughly dry before the succeeding coat is applied. Allow at least twenty-four (24) hours or more between applications of coat. For exterior painting during rainy season, allow one (1) week drying time before the succeeding coat is applied.

Painting coats as specified are intended to cover surfaces perfectly, its surfaces are not fully covered, further coats shall be applied to attain the desired evenness of the paint application. All finishes shall be uniform as to sheen, color and texture. Paint may be applied by spray method, except when, in the opinion of the spraying in any particular application would produce unsatisfactory results. The Contractor shall provide all drop cloths and other covering requisite to the protection of the floors and other work.

Each surface shall be inspected carefully before applying any finish; and if surface is not in proper condition, they shall be notified to that effect in writing, otherwise the Contractor shall be held responsible for any defects in the

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finishes arising there from. Should a coat of paint be applied to a certain area and defects shall be knocked out and re-plastered by the Contractor and repainted to the satisfaction of the Project Manager.

9.8.4 Inspection of Surfaces

The Contractor shall inspect all surfaces to be painted and all defects shall be remedied before starting the work before starting the work. No work shall be started unless the Contractor shall have made certain the dryness of the surfaces. Test shall be made, in the presence of the Project Manager, to verify the dryness of surfaces to be painted.

9.8.5 Concrete Surfaces

(1) Surface Preparation

Before applying paint, concrete and cement surfaces shall be allowed to dry thoroughly. Clean surfaces of all dirt, alkali and grease before commencing work. Treat all surfaces with a solution of two (2) kilos of zinc sulfate to four (4) liters of water and sufficient phenolphthalein to act as color warning. Presence of alkali is indicated when phenolphthalein turns red and further treatment is required to neutralize it. Allow the surface to dry at least three (3) days and remove and loose crystals from the surface before finishing.

(2) Finishing

For exterior and interior concrete surfaces and all other surface with cement plaster finish, use flat concrete paint with the specified brand approved by the Project Manager.

First Coat- Apply flat concrete paint thinned with ½ liter water per 4 liters of paint; tint with latex tinting color to closely match color of topcoat or use premixed paint. Dry for 3 to 6 hours.

Intermediate Coat- Repair all minor surface imperfection with paint putty made by mixing paint with patching compound powder. Let it dry for 24 hours, and then smoothen the surface with sand paper, before applying the intermediate coat.

Final Coat- Apply semi-gloss or gloss paint tinted with latex tinting color to the shade specified.

Ducco or semi-ducco finish shall be applied using the appropriate paint sprayer by a well experienced painter.

9.5.6 Wood Surfaces

(1) Surface Preparations

Plane the surface of wood with sandpaper to remove roughness, loose edges, splinters, slivers then clean to remove dust. All frames in contact with concrete or plaster shall be treated with an anti-termite solution or solution or equivalent before applying paints. Set the nail heads into the wood, fill holes, cracks and defects. Dry for three (3) hours and clean surface with sandpaper to smoothen the surface.

(2) Finishing

For all woodwork, use gloss latex house paint with the specified brand approved by the Project Manager.

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First Coat- Apply paint thinned with ½ liter water per 4 liters of paint.

Second Coat- Apply latex thinned with latex tinning colors to the shade specified for 4 to 6 hours.

9.6 Method of Measurement and Basis of Payment

The finished area to be paid for under each item shall be measured by the number of square meter painted surfaces accepted in accordance with the plans and specifications. The cost of plastering works, tinting color, thinner, sand paper, putty including mixing, application, curing, false work and protection work shall be deemed to be included in the contract unit price for each pay item as shown in the bid schedule.

The finished area to be paid for tiles surfaces shall be measured by the number of square meter accepted in accordance with the plans and specifications. The cost of tile trims, plastering, grout adhesive, rubber nosing and other required materials as per plans shall be deemed to be included in the contract unit price for each pay item as shown in the bid schedule.

The accepted quantities measured as stipulated above shall be paid for at the contract unit price for each of the particular pay item listed below, which price and payment shall be full compensation for furnishing and placing all materials, labor, equipment, tools and incidentals necessary to complete each work item.

10.0 PLUMBING WORKS

10.1 Scope of Work

This item shall consist of furnishing all materials, tools, equipment and fixtures required as shown on the Plans for the satisfactory performance for the entire plumbing system including installation in accordance with the latest edition of the National Plumbing Code, and this Specification.

10.2 Material Requirements

This item shall consist of furnishing all materials, tools, equipment and fixtures required as shown on the Plans for the satisfactory performance of the entire plumbing system including installation in accordance with the latest edition of the National Plumbing Code, and this specification.

10.2.1 For cold water lines, Pn 10 Fusion Weld Polypropylene Pipes. Provide coal tar with burlap for embedded pipe.

10.2.2 Pipe series 1000 conforming to ASTM D-2729 for all downspouts and sewer, waste & vent lines.
UPVC

10.2.3 Water Closets shall be Flush-type for offices and other specified areas and lever-type with pressurized tank for patients' comfort rooms.

10.2.4 Unless otherwise specified, toilet lavatories shall be countertop lavatories with complete fittings. Counters shall be granite slab or as specified on the drawings.

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10.2.5 Where indicated in the plans, the counter top model, make and color shall be approved by the Architect or Engineer.

10.2.6 Pipes, plumbing fixtures, water lines, clean out and vents shall be supplied and installed in accordance with the approved workmanship.

10.2.7 Drainage pipes shall be Reinforced Concrete Pipes of specified sizes.

10.2.8 Water Supply Pipes and Fittings

(a) Pipes shall be Pn 10 Fusion Weld Polypropylene Pipe conforming to specification requirements including Trims and Fittings.

(b) Valves for water supply shall be bronze body with threaded ends rated 21.0 kgf/cm. square. All valves are gate valves unless otherwise specified. Gate valves shall have solid wedge body and discs conforming to specification requirements defined in ASTM B-62. Globe valves shall have plug type discs with ferrule-threaded ends and bronze body.

(c) Unions in ferrous pipe 50 mm in diameter and smaller shall be malleable iron.

10.2.9 Approved Alternate Pipes and Fittings

Pipes and fittings for sanitary and potable water lines as approved alternative shall be Galvanized Iron Pipes and Fittings Schedule 40 and Unplasticized Polyvinyl Chloride Pipes and Fittings (UPVC). Pipes and fittings shall be made of virgin materials conforming to specification requirements defined in ASTM D-2241 and PNS 65: 1986. Fittings shall be molded type and designed for solvent cement joint connection for water lines and rubber O-ring seal joint for sanitary lines.

10.3 Construction Requirements

The Contractor before any installation work is started shall carefully examine the Plans and shall investigate actual structural and finishing work condition affecting all this work. Where actual condition necessitates a rearrangement of the approved pipe layout for approval by the Project Manager.

10.3.1 Installation of Waste and Vent Pipes

(1) Horizontal lines shall be secured strongly by hooks to the building frame and suitable brackets or chairs shall be provided at the floor which they start.

(2) Vent pipes in roof spaces shall be run as closest possible to under side of roof with horizontal piping pitched down to stacks without forming traps. Vertical vent pipes connected into one main vent riser above the highest vented fixtures.

(3) Where an end circuit vent pipe from any fixtures is connected to a vent line serving other fixtures, the connection shall be at least 1.20 m above the floor on which the fixtures are located.

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(4) Horizontal waste line receiving the discharge from two or more fixtures shall be provided with end vents separate venting of fixtures is noted on the plans.

(5) All changes in pipe size on soil and waste lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made appropriate use of 45 degrees, wyes, half wyes, quarter bends or elbows may be used in waste lines where the change in direction of flow is the horizontal to the vertical and on the discharge from waste closets. Where it becomes necessary to use short radius fittings in other location the approval of the Project Manager shall be obtained prior to installation of the same.

(6) Vent pipe shall be provided with Vent Cap (Studor) and flashed and made watertight at the roof with ferrule lead. Flashing shall be turned down into pipes.

10.3.2 Water Pipes, Fittings and Connections

All water piping inside the building and underground, 100-mm in diameter and smaller shall be schedule 40, series 1000 PVC pipes fittings.

(1) The water piping shall be extended to all fixtures, outlets and equipment from the gate valves installed in the branch near the rise.

(2) The cold water system shall be installed with a fall towards a main shut off valve and drain. Ends of pipes and outlet shall be capped or plugged and left ready for future connections.

10.3.3 Mains and Branches

(1) All pipes shall be cut accurately to measurements and shall be worked into place without springing or forcing. Care shall be taken so as to not to weaken the structural portions of the building.

(2) All piping above the ground shall be run parallel with the lines of the building unless otherwise indicated on the plans.

(3) All service pipes, valves and fittings shall be kept at sufficient distance from other work to permit finished covering on the different services.

(4) No water piping shall be buried in floors, unless specifically indicated on the Plans and approved by the Project Manager.

(5) Changes in pipes shall be made with reducing fittings.

10.3.4 Drain Cocks

Pipe drain indicated on the drawing shall consist of 12-mm globe valve with renewable disc and installed at low points on the cold water piping so that all piping shall slope 100 in 30.5 m.

(1) Threaded Pipe Joints

All pipes shall be reamed before threading. All screw joints shall be made with graphite and oil or with an approved granite compound applied to make threads only. Threads shall be cut not more than three threads on the pipe shall remain exposed.

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(2) Expansion and Contraction of Pipes

Accessible contraction-expansion joints shall be made whenever necessary. Horizontal runs of pipe over 15 m length shall be anchored to the wall to the supporting structure about midway on the run to force expansion and contraction equally toward the ends or as shown on the Plans.

- Valves shall be provided on all supplied fixtures as herein specified.
- The cold water connection to the return circulation connection shall have and a check valve.
- All connection to domestic hot water heaters shall be equipped with unions between valve and tanks.
- Valve shall not be installed with its stem below the horizontal. All valves shall be gate valves unless otherwise indicated on the Plans.
- Valves p to and including 50-mm diameter shall be threaded ends; rough bodies and finished trimmings, except those on chromium plated brass pipe.
- Valves 63 mm in diameters and larger shall have iron bodies, brass mounted and shall have either screws or flange ends.
- Hose bibs shall be made of brass with 12.5-mm inlet threads, hexagon shoulders and 19 mm male.

10.3.5 Fixtures, Equipment and Fastenings

(1) All fixtures and equipment shall be supported and fastened in a safe and satisfactory workmanship as practiced.

(2) All fixtures where required to be wall mounted on concrete or concrete hollow block wall, fasten with brass and expansion bolts. Expansion bolt shall be 6-mm diameter with 20-mm threads to 25 m into solid concrete, fitted with loose tubing to sleeves of proper length to acquire extreme rigidity.

(3) Insert shall be securely anchored and properly flushed into the walls. Inserts shall be concealed and rigid.

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- (4) Bolts and nuts shall be horizontal and exposed. It shall be provided with washers and chromium plate finish.

10.3.6 Plates and Flashing

- (1) Plates to cover exposed pipes passing through floor finished walls or ceiling shall be fitted with chromium plated cast brass plates or chromium plated cast iron steel on ferrous pipes.
- (2) Plates shall be large enough to cover and close the hole around the area where pipes pass. It shall be properly installed to insure permanence.
- (3) Roof areas penetrated by vent pipes shall be rendered watertight by lead sheet flashing and condor flashing. It shall extend at least 150 mm above the pipe and 300 mm along the roof.

10.3.7 Bathroom and Toilet Accessories

- (1) Shower head and fittings shall be movable, cone type with escutcheon arm complete with stainless steel; shower valve and control lever. All exposed surface to be chromium finish.
- (2) Grab bars shall be made of tubular stainless-steel pipe provided with safety grip and mounting flange for disabled people.
- (3) Floor drains shall be made of steel beehive type, measuring 10cm x 10 cm and provided with detachable stainless strainer, expanded metal lath type.
- (4) Toilet paper holder and soap holder shall be vitreous china or approved equal wall mounted. Color shall reconcile with the adjacent fixture and facing tiles.
- (5) Faucets shall be made of stainless steel for interior use.
- (6) Hose bibs shall be made of bronze cast finish.

10.4 Drainage System Test

- 10.4.1 The entire drainage and venting system shall have all necessary openings, which can be plugged to permit the entire system to be filled with water to the level of the highest water or a full 30 minutes during which time there shall be no drop greater than 102 mm.

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10.4.2 Where only a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system except that a vertical stack 3.00 m highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure or water pump may be used to supply required pressure.

10.4.3 If and when the Project Manager decides that an additional test is needed, such as an air to smoke test on the drainage system, the Contractor shall perform such test without any designated representative.

10.5 Water Test on System

10.5.1 Upon completion of the roughing-in and before connecting fixtures the entire cold water piping system shall be tested at a hydrostatic pressure 1 ½ times the expected working pressure in the system during operation and remained tight and leak-proofed.

10.5.2 Where piping system is to be concealed the piping system and in the presence of the Engineer of his duly designated representative.

10.6 Defective Work

10.6.1 All defective materials replaced and tested will be repeated until satisfactory performance is attained.

10.6.2 Any material replaced for the satisfactory performance of the system made shall be at the expense of the Contractor.

10.6.3 Caulking of screwed joints or holes will not be permitted.

10.7 Disinfection

10.7.1 The entire water distribution system shall be thoroughly flushed and treated with chlorine before it is operated for public use.

10.7.2 Disinfection of materials shall be liquid chlorine or hydro-chloride and shall be introduced in a manner approved as practice or potable water.

10.7.3 Valves for the water distribution system shall be opened and closed several times during the 16 hours chlorinating treatment is done.

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10.8 Method of Measurement and Basis of Payment

The work done under this item shall be quantified per length and/or number of units as provided in the Bill of Quantities, tested and accepted to the satisfaction of the Project Manager. The accepted quantities measured shall be paid at the contract unit price and payment shall be full compensation including labor, materials (pipes, fittings, etc.) and incidentals necessary to complete this item.

11.0 ELECTRICAL WORKS

11.1 Scope of Work

All work under these specifications shall consist of furnishing/cause to furnish materials, labor, tools, appliances, and all other services necessary unless otherwise indicated to complete and make ready for operation, the electrical power, lighting, and other utility system described herein and/or indicated in the electrical plans including owner-furnished equipment and fixtures. In accordance with the electrical plans and these specifications.

- (1) Roughing-in and wiring for lighting, power, telephone, fire alarm, nurse call, and paging system.
- (2) Supply and install/cause to install primary metering.
- (3) Supply, installation, and testing of panel boards, and disconnect switches.
- (4) Supply and installation of underground feeder system included in the plan to powerhouse.
- (5) Supply and installation of boxes, pull boxes, auxiliary gutters, wire gutters, bus bar gutters, circuit breaker gutters and the like.
- (6) Supply and installation of lighting fixtures, switches, ceiling fans, and power outlets.
- (7) Supply and installation of hangers and supports of conduits for power, feeder and sub-feeder system and auxiliary system.
- (8) Painting of electrical works covering conduits, boxes, hangers, gutters, and the like.
- (9) Testing for electrical system:
 - (a) Insulation resistance test
 - (b) Ground resistance test
 - (c) Continuity test
 - (d) Operational test
 - (e) Polarity check
 - (f) Phase balancing check

11.1.1 Anything that has been omitted in any of work or materials usually furnished which are necessary for the completion of the works as outlined herein shall be undertaken or supplied by the contractor included in this division of work and must be included in the bid proposal.

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11.2 Code Regulations

All materials and equipments to be used in the electrical installations and construction shall be in accordance with the provisions of the latest edition of the Philippine Electrical Code and the pertinent ordinances of the municipality wherein the project is located.

All work shall comply with the rules and regulations of the local power utility company in so far as they are concerned in providing the respective permanent services to the building.

11.3 Drawings and Specifications

The electrical plans and these specifications are meant to be complementary to each other, and what is called for in one shall be as binding as if called for by both.

Any permanent conflict between the electrical plans and this specification and any unclear points of controversial matter in either shall be referred to the owner's assigned representative for final decision.

Upon final completion of the work herein described, the electrical contractor shall furnish the Owner two (2) copies of the "As-built" plans for future reference and maintenance purposes.

The electrical plans indicate the general layout of the complete electrical system, arrangement of feeders, circuit outlets, switches, controls, panel boards, service equipment and other work. Field verification of the scale dimensions on the plane must be made, since actual locations, distances and levels will be governed by actual field conditions.

The Electrical Contractor shall check architectural, structural and plumbing plans if necessary to resolve such conflicts. The Electrical Contractor shall notify the architect and secure approval and agreement on necessary adjustments before installation is started.

11.4 Permits and Inspection

The Electrical Contractor shall obtain all necessary permits and certificates of electrical inspection from the proper government authorities concerned, required both for the performance of the work involved and the operation of the system upon completion of the work.

The Electrical Contractor shall pay all the fees necessary to secure the above-mentioned permits and certificates.

The Electrical Contractor shall at his own expense, reproduce the electrical plans to the necessary scale and size, complete them with all the necessary information and requirements as maybe required by the government authorities concerned with the approval of plans.

The Electrical Contractor shall coordinate with the local power company regarding the power facilities and secure approval of the power requirements.

11.5 Materials and Workmanship

All materials to be used shall be brand new, with trade name, unused, and shall in every case be the best where such standards have been established for the particular type of materials used.

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Trade/brand name of materials indicated in the specifications are recommendatory in nature and are included for the purpose of uniformity in bids. If trade/brand names other than those indicated are to be used during construction, brochures and samples shall be submitted to the owner's representative for approval.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of the installation work. All workmanship shall be of the best quality and all works shall be done in accordance with the best engineering practice of the trade involved.

11.6 Wiring Method

Lighting and Power Branch Circuit – uPVC pipes concealed in ceilings and double walls and/or embedded in concrete walls/slabs. All uPVC pipes ran underground outside of buildings shall be buried not less than 40mm below natural grade line and enclosed in concrete envelope. All concrete envelopes passing under roadways or areas accessible to vehicles shall be steel reinforced up to 1.0m from the edge of the roadway.

Low Voltage Service Entrance and All Feeders – rigid steel conduit, exposed/concealed in ceiling/double walls, embedded in concrete walls/slabs or ran underground encased in concrete.

All Other Auxiliary Layout – uPVC pipes concealed in ceilings/double walls and/or embedded in concrete walls/slabs.

Use flexible metal pipe for connection between junction boxes inside ceiling and lightings and other fixtures using approved fittings.

All boxes, cabinets and other equipments shall be flush-mounted unless specified/approved otherwise.

All boxes for lighting outlets, convenience outlets, tumbler switches and other devices shall be unless specified, galvanized pre-painted or uPVC and other approved products of reputable manufacturers. Cut ends of conduits shall be reamed and cleaned to remove burr and sharp edges. Threads cut on conduits shall be the same thread dimensions as factory cut conduit threads. Conduits joints shall be made straight and true. Elbows and offsets and changes in direction and runs shall be uniform. Bends shall be made without kinking or destroying the cross-sectional contours of the conduits. Conduit terminals shall be provided at outlet boxes and cabinets with locknuts and bushing. Conduits shall be continuous from outlet and from outlet to pull boxes and cabinets in the manner that the conduit system shall be electrically continuous.

Where conduit runs are exposed, they shall be supported at an interval of not more than 0.75 m maximum with proper clamps and bolts or expansion shields or other means of support.

All splices, taps, junction in wires larger than 8.0 sq.mm. shall be done with solderless connectors of suitable sizes and properly insulated with rubber tapes and protected by friction tapes, so that the insulation strength shall at least be equal to the insulation of the conductors they join.

Unless otherwise specified, the type of wires to be used shall either be THW or THHN. Smallest size of wire to be used for lighting and power unless otherwise indicated shall be 3.5 sq.mm.

11.7 Feeders

Feeders shall be laid out in accordance with the riser diagram shown in the electrical plans.

Unless otherwise specified type THW or THHN wires shall be used for feeder lines. The wires and conduits sizes shown in the electrical plans shall be the minimum sizes to be used.

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11.8 Wall Switches and Receptacles

All wall switches shall be flush type and mounted 1.40 meters above finish floor line unless otherwise specified.

Convenience outlets shall be grounding type, wall flushed, mounted 0.30 meter above finished floor line or finished counters unless otherwise specified in the plan. Ground fault circuit interrupter protected convenience outlets shall be used in bathrooms, lavatories, sinks, laundry areas and the like.

11.9 Main Switches, Transfer Switches and Panel Boards

The cabinets for the above shall be of standard sizes and shall be gauge #16. Circuit breakers shall be as specified in the plan and shall be followed at all times.

11.10 Lighting Fixtures

Install all lighting fixtures and lamps as specified and as shown on plans, fluorescent lamps and bulbs shall be 48 inches/28 watts and 5-7 watts respectively, standard cool white or daylight with the minimum light output of 3,000 lumens. Use high power factor ballast.

All fluorescent fixtures housing shall be of US Gauge 22 minimum.

Submit one sample of each type of fixtures to the Architect for approval prior to manufacturing and installation.

11.11 Water Pump

The Electrical Contractor shall install a complete wiring and conduit system including circuit breaker.

The Electrical contractor shall; supply, install, test and commission the water pump and accessories such as motor, starter, ground fault protection, water level controller, etc.

11.12 Auxiliary Systems

The Electrical Contactor shall, after completion, submit a complete schematic wiring diagram of the above to the owner's representative.

11.13 Method of Measurement and Basis of Payment

The work done under this item shall be quantified per length and/or number of units as provided in the Bill of Quantities, tested and accepted to the satisfaction of the Project Manager. The accepted quantities measured shall be paid at the contract unit price and payment shall be full compensation including labor, materials (wires, pipes, fittings, etc.) and incidentals necessary to complete this Item.

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12.0 MECHANICAL

12.1 Air-conditioning and Refrigeration System

This item shall consist of furnishing and installation of air conditioning, refrigeration and ventilation systems, inclusive of necessary electrical connections, ductworks, grilles, pipes and condensate drains and all other necessary accessories, ready for service in accordance with the Plans and Specifications.

The types, sizes, capacities, quantities and power characteristics of the compressor, evaporator, condenser chilled water pump and condenser water pump shall be as specified or as shown on the Plans.

12.2 Construction Requirements

The air conditioning system shall be entirely automatic in operation and shall not require the presence of an attendant except for periodic inspection for lubrication. All equipment and materials shall be inspected upon delivery and shall be tested after installation. Piping shall not be buried, concealed, or insulated until it has been inspected, tested and approved. Walls, floors and other parts of the building and equipment damaged by contractor in the prosecution of the work shall be replaced as shown on the Plans.

12.3 Operating Tests

Operating test of complete air conditioning system shall be 6 hours minimum for each system. Tests of air flow, temperature and humidity shall be made to demonstrate that each complies with the requirements of the Plans and Specifications.

12.4 Miscellaneous

The owner shall be provided with three (3) bound copies "AS-BUILT" diagram, shop drawings, parts lists, serial number and inventory of equipment including manufacturers and maintenance manuals for submission to the hospital's Material Management Section (MMS).

All standard tools and equipment shall be furnished for proper and regular maintenance of installed equipment.

12.5 Method of Measurement

The work under this Item shall be measured either by set, piece, length, square meter actually placed and installed as shown on the Plans.

- (1) Lighting Fixtures – including pipes and fittings, wires and cables and other miscellaneous expenses
- (2) Wiring Devices – including pipes and fittings, wires and cables, boxes and other miscellaneous expenses
- (3) Panelboard/Circuit Breakers – including bush bars, housing and other miscellaneous expenses

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- (4) Aircon Overload Protection – including pipes and fittings, wires and cables and other miscellaneous expenses
- (5) Other Electrical Works (Roughing-in for upper floors) - pipes and fittings for lighting fixtures, convenience outlets, wiring devices.

12.6 Basis of Payment

All work performed and measured and as provided for in the Bill of Quantities shall be paid for the Unit Bid of Contract Unit Price which payment shall constitute full compensation including labor, materials, tools and incidentals necessary to complete this Item:

13.0 MISCELLANEOUS

13.1 Signage

Informative and directional signage must be installed in conspicuous places. It shall be made of stainless steel, high quality acrylic lettering, and/or other materials stated in the plans and/or bill of quantities.

13.1.1 Construction Requirements

The area to be installed shall be free from any foreign materials to ensure strong contact surface. If welded, the finish must be free from weld excess and precise welding process must be observed.

13.2 Telecommunication Lines and Wifi System

Delivery, installation and testing of telecommunication lines and wifi system on conspicuous places reflected in the plans.

13.2.1 Construction Requirements

All lines must be kept above the finished ceiling boards. Secured with conduit pipe and for ease of identification, labeling may be done.

13.3 CCTV System

Delivery, installation and testing of CCTV System.

13.3.1 Construction Requirements

CCTV cameras must be placed in conspicuous places to provide enough vision where blind spots are identified. Lines must be kept above the finished ceiling boards. Secured with conduit pipe and for ease of identification, labeling may be done. Monitors must be placed on offices.

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13.4 Generator Set

Delivery, installation and testing of Generator Set.

13.4.1 Construction Requirements

Generator Set must be installed to suffice the electrical power requirement of the area during power interruption. Lines must be kept above the finished ceiling boards. Secured with conduit pipe and for ease of identification, labeling may be done. Housing for the generator must be constructed and installed in an area where ease of mobility is present.

13.5 Fire Detection and Alarm System

Delivery, installation and testing of Fire Detection and Alarm System to include automatic sprinklers.

13.5.1 Construction Requirements

Fire detection and alarm system to include automatic sprinklers must be installed on all conspicuous areas. A main server to monitor the location and position of fire incident must be installed in offices. In case of fire, an automated mechanism will trigger to enable the fast response of motor pump to supply water from the cistern tank, through installed lines, into the sprinklers.

13.6 Basis of Payment

All work performed and measured and as provided for in the Bill of Quantities shall be paid for the Unit Bid of Contract Unit Price which payment shall constitute full compensation including labor, materials, tools and incidentals necessary to complete this item

NOTE: THE CONTRACTOR'S PROPOSAL SHALL COVER ALL ITEMS AND OTHER INCIDENTAL WORKS NECESSARY TO COMPLETE EACH ITEM OF WORKS MENTIONED ABOVE. IN CASE OF DISCREPANCIES BETWEEN THE ABOVE MENTIONED SPECIFICATIONS IN THE BILL OF QUANTITIES, THE CONTRACTOR MUST IMMEDIATELY COORDINATE WITH THE CONCERNED OFFICE FOR VERIFICATION.

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