Technical Specifications

PROJECT TITLE ***: INCREASE IN CARRYING CAPACITY OF THE COLLEGE OF MEDICINE (COM ANNEX BUILDING III – PHASE I)***

LOCATION ***: WVSU MAIN CAMPUS***

I. SITE WORK

A. WORK INCLUDED

1. Establishment of lines, grades and benchmarks and provision of temporary facility

2. All backfolding, filling and grading, removal of excess materials from site.

3. Protection of property, work and structures, workmen, and other people from damage and injury.

B. LINES, GRADES AND BENCHMARKS

1. Stake out accurately the lines of the building and of the other structures included in the contract, and establish grades therefore, after which secure approval by Architect before any excavation work is commenced.

2. Erect basic better boards and basic reference marks, at such places where they will not be disturbed during the construction of the foundations.

C. EXCAVATIONS

Structural Excavations – Excavations shall be to the depths indicated bearing values. Excavations for footings and foundations carried below required depths shall be filled with concrete, and bottom of such shall be level. All structural excavations shall extend to sufficient distance from the walls and footings to allow for proper erection and dismantling of forms, for installation of service and for inspection. All excavations shall be inspected and approved before pouring any concrete, laying underground services or placing select fill materials.

The Contractor shall control the grading in the vicinity of all excavated areas to prevent surface drainage running into excavations. Water which accumulates in excavated areas shall be removed by pumping before fill or concrete in placed therein.

Note: This structure will be adjacent with an existing structure, thus be careful with existing structures, footing, beams, posts, pipes underground, any other pipelines present on site. Consult with Engineer before any major demolition and boring. Any damages will be shouldered by the contractor.

D. FILLINGS AND BACKFILLING

1. After forms have been removed from footings, piers, foundations, walls, etc. and when concrete work is hard enough to resist pressure resulting from fill, backfilling may then be done. Materials excavated may be used for backfilling. All filling shall be placed in layers not exceeding six (6) inches in thickness, each layer being thoroughly compacted and rammed by wetting, tamping, rolling.

E. PLACING AND COMPACTING FILL

1. Common Fill- shall be approved site-excavated materials free from roots, stumps and other perishable or objectionable matter.

2. Select Fill – Shall be placed where indicated and shall consist of crushed gravel, crushed rock, or combinations thereof. The materials shall be free from adobe, vegetable matters and shall be thoroughly tampered after placing.

3. Before placing fill material, the surface upon which it will be placed shall be cleared of all brush roots, vegetable matters and debris, sacrificed and thoroughly wetted to insure good bonding between the grounds.

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F. DISPOSAL OF SURPLUS MATERIALS

1. Any excess materials remaining after completion of the earthwork shall be disposed of by hauling and spreading in nearby spoil areas designated by the OWNER. Excavated materials deposited in soil areas shall be graded to a uniform surface.

II. CONCRETE AND REINFORCED CONCRETE

A. GENERAL

1. Unless otherwise specified herein, concrete works shall conform to the requirements of the ACI Building Code. Full cooperation shall be given other trades to install embedded items. Provisions shall be made for setting items not placed in the forms. Before concrete is placed, embedded items shall have been inspected and tested for concrete aggregates and other materials shall have been done.

B. MATERIALS

1. Cement for concrete shall conform to the requirements of specifications for Portland Cement (ASTM C – 150)

2. Water used in mixing concrete shall be clean and free from other injurious amounts of oils, acids, alkaline, organic materials or other substances that may be deleterious to concrete or steel.

3. Fine aggregates shall consist of hard, tough, durable, uncoated particles. The shape of the particles shall be generally rounded or cubicle and reasonably free from flat or elongated particles. The stipulated percentages of fines in the sand shall be obtained either by the processing of natural sand or by the production of a suitably graded manufactured sand.

4. Coarse aggregates shall consist of gravel, crushed gravel or rock, or a combination of a gravel and rock, coarse aggregates shall consist of hard, tough, durable, clean and uncoated particles. The sizes of coarse aggregates to be used in the various parts of the works shall be in accordance of the following:

   Maximum Size – 1 ½" for all concreting works

5. Reinforcing bars shall conform to the requirements of ASTM standard specifications for Billet Steel Bars for concrete reinforcement (A15-625) and to Specification for requirements for the deformed steel bars for concrete reinforcement (A 305-56).

   All secondary ties such as stirrups, spirals and inserts may also be deformed bars. The main reinforcing bars shall be as follows:

No. 4 (1/2") 12 mm	No. 8 (1") 25 mm
No. 3 (3/8") 10 mm	No. 9 (1 11/8") 28 mm
No. 5 (5/8") 16 mm	fy – 33,000 psi
No. 6 (3/4") 20 mm	fy – 40,000 psi
No. 7 (7/8") 22 mm	fy – 60,000 psi

C. PROPORTIONING AND MIXING

1. Proportioning and mixing of concrete shall conform to the requirements for Item 405 of the standard specification with the following proportions:

	Cement	: Sand	: Gravel
Class "A" –	1	: 2	: 3
Class "B" -	1	: 2	: 4
Class "C" -	1	: 2 ½	: 5

2. Class of Concrete – concrete shall have 28-day cylinder strength of 3,000 psi. for all concrete works, including columns and beams unless otherwise indicated in the plans or approved by the engineer.
   Concrete for slab-on-fill shall have a 28-day cylinder strength of 2,500 psi.

3. Mixing – concrete shall be machine mixed. Mixing shall begin within 30 minutes after the cement has been added to the aggregates. In the absence of the concrete mixer, manual mixing is allowed.

D. FORMS

1. General – Forms shall be used whatever necessary to confine the concrete and shape it to the required lines, or to insure the concrete of contamination with materials caving from adjacent, excavated surfaces. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in correct position. Forms shall be sufficiently tight to prevent loss or mortar from the concrete. Forms for exposed surfaces against which backfill is not be placed shall be lines with a form grade plywood.

2. Cleaning and Oiling of Forms – before placing the concrete, the contact surfaces of the formed hall be cleaned of encrustations of mortar, the grout or other foreign material, and shall be coated with a commercial form oil that will effectively prevent sticking and will not stain the concrete surfaces.

3. Removal of Forms – forms shall be removed in a manner which will prevent damage to the concrete. Forms shall not be removed without approval. Any repairs of surface imperfections shall be formed at once and airing shall be started as soon as the surface is sufficiently hard to permit it without further damage.

E. PLACING REINFORCEMENT:

1. General – steel reinforcement shall be provided as indicated, together with all necessary wire tires, chairs, spacer supported and other devices necessary to install and secure the reinforcement properly. All reinforcement, when placed, shall be free from loose, flaky rust and scale, oil grease, clay and other coating and foreign substances that would reduce or destroy its bond with concrete.

   Reinforcement shall be placed accurately and secured in place by use of metal or concrete supports, spacers and ties. Such supports shall be used in such manner that they will not be exposed or contribute in any way, to the discoloration or deterioration of the concrete.

F. CONVEYING AND PLACING CONCRETE:

1. Conveying – concrete shall be conveyed from mixer to forms as rapidly as applicable, by methods which will prevent segregation, or loss of ingredients. There will be no vertical drop greater than 1.5 meters except where suitable equipment is provided to prevent segregation and where specifically authorized.

2. Placing – concrete shall be worked readily into the corners and angles of the forms and around all reinforcement and imbedded items without permitting the material to segregate, concrete shall be deposited as close as possible to its final position in the forms so that flow within the mass does not exceed two (2) meters and consequently segregation is reduced to a minimum near forms or embedded items, or elsewhere as directed, the discharge shall be so controlled that the concrete may be effectively compacted into horizontal layers not exceeding 30 centimeters in depth within the maximum lateral movement specified.

3. Time interval between mixing and placing. Concrete shall be placed before initial set has occurred and before it has contained its water content for more than 45 minutes. No concrete mix shall be placed before 60 complete revolution of the machine mixer.

4. Consolidation of Concrete – concrete shall be consolidated with the aid of mechanical vibrating equipment and supplemented by the hand spading and tamping. Vibrators shall not be inserted into lower cursed that have commenced initial set; and reinforcement embedded in concepts beginning to set or already set shall not be disturbed by vibrators. Consolidation around major embedded parts shall by hand spading and tamping and vibrators shall not be used.

5. Placing Concrete through reinforcement – In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. On the bottom of beams and slabs, where the congestion of steel near the forms makes placing difficult, a layer of

mortar of the same cement-sand ratios as used in concrete shall be first deposited to cover the surfaces.

G. CURING

1. General – All concrete shall be moist cured for a period not less than seven (7) consecutive days by an approved method or combination applicable to local conditions.

2. Moist Curing – The surface of the concrete shall be kept continuously wet by covering with burlap plastic or other approved materials thoroughly saturated with water and keeping the covering spraying or intermittent hosing.

H. FINISHING

1. Concrete surfaces shall not be plastered unless otherwise indicated. Exposed concrete surfaces shall be formed with plywood, and after removal of forms, the surfaces shall be smooth, true to line and shall present or finished appearance except for minor defects which can be easily repaired with patching with cement mortar, or can be grounded to a smooth surface to remove all joint marks of the form works.

2. Concrete Slabs on Fill. The concrete slabs on fill shall be laid on a prepared foundation consisting of sub grade and granular fill with thickness equal to the thickness of the overlaying slab except as indicated otherwise.

III. MASONRY WORKS

A. MATERIALS

1. Concrete Hallow Blocks shall have a minimum face shell thickness of 1” (.025). Nominal size shall be 4” x 8” x 16” or 6” x 8” x 16” with minimum compressive strength as follows:
   Class “A” – 900 psi
   Class “B” – 750 psi
   All units shall be stoned for a period of not less than 28 days (including curing period) and shall not be delivered to the job site prior to that time unless the strengths equal or exceed those mentioned in these specifications.

2. Wall Reinforcement shall be 10mmØ or 12mmØ steel bars as specified in the plans.

3. Sand shall be river sand, well screened, clean, hard, sharp sillicious, free from loam, silt or other impurities, composed of grains of varying sizes within the following limits:

Sieve No.		Percent (%)
9	Passing	100
16	Retained	5
100	Retained	95

4. Cement shall be standard Portland cement, ASTM D-150-68 Type 1.

5. Mortar – Mix Mortar from 3 to 5 minutes in such quantities as needed for immediate use. Retampering will not be permitted if mortar stiffens because of premature setting. Discard such materials as well as those which have not been used within one hour after mixing.
   Proportioning: Cement mortar shall be one (1) part Portland cement and two (2) parts sand by volume but not more than one (1) part Portland cement and three (3) parts sand by volume.

B. ERECTION

1. All masonry shall be laid plumb, true to line, with level and accurately spaced courses, and with its course breaking joint with the source below. Bond shall be kept plumb throughout; corners and reveals shall be plumb and true. Units with greater 12 percent absorption shall be wet before laying. Work required to b built in with masonry, including anchors, wall plugs and accessories shall be built in as the erection progresses.

2. Masonry Units. Each course shall be solidly bedded in Portland cement mortar. All units shall be damp when laid units shall be showed into place not laid, in a full bed of unfurrowed mortar. All horizontal and vertical points shall be completely filled with mortar when and as

laid. Each course shall be bonded at corners and intersections. No cell shall be left open in face surfaces. All cell shall be filled up with mortar for exterior walls. Units terminating against beam or slab suffits shall be wedge tight with mortar. Do not lay cracked, broken defaced block.

3. Lintels shall be of concrete and shall be enforced as shown in the drawings. Lintels shall have a minimum depth of 0.20 (8") and on each side of opening.

C. WORKMANSHIP AND INSTALLATION:

1. Plastering: Clean and evenly wet surfaces. Apply scratch coat with sufficient force to form good keys. Cross scratch coat after scratch coat has set at least 24 hours after scratch coat application. Lightly scratch brown coat; keep moist for two (2) days; allow drying out. Do not apply finish until brown coat has seasoned for seven (7) days. Just before applying coat, wet brown coat again. Float finish coat to true even surface; trowel in manner that will force sand particles down into plaster; with final toweling, leave surfaces banished smooth, free from rough area, trowel marks, cheeks, other blemishes. Keep finish cost mist for at least two (2) days; thereafter protect against rapid drying until properly, thoroughly cured.

2. Pea Gravel Washout: Before start of work, provide desired pitch for drainage. Roughen concrete surface with pick or similar tool. Clean off loose particles and other materials which may prevent bond, keep surface wet for at least four (4) hours before applying. Scratch coat of mortar. Coat more than ¾" thick. Apply mixture of pea gravel and Portland cement with pressure to obtain solid adhesion. Trowel pea gravel to hard, smooth, and even plain and rod and float to uniform surface or even texture. When surface is semi-dry evenly spray surfaces with clean water with spray machine to washout loose cement to part exposed pea gravel. Remove and wash down remaining cement paste with soft brush, to leave pea gravel in its natural texture appearance. Before applying pea gravel finish, submit samples to owner for approval.

D. SCAFFOLDING

Provide all scaffolding required for masonry works, including cleaning down on completion, remove.

IV. ARCHITECTURAL FINISHES SCHEDULE

A. Bush-Hammered Finish

1. General – The work includes the performance of all work required in connection with bush hammered finish on concrete and masonry surfaces as shown on the drawings.

1.1 Materials

1.1.1 Cement shall conform to ASRM Standard, C150, Type 1.
1.1.2 Adobe Granules shall be of high quality subject to the approval of the Engineer.

1. Requirements. The surface to be finished shall be thoroughly cleaned. Bush-Hammered finish shall be composed of one part cement and two parts of adobe granules. The base coat shall be applied with sufficient materials and pressure to form a good bond with masonry and then it shall be dressed with a bush-hammer to provide a uniformly roughened surface. No abrupt irregularities shall be permitted and the granules shall not exceed in any case one (1) mm, using a straight edge or templates for testing irregularities. Corrective work, if any, shall be done by the Contractor to the satisfaction of the Engineer.

B. Pea-Gravel Finish

1. Pea-Gravel Finish shall have a composition of cleaned "Bohol" pea-gravel, No. 10 size, and with a 70 percent beige and 30 percent white color of pebble, unless otherwise indicated.

2. Sealer. Penetrating type, free from harmful alkali or acid content. Sealer shall not discolor the surface nor leave a tacky or sticky finish film on surface.

3. Pea-Gravel Washout Matrix shall be composed of 100 kilograms of pea-gravel composition per bag of Portland cement. Thoroughly mix dry ingredients before adding water in the amount of 18 liters per bag of cement. Apply to a minimum thickness of 13mm.

4. Installation Pea-Gravel Washout Matrix. Thoroughly moisten substrate but do not saturate; slush with neat cement into the substrate surfaces and then place the matrix. Compact by

toweling to extract all excess cement and water. Sprinkle with pebble composition where required to produce even texture of matrix. Follow immediately with water fogging to expose pebbles over matrix.

5. Curing. Keep the completed pea-gravel washout continuously moist for a period of 6 days by sprinkling water.

6. Cleaning and Sealing. After curing, remove all laitance from washout surfaces with an acid bath, using a 1 to 10 solution of muriatic acid to water and screbbing surface, followed by thoroughly rinsing with clean water. When surface is dry, apply sealer in accordance with sealer manufacturer's instructions.

7. Protection. Protect pea-gravel washout works from damage until completion of the work of all other trades.

C. TILEWORKS

1. General – Consist 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. Tilework shall not be started until roughing-ins for plumbing and electrical work has been completed and tested. The work of all other trades in the area where the work is to be done shall be protected from damage in a workmanship manner as directed by the Engineer.

2. Materials

2.1 Floor tiles shall be standard grade unglazed natural clay tile of 6mm thick manufactured by "Mariwasa" or its equivalent. Color and pattern shall be specified in the drawings or as approved by the Architect/Engineer. Present actual samples for approval before implementation

2.2 Wall and Special Tiles shall be of 6 mm thick non-vitreous body glazed tiles, manufactured by "Mariwasa" or its approved equivalent. Color and pattern shall be as specified in the drawings or as approved by the Engineer. Tiles shall be free from laminations, serrated edges, chipped off corners and other imperfection affecting their quality, appearance and strength.

2.3 Cement shall conform to ASTM Standard c150, Type 1.

2.4 Heavy duty tile and heavy duty tile adhesive be used when specified by the Architect/Engineer.

2.5 Sand shall be natural sand and shall be retained between No. 50 and No. 100 sieves.

2.6 Lime shall be hydrated lime where the free (unhydrated) calcium oxide and magnesium oxide content does not exceed 8 percent by weight.

2.7 Cement Pigment non-Fading mineral oxides of the quality as approved by the Engineer.

2.8 White cement shall be of the standard quality approved by the Engineer.

Manufactured materials shall be delivered in the original unbroken packages or containers that are labeled plainly with the manufacturer's names and brands. Containers for tiles shall be grade-sealed. Materials shall be stored in dry, weather tight enclosures and shall be handled in a manner that will prevent the intrusion of deleterious materials that will affect the quality and appearance of the tiles.

3. Mortar – 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.

D. FLOOR TILING

a. 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 water ponds shall be gilled, leveled and retested before the setting bed is 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 be permitted to remain on the surface. A skin coat of Portland cement mortar shall then be applied not more than 1.5mm 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 shall

reached its initial set, must be placed in one (1) operation, but in the event that more setting mortar has been placed than can be covered, the unfinished portion shall be removed and cut back to a clean leveled edge.

b. Application for Floor Tile. All tiles shall be soaked in clean water to a minimum of one (1) hour before they are installed. Absorptive mounted tile shall be damped by placing tile on a wetted cloth in a shallow pan before installing. Before the initial set has taken place in the setting bed, a skim of Portland cement mortar .75mm to 1.5mm thick shall be toweled or brushed over the setting bed or plain Portland cement .75mm to 1.5mm 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 defines lines shall be laid before the field or body of the floor. Where floor drain is provided, the floor shall be slopped properly to the drains. Cutting of tiles, where necessary, shall be done along the outer edges of 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 Engineer. All lines shall be kept straight, parallel and true and all finished surface brought to true and even planes.

E. WALL TILLING

a. Preparation of wall 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, rodded, and floated flushed with the screeds over an area no greater than will be covered with the title while the bed remain plastic. The thickness of the setting bed shall not exceed 20mm and the mortar shall not be retempered.

b. 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 of Portland cement mortar, mixed with water to the consistency of thick cream shall be applied .75mm thick 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 in the place 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 surfaces brought to true and even planes, internal corners squared and external corners, rounded. Horizontal joints shall be maintained level and vertical joints plumb in alignment.

F. JOINTS

1. 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 center line of the adjoining tiles. Joint widths shall be uniform and measured to accommodate the tiles in the given spaces with a minimum cutting.

G. PROTECTION

a. Areas where tiles are being laid shall be closed to traffic of other work until the floors are completed and the tiles have firmly set. Tile works shall be adequately protected from damage until the completion of the Contract.

H. GROUTING

a. 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, a mixture of white cement and non-fading mineral oxide shall be used to produce the desired colors. The quantity of mineral oxides shall not exceed 10 % of the volume of the cement in any case.

I. CLEANING

a. Upon completion of the grouting, the tiles shall be thoroughly cleaned and maintained in this condition until completion of the Contract.

V. CEILINGS

A. General – This item shall consist of all fabricated materials complete with hardware necessary for the proper functioning thereafter as called for in this specification unless indicated otherwise in the drawing.

1. All interior ceilings shall be as specified in the drawings/ or as approved by Architect.

2. Outside ceiling eaves shall be as specified in the drawings/ or as approved by Architect.

VI. DRYWALL PARTITIONS

A. General – This item shall consist of all fabricated materials complete with hardware necessary for the proper functioning thereafter as called for in this specification unless indicated otherwise in the drawing.

VII. WOOD DOORS

A. General – This item shall consist of all fabricated wooden doors complete with hardware necessary for the proper functioning thereafter as called for in this specification unless indicated otherwise in the drawing.

B. Materials – All limber for doors, jambs, door bars, shall be kiln dried with not more than fourteen percent (14%) moisture content.

1. Doors (Swing-Doors). Doors shall have 44mm thickness unless otherwise specified or shown on plans, except counter or louver doors which shall be 31mm thick. In cases where varifold type is indicated on plans, the manufacturers' specifications shall be followed subject to the approval of the Engineer.

2. Door Types (as applicable)
   2.1 Solid Core Doors (Glazed and/or Wood Panel). This Type of door shall have cores of the stile and nail type raised on both faces, set loose and either nailed or glued in place. It can either be of glass or wood panels or combination thereof.

   2.2 Hollow Core Doors (Flush Door). Except as otherwise specified, flush door shall be done in accordance with the details as shown on the plans. The plywood edge protection shall be around and into the outside frame of the door in order to prevent "pulling off" of the plywood veneers at the edges.

   2.3 Glass Window Pane. This type of window shall consist of a single plate of glass framed in kiln–dried lumber, fabricated, shaped and molded true to details and joined properly to acquire rigidity.

C. REQUIREMENTS
1. Pre-fitting and Factory-Priming or Factory Finishing. Doors with surfaces to receive paint finish may be furnished factory primed, and doors with natural finish may be furnished factory pre-finish. Final finishing shall be done in site in accordance with painting and varnishing specifications.

2. Adhesive and Bonds. Adhesive and Bonds shall be in accordance with manufacturer's recommendations for all types of doors subject to the approval of the Engineer. Adhesive for doors with natural finish shall be non-staining.

D. INSTALLATION. Installations shall be installed only after completion of other work which may affect the moisture content of the doors. Doors shall be fitted and trimmed as required by the opening they will cover. Doors shall have a clearance of 3mm at the side and top and shall have a bottom clearance of 6mm over threshold or as known on details. The lock edge of doors shall be beveled at the rate of 3mm in 50mm. Cuts made on the jambs shall be sealed immediately after cutting, using a clear water resist and varnish or sanding sealer.

VIII. CARPENTRY AND JOINERY WORK

A. Materials
1. Quality of Lumber: Lumber shall be approved quality of the respective kinds of the various parts of the work, well seasoned, thoroughly dry, and free from large, loose, or unsound knots, sups, shakes, and other imperfections impairing its strength, durability or appearance. All finishing lumber to be used shall be completely dried and shall not contain more than 14% moisture. All flooring, tongue and groove shall be kiln dried.
2. Treatment of the Lumber:
   a. All concealed lumber shall be sprayed with anti-anay or buk-bok liquid.
   b. Surface in contact with masonry and concrete coated with creosote or equivalent.

3. Door Sashes: All door sashes shall be well seasoned, flush type, semi-hollow core and solid core, Tanguile plywood veneers on both sides. Exterior doors shall be of kiln dried Tanguile panel doors.

4. Kind of Lumber:
   All unexposed lumber for framings shall be of Apitong.
   All windows and door jambs shall be of Apitong or Tanguile.

B. WORKMANSHIP

1. Execute rough carpentry in best, substantial, workmen like manner. Erect framing true to line, levels and dimensions, squared, aligned, plumbed, well spliced and nailed, and adequately braced, properly fitted using mortise and tennon joists.

2. Millwork – Accurately milled to details, clean cut moldings profiles, lines, scrape, sand smooth; mortise, tennon, splice, join, block, nail screw, bolt together, as approved, in manner to allow free play of panels; avoid swelling, shrinkage, ensure work remaining in place without warping, splitting opening or joints. Do not install mill work and case until concrete and masonry work have been cured and will not release moisture harmful to woodwork.

3. Secure work to ground, otherwise fasten in position to hold correct surfaces, lines and level, Make finished work flat, plumb, true.

IX. PAINTING, VARNISHING AND FINISHING

SCOPE OF WORK

1.1 This section includes the supply and furnishing of all materials, labor, and equipment required for the preparation, painting and finishing of all shown on the Drawings and all other work required to complete Painting work as required by these Specifications.

1.2 GENERAL REQUIREMENTS

a. Refer to Drawings and schedule for location, extent of work and other requirements;
b. Materials Handling: Deliver all materials to the jobsite in clean, sealed, original containers with all labels and markings intact. Store materials, in designated storage areas that will be kept neat, clean and locked;
c. Protection: Protect designated and adjacent areas and materials, lawns, shrubbery and other areas not to be painted, from stains and paint splatters resulting in the performance of painting work;
d. Fire Prevention: Contractor shall take every precaution to prevent fires. At the end of each day's work, all oily rags, empty containers and combustible materials must be removed from the premises;
e. Clean-up: Upon completion of work, Contractor shall remove all paint splatters and leave the area in neat and orderly condition;
f. Color Scheme: The Contractor shall faithfully follow the color chips supplied for matching the Color Scheme and Painting Schedule of the Project Engineer. All undercoats shall be tinted to approximate the finish color coat.

MATERIALS

a. All paints, latex, enamels, varnishes, lacquers, and other products to be used in this project shall be of excellent brand and quality
b. Materials necessary to complete the painting and finishing schedule that are specified in these Specifications are standards for kind, quality and function.

PREPARATION OF SURFACES

3.1 GENERAL

Follow standard surface preparation Specification or as specified by the Architect;
a. Metal Surfaces - Remove dust, rust, oil and grease before application of priming coat;
b. Concrete and Masonry surfaces - Remove all loose grit, mortar, dust, dirt, grease, oil and any other foreign matter. Treat with Masonry Neutralizer;
c. Wood Surfaces - Follow manufacturer's instruction for both exterior surface preparation producers before painting work;
d. Fill, caulk or putty all holes, cracks and open joints. Apply putty with knife where necessary, after application of priming coats.

WORKMANSHIP AND APPLICATION

4.1 Apply paint as per manufacturer's Specifications and recommended application procedures.

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4.2 WORKMANSHIP

a. Finished surfaces shall be smooth, even and free from defects;
b. Apply paint to completely dry surfaces only and no succeeding coat applied until preceding coat is completely dry;
c. Paint by spray, brush or rollers as per Architect's instructions and specifications.

4.2 PAINTING SCHEDULE

a. Exterior concrete and masonry surfaces:

Coating System	Semi-gloss Finish (acrylic solvent type)
Primer	Flat latex paint
Putty	Masonry glazing putty
2nd/3rd Coats	Latex semi gloss

b. interior concrete and masonry surfaces:

Coating System	Semi-gloss Finish (acrylic solvent type)
Primer	Flat latex paint
Putty	Masonry glazing putty
2nd/3rd Coats	Latex semi gloss

c. Fiber Cement board and similar materials surfaces:

Coating System	Semi-gloss Finish (acrylic solvent type)
Primer	Flat latex paint
Putty	Masonry glazing putty
2nd/3rd Coats	Latex semi gloss

d. Wood flush doors, jambs, and cabinets:

Coating System	Acrylic Finish

e. Architectural Metal surfaces

Coating System	
Primer	Epoxy Paint Finish
2nd/3rd Coat	Acrylic Finish

X. STEEL WINDOWS

A. General – The work covered by this section consist of furnishing of all equipment, materials and labor in the fabrication and installation of steel windows complete in accordance with the applicable drawings and specifications.

B. Materials. All members shall be hot rolled new billet steel with frame and ventilators section not less than 33.3mm (1-5/16") deep from front to back. Frame members shall be of equal leg design section at points where called for by detail drawings, and continuous angle fins, as indicated on drawings, shall be furnished. See-type section of special design with offset permitting down turned leg of the vent member to seat flush when vent in a fully closed position, shall be used for frame angle shaped. Frames and vent members shall have integral weathering baffles providing double first parallel weathering contracts of not less than 6 mm width on all four side of the vent. Muntins shall be 22mm by 31mm rolled-tee sections.

a. Requirements
    1. Aide Hinged Ventilators (Casement Type)
        1.1 Simplex-type Hinges shall be of extension friction type with bronze friction washers and rust proofed steel acorn-nuts. Hinged design shall provide ferrous to non-ferrous contacts between all movable surfaces, Hinges shall be welded to both frame and vent.
        1.2 Polished bronze locking handle and strike shall be furnished for ventilators 1524mm and under in height, two-point locking device and three hinges shall be furnished for vents over 1524mm in height. Sill adjustors shall be provided for vent over 3.048 sq. m.

4. Mullions. Rolled Steel T-bars, pipe, plate or other formed section, or a combination of them, as shown on drawings, shall be furnished where two or more window units are installed in the same window opening.

C. Installations of Corners

i. Corners of vents shall be mitered, electrically butt-welded and ground smooth. Corners of frame and all other window joints and intersections of Muntins with frame and vent members shall be coped and electrically welded. Muntin, bars, except where ventilators occur, is to be continuous from head to sill and from jamb to jamb. Muntin cross joints shall be rigidly and neatly interlocked with faces flushed. Frame sections at vent sill shall have weep holes to provide for drainage. Continuous weather drips shall be provided where required at the heads for side-hinged ventilators. Windows shall be designed for glazing at the outside with wire glazing clips and steel casement putty. All units shall be prepared and supplied with necessary standard hardware and screens when included or called for on plans or drawings.

ii. Windows shall be set plumb and true in openings. The joints between the window frame and masonry shall be carefully caulked. Contacts between windows and adjacent steel, including mullions, shall be sealed with mastic. Windows shall be glazed on the inside glass, shall be bedded with steel window putty, held in place by wire glazing clips and faced putted to a neat trim line.

D. Shop Finish

1. Hot (or cold) Phosphate Surface Treatment. Cleaned, chemically treated and primed; except as otherwise specified, windows should be given a treated and primed finish, consisting of the following operation:

iii. After fabrication; grease and dirt shall be removes by a hot alkali solution and the window rinsed in hot water.

iv. After cleaning, all parts shall be immersed in a hot phosphate solution and rinsed in a diluted solution of chromic acid.

v. After air drying under controlled temperature, one coat of shop primer shall be applied by dipping or spraying all surfaces. The primer shall be of a type specifically developed for materials treated with phosphate.

vi. The cleaning, phosphating, dipping or spraying of shop primer, and the even drying shall be done on a continuous operation at the factory.

E. Shop Drawings

vii. The Contractor, shall before proceeding with the manufacture of steel windows, prepare and submit complete manufacturing and installation drawings in full size and in triplicate, together with samples of member-sections and hardware to be used, or the approval of the Engineer. Windows to be manufactured shall conform to the approved drawings and samples.

XI. GLASS JALOUSIE WINDOWS

- Scope. This section covers furnishing of all glass jalousie window type materials and fixing accessories necessary for the proper functioning thereafter as shown on plans and as herein specified.

- Materials

i. Lever Type Operation. This type of jalousie window shall be capable of locking the unit in any position and cannot be opened outside. Louver or glass slats clip and tilt bar casing shall be extruded aluminum sections, true to details with clear, straight, sharply defined profiles and free from defects impairing its strength or durability. Aluminum extruded section and strips shall be type AA conforming to ASTM B 235-50T.

ii. Window Frames (Wood Jambs). Opening frames for jalousie window shall be well seasoned thoroughly dried “Yakal” to avoid any possibility of warping after this glass jalousie window type material has been set in place.

iii. Glass panes shall be “Industrex” glass of high quality free from unevenness or other imperfection that affects its quality and form.

- Construction Requirements. All wood frames used as jambs for window opening shall be shaped, molded true to details and properly equipped with weather strip to prevent penetration of rain water. Corners of frames shall be mitered and mechanically locked resulting in extremes rigidity. Aluminum lever casing with glass clips, tilt bar and locking handles shall be set and properly adjusted leveled and aligned to acquire satisfactory operation and to assure weather tight construction. Aluminum parts shall be protected in adequate manner to insure against damage during delivery and construction operation. Glass panes shall be fitted and accurately cut to size as required in the plans

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XII. GLASS AND GLAZING

A. Scope of Work. The Contractor shall furnish all materials, equipment, tools, labor and incidentals necessary for the satisfactory performance of all works for glass and glazing, including mirrors as shown in the drawings and as specified herein.

B. Materials.

i. Materials shall be delivered and stored in a safe location.

ii. Label shall be affixed to each pane at the factory and shall remain intact until final cleaning.

iii. Quality and thickness of glass shall be mentioned in USGM Specification No. 123 in so far as it is established as a requirement. For other qualities and thickness, recognized commercial standards can be referred to subject to the approval of the Engineer.

iv. Putty on wood or steel sash shall be of the approved type as recommended by the manufacturer and acceptable to the Engineer.

C. Quality of Glass and Glazing Materials

1. All glass sheets for doors and windows, unless otherwise specified herein or otherwise indicated in the drawings, shall be locally manufactured.

2. All glass sheets used in aluminum and steel doors and windows shall be 5.6mm (7/32”) thick or as required by the Engineer.

3. All tempered glass specified herein or indicated on drawings shall be locally manufactures safety glass, 5.6mm (7/32”) thick or as required by the Engineer.

4. Plate glass for mirrors shall be 6mm (1/4”) thick, polished glass mirror, copper-backed, with exposed edges, leveled and polished. Mirror should project a clear image without refractory effect.

5. Samples of all glass and glazing shall be submitted to the Engineer for approval prior to any installation work.

D. Workmanship

1. All glass shall be accurately cut to fit openings and set with equal bearing on the entire width of the pane. Convex side of glass shall be on the outside.

2. The Contractor shall be responsible for all glass broken due to faulty setting and shall be replaced to the satisfaction of the Engineer.

3. Mirrors, as specified, shall have the proper backing of 6mm (1/4”) thick tanguile or palosapis veneer plywood with brass chromium plated frame.

4. Putty shall be neatly run in straight line parallel with inside of glazing frame. Corners shall be carefully made; all excess putty shall be removed and surfaces left clean.

E. Installation

1. Set glass after steel framing have been primed and dried.

2. All glass shall be bedded, back and face puttied, secured in place. Secure glass in aluminum frames with non-corrosive clips excepts where glazing beeds are required. Apply putty uniformly in straight lines, with accurately formed levels and clean cut corners; remove excess putty from glass.

3. Set glass in hollow metal doors and in metal frames to interior partitions in felt channel inserts or bed in putty to prevent any rattle; secure glass in wood doors with glazing stops; secure stops on doors with screws.

4. Improperly set glass shall be replaced to the satisfaction of the Engineer.

F. Cleaning

1. Clean all glass on both sides after puttying has been done completely. Do not disturb edge of putty with scraper. At completion of work leave glass whole free from cracks and rattles.

XIII. FINISH HARDWARE AND SPECIALITITES

A. General Requirements

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1. The Contractor shall provide all rough hardware required for the completion of the work, including hails, spikes, bolts, screws, etc., and shall provide and fit in place all finishing hardware.

2. The Contractor shall provide and fit in place all hardware not herein specifically mentioned but necessary to complete the work. All such hardware, should be there be any, shall conform in every respect to the hardware herein specified.

3. Finishing hardware, suitable to the service required to fully equip in the most satisfactory operative condition, for all doors and windows transom sashes, screen doors and windows, closet, built-in cabinet counters, drawers, lockers, and other operating members throughout the project shall be furnished and installed or fitted by the Contractor.

4. Where the exact types of hardware specified are not adaptable to the finishing, shape or size or members requiring the hardware, suitable types as applicable to same operation and quality as the corresponding individual types specified shall be furnished subject to the approval of the Engineer.

B. Make
   1. The model numbers herein given designate and quality and style (type, design, operation, materials and finish) of hardware designed. Any other hardware equally good, may be substituted only in cases of urgent necessity and subject to the written approval of the Engineer.

C. Finish
   1. Unless otherwise specified, exposed surfaces shall have the following U.S. Standard Finishes:
      1.1 US9 (Polished, Bright Brass or Bronze), Bronze surfaces exposed on exterior building not specified to have US26 finish.

      1.2 US26 (Polished Chromium plated over nickel or brass). Brass or bronze surfaces exposed in toilets, lavatory and shower rooms and all others in the interior of the building.

      1.3 USP (Prime Coated for Painting) Ferrous metal surfaces, unless zinc coated.

D. Fastenings
   1. Fastenings of suitable size, quality and type shall be provided to secure hardware in position. Machine screws and expansion shields shall be provided for securing items of hardware to concrete, brick tile or masonry instead of wood screws.

E. Exposed Items of Hardware
   1. After hardware has been properly fitted, all exposed items such as knobs, plates, pulls, locks, etc., shall be removed until final coat of painter's finish has been applied, and then hardware installed.

   2. Other items of hardware that are not to be removed before painting shall be properly marked or completely covered until final coat of painter's finish has been applied, after which such protective cover shall be removed.

F. Placing Order of Hardware
   1. The Contractor shall schedule his order for all hardware in such a way to avoid delay in the job.

   2. No request for extension of time will be entertained by the Engineer consequence to Contractor's delay in placing his order.

   3. No substitution of hardware shall be allowed due to negligence of the Contractor to place his order ahead of time.

G. Door Knobs, Locks and Latch Strikes. A
   1. All lock and latch strikes shall be installed in door frames at the same height from the floor. Door knobs shall be so located that the center of the knob is 0.95 m. from the finished floor.

H. Butt Hinges
   1. Each panel of hinged doors shall be provided with two (2) butts for doors 1.50m or less in height; three (3) butts over 1.50 m high and not over 2.10 m; four (4) butts, above 2.10 m in height.

   2. Doors of a greater height than 2.10 m, unless otherwise specified, shall be provided with an additional one (1) butt for each 0.65 m or fraction thereof.

   3. Size of Butt Hinges required:

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Thickness Of Door	Width of Door	Size of Butt Hinges
21mm or 25mm (7/8" or 1")	:	63mm(2 ½")
28mm (1-1/8")	:	75mm x 75mm (3"x3")
35mm (1-3/8")	:	0.90 mtrs. (3')
	:	(3-1/2"x3-1/2") or less
44mm (1-3/4")	:	100mm x125mm (4" x 4")
56mm x 63mm (2-1/4" x 2-1/4")	:	125mm x 125mm (5" x 5")

The shower doors shall be covered by the above schedule for hinges.

4. Where size of the butt hinges is not sufficient to allow door to clear door trim in open position, same shall be increased.

5. Unless otherwise specified, and except for toilet or shower or water closet compartment doors, provide in all double acting doors type Nu-Jamb No. 42024 – ½ double acting hinge or approved equivalent.

I. Butt Hinges (Make)
   1. For all doors in butt hinges, unless otherwise specified, use bottom tip butts, "HAGER", "STANLEY", U.S., or approved equivalent, highly polished and plated with non-raising pin for door opening outside. For size and number to each door, refer to section H.3 of this section of the specifications.

J. Door Latches, Indicator.
   1. Provide and fit each door of all water closets compartment with No. 1990 rim bolt No. 1985 indicator, cast brass, chromium plated and polished as illustrated and describe on Hinges Catalog, or any approved equivalent of similar type.

K. Locks
   1. The Contractor shall provide and set complete, ready for operation, one pin tumbler cylinder lock of the medium or standard type, for each door in accordance with the schedule below. Standard finished as specified, shall apply to all locks, used "YALE", "CORBINE" of the standard type, or approved equivalent.

      The trademark and plate numbers given herein are to designate only the quality, type, operation, materials and style (design) required.

L. Schedule of Lockset and Door Closers
   1. Lockset shall be of any approved equivalent installed complete ready for use and service in accordance with the manufacturer's institutions for the doors on all rooms and Comfort Rooms.

XIV. ROOFING AND TIN SMITHING WORKS

- General. Except as specified otherwise herein, all materials shall be installed in accordance with the manufacturer's printed erection instructions. Care shall be exercised in storing, handling and installing to prevent any damage to roofing and siding sheets. The sheets shall be of the length indicated or the greatest length to suit the purlins spacing. End laps of roofing shall be located over purlins, and end laps in siding shall be located over girts. Extreme care shall be exercised in drilling pilot hole for fastening to keep drills perpendicularly centered in valleys or crowns as applicable. After drilling, all metal filings and burrs shall be removed from holes prior to installing fasteners and washers. Sheets deformed or otherwise damaged by over-torque fastenings, shall be removed and new sheets applied shall be installed. Size and spacing of fasteners used in erection shall be installed. Size and spacing of fasteners used in erection shall be as recommended by manufacturer subject to the approval of the Engineer. All metal shavings shall be swept from roofs on completion to prevent rusting and discoloration. Use Long Span Pre Painted roofing, 0.05mm thick or otherwise specified. Present actual sample for Approval of Engineer/Architect before implementation. Use Purlins and Angle bars as specified on drawings by Designer.

- Joint Sealing Materials

Joint sealing materials shall be provided to seal all joints in and around sealing strips at ridges, eaves and valleys, bolt holes before inserting fasteners, for all flashing and elsewhere as necessary to provide watertight construction.

- Fastening
  Pre-painted roofing sheets shall be fastened to the purlins by means of mounting brackets or self-tapping screws, hexagonal head with neoprene washer per manufacturer's recommendation and approved by the Engineer.

- End Lap.
  Provide a minimum end lap of 250 mm.

- Sheet Metal Flashing
  Sheet metal flashing shall be secured to roofing with cadmium plated or zinc-coated sheet metal screws in accordance with the manufacturer's recommendation and subject to the approval the Engineer.

- Flashing
  Flashing shall be approved as indicated and where necessary to make the work watertight. Flashing shall not be bent at sharp angles, but shall be worked to as large a radius as possible. Exposed edges of counter-flashings shall be folded 12mm. End-laps in counter flashing shall not be less than 75mm and shall be made watertight with plastic cement.

- Roof Accessories
  i. Drain or Overflow Pipe shall be adequately provided to all concrete roof gutters or any other concrete work that catches drains or collects rain water. Pipe shall be 25 mm G.I. Pipe spaced at two (2) meters on center or as shown in the drawings. Roof drain shall be a product of a reputable manufacturer acceptable to the Engineer.

  ii. Weep holes shall be provided by the Contractor to allow free flow of water to drain from one level to lower level or to outer drains as shown in the drawings or as directed by the Engineer.

  iii. Downspout shall be zinc coated Galvanized Iron (G.I.) for downspout flushed connected in concrete wall/columns and shall by Polyvinyl Chloride (P.V.C.) pipe or embedded in concrete as shown on the drawings or as directed by the Engineer. G.I. downspout shall not be less than 50 mm x 100 mm and PVC downspout shall not be less than 75 mm in diameter. Downspout shall be fastened to the wall at top, bottom, and at intermediate point not to exceed 1.50 m on center with leather strap and fastener of metal compatible with downspout.

  iv. Gutter. Where shown in the drawings, gutter shall be zinc coated Galvanized Iron, 0.05mm thick steel sheet. Support gutter on adjustable hangers spaced not more than 75 cm. on center or as directed by the Engineer.

H. Installation Workmanship

1. Sheathing – layout the roof sheets in a manner that the side overlap faces away from the prevailing wind. Provide not less than 0.30 m develop on ends and not less than 1- ½ corrugation on side laps on both sides. Secure the roofing sheets to purlins by using G.I. rivets and 1" wide G.I. Ties.

2. Gutter – a connection of gutters shall be made by using brass rivets and fully joined by nikolite lead. Provide a minimum of 1% slope toward the downspout.

3. Downspout – shall be 2" x 4" plain G.I. sheets or colored PVC pipe as approved by the Engineer.

4. Flashing – shall be plain 0.05mm thick plain G.I. sheet over corrugated roofing of not less than 0.30% overlap extended G.I. Flashing until it covers the top portion of the firewall or parapet wall.

XIV. ELECTRICAL WORKS

A. Scope. The work contained in this section includes furnishing of all labor, equipment, tools and materials and performing all operations, including cutting, channeling and chasing necessary for the installation of complete wiring and conduit system, electrical equipment and electric service connection in accordance with this specification unless otherwise required in the drawings.

B. Requirements.
General. Unless indicated or specified otherwise herein, all materials and workmanship shall conform to the specifications and to the applicable standards, codes, regulations and specifications listed herein. Workmanship shall be of the highest grade. Electrical materials shall be new and approved by the Underwriters Laboratories, Inc. wherever standards have been established by the agency.

Defective equipment or equipment damage in the course of installation shall either be replaced or repaired as directed by the Engineer. The contract drawings indicate the extent and general arrangement of the conduit and wiring system. If nay departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons thereto shall be submitted as soon as practicable to the Engineer for approval. No departure shall made without the prior written approval of the Engineer.

C. Materials

Standard Products. The materials shall be the standard product of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that complies with the specifications requirements.

D. Approval of Materials

The Contractor shall submit for approval a complete description of all materials to be used in the work. The description shall include catalog numbers, illustrations, diagrams, dimensional data, etc., as required to describe fully the materials.

E. Conduit and Conduit Fittings

Conduit shall be rigid metal conduit, hot dip galvanized, conforming to NSI Standard C180-1, "American Standard Specifications for Rigid Steel Conduit, Zinc Coated", unless otherwise shown in the drawings. The conduit fittings and covers, shall be galvanized, sherardized, or cadmium plated, grey iron or malleable iron castings. Composite rubber gasket shall be provided on all openings requiring covers. Outlets and pull boxes shall be of sizes and types shown in the drawings.

F. Wires and Cables

1. Conductors in conduits shall be copper, moisture and heat-resistant rubber or thermo-plastic insulated. In dry locations, wires and cables shall be type TW for sizes 8 sq.mm and smaller and type THW for sizes 14 sq.mm and larger. In damp or wet locations as defined by the National Electrical Code/Philippine Electrical Code, wires and cables shall be type THW, for sizes 8 sq.mm and smaller; and type RHW with neoprene jacket for sizes 14 sq.mm and larger. All conductors shall have 600 volts insulation unless otherwise specified in the drawings. Wire shall be stranded copper for 8 sq.mm and larger sizes. The number and sizes shall be as specified in the drawings.

G. Outlets

1. Each outlet in the wiring or raceway system shall be provided with an outlet box to suit the conditions encountered. Boxes for exposed work or in wet locations shall be of the cast metal type having threaded hubs. Boxes for concealed work shall be the cadmium-plated or zinc-coated sheet metal type. Each box shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of the National Electrical Code/Philippines Electrical Code. Boxes shall not be less than 40 mm deep unless shallower boxes are required by structural conditions that are specifically approved by the Engineer. Ceiling and bracket outlet boxes shall not be less than 100 mm octagonal except that smaller boxes may be used where required by the particular fixtures to be installed. Switch and receptacle boxes shall be approximately 100 mm x 54 mm x 40 mm. Boxes installed in concealed locations shall be set flushed by the finished surfaces and shall be provided with the proper extension rings or plaster covers where required. Boxes shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction, or shall be fastened directly with wood screws on wood. Location of outlets shown on the drawings are approximates; the Contractor shall study the building plans in relation to the spaces and equipment surrounding the outlet so that the lighting fixtures are symmetrically located according to the room layout. When necessary, with the approval of the Engineer, outlets shall be relocated to avoid interference with mechanical equipment or structural features.

H. Pull Boxes

1. Pull boxes shall be constructed of code-gage galvanized sheet metal of not less than the minimum size required by the National Electrical Code/Philippine Electrical Code. Boxes shall be furnished with screw fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly their electrical characteristics, circuit number and panel designation.

I. Device Plates

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1. Device plates of the one-piece shall be provided for all outlets, to suit the devices installed. Plates for exposed work shall be of zinc-coated sheet metal having rounded or beveled edges. Plate for concealed work shall be bake lite ivory. Screws shall be o metal with oval heads, having color to match the finish of the plate. Plate shall be installed with all four edges in continuous contact with similar devices. Plaster fillings shall not be permitted. Plates shall be installed vertically, use of sectional-type device plates shall not be permitted. Device plates for telephone inter-communication outlets shall have 10 mm opening in the center.

J. Receptacles

1. Receptacle shall be of the type and rating as shown in the drawings.

1.1. Duplex Receptacles shall be rated 15 amperes, 250 volts, 2 wire, 2- pole, for flush mounting or as indicated in the drawings.

1.2. Receptacle for air conditioning units shall rated 30A, 250V, 3-wires, 2-pole grounding receptacle for flush mounting or as indicated in the drawings.

K. Panel Boards

1. Panel board shall be of the dead-front safety type conforming to the Underwritters Laboratories, Inc., standard for panel board UL67, and provide with the size and number of circuits as indicated. Panel Board shall be the automatic circuit breaker type.

1.1. Circuit Breaker shall be molded bolt-on type with frame size and trip settings as shown on the drawings. Molded case circuit breakers shall conform to NEMA standard publication AB1. Tripping mechanism shall be thermal-magnetic with interrupting capacity of 18,000 amperes similar to “Mitsubishi NF breakers C-line type” or equivalent.

L. Safety Switch

1. Safety switch shall be general duty cartridge fuse type and spring assisted positive make and break mechanism full cover interlock and quick make, quick break mechanism. The switch shall be rated 250 volts with ampere rating as indicated in the drawing.

M. Lamp and Lighting Fixtures

1. Lamp and lighting fixtures of type and sizes as specified in the drawings shall be furnished and installed completely

1.1. Incandescent lamps shall be inside frosted lamp, 220 volts, wattage as indicated in the plan.

1.2. Fluorescent lamp shall be pre-heat type, cool white color characteristics and shall have complete energy saver type.

1.3. Wall switches shall be of the totally enclosed type. Bodies shall be thermo-setting plastic compound. Wiring terminals shall be of the screw type. Not more than three switches shall be installed in a single plate position.

1.4. Fixture shall conform to Under writers Laboratories, Inc., standard UL57. Fixtures are designated by letters and illustrated on the drawings. Illustrations shall be indicative of the general type desired and shall not restrict selection to fixture of any particular manufacture. Fixtures of similar design and equivalent light distribution and brightness characteristics having equal finish and quality may be acceptable but subject to the approval of the Engineer.

1.5. See specifications on drawings for verification of lighting and electrical fixtures and conduits. Confirm with Engineer for approval.

N. Installation

1. Conduit System. The contractor shall install and test all embedded and exposed conduit, boxes, and fittings including all necessary hardware required for the electrical power, control, communication and lighting systems as shown on the drawings. Installation of all conduits, boxes, fittings, and accessories shall conform to the requirements of the National Electrical Code (NEC), and the Philippine Electrical Code (PEC) unless otherwise specified. During installations, due precaution shall be taken to protect the conduits and threads from mechanical injury. The ends of conduits shall be sealed in an approved manner during installation, whenever the work is interrupted and upon completion, runs shall be sealed by the use of caps and discs or plugs. The seals shall be maintained, except during inspection and tests, until the conductor is pulled in. Conduits shall be checked from constructions by

pulling a wooden mandrel of the proper size through the conduit, whenever required or directed by the Engineer. All boxes and fittings shall be kept closed and protected from dirt, moisture and debris.

O. Installation of Imbedded Metal Conduit

1. Each run of conduit between boxes or equipment shall be electrically continuous. Threads shall conform to the American Standard for tapered pipe threads. Conduits shall be cut square, ends reamed and threads cut with approved dies. Running or non-tapered threads shall not be used. Conduits entering slip holes in boxes shall be secured with a locknut on each side of the box wall and terminated with a bushing.

2. All joints between lengths of conduits and threaded connections to boxes, fittings, and equipment enclosures shall be made watertight.

3. Conduits shall be sloped towards drain points. Conduits shall be rigidly supported and braced to avoid shifting during placement of concrete. Conduits extending out of the floors, wall, or beams shall be at tight angles to the surface.

4. Spacing of conduits shall be such as to permit the floe of concrete between them. A minimum spacing of not less than 5 cm. shall be maintained, except where conduits enter boxes. Where conduits are placed in two or more layers or rows, the conduits in the upper or inner layers shall be placed directly over or behind the lower or outer layers, respectively.

5. Conduits terminating at the face of the concrete for initial or future extensions as exposed runs shall be terminated with plugged couplings set flush with the floor, ceiling or wall. Galvanized iron plugs shall be provided for conduits which are to be extended in the future. Where it is not practical to employ flush couplings, the conduits ends shall be suitably boxed otherwise protected and plugged.

6. Conduits running in floors and terminating at motors or other equipment mounted on concrete bases shall be brought to up to the equipment within the concrete base wherever possible.

7. Conduit boxes shall be flush with the finished wall with covers and openings easily accessible. The contractor shall remove and reset all boxes not properly installed or shifted out of line during concreting to the satisfaction of the Engineer.

8. Conduits shall have long field bends wherever possible, but shall in no case have bends of smaller radius than that given in the National Electrical Code (NEC) / Philippine Electrical Code (PEC). Bends shall be made with a bending machine, or other approved devices which will not reduce the internal diameter of the conduit or injure the protective coatings. The bend shall be free of kinks, indentations, or flattened surfaces, heat shall not be applied. Factory-made elbows shall be used only where conduits turn out of floor slabs or at conduit termination.

P. Installation of Cancelled or Exposed Conduit

Conduit concealed or exposed shall be rigidly supported at intervals of not more than 1800mm and shall have runs installed parallel or perpendicular to the walls, structural members, or intersections of vertical plains and ceiling.

Q. Wiring System

1. Wiring Methods. Wiring in rigid steel conduits shall be used or as indicated in the drawings. Wiring for general purpose location shall be in accordance with the provisions of NEC general purpose installation. Branch circuit shall be used for any branch circuits unless otherwise noted on drawings for special system drawings. The conductors terminating at each wired outlet shall be left not less than 300mm long within the outlet devices or fixtures.

2. Where two or more pairs of conductors or circuits enter an outlet, the several pairs of circuits shall be neatly spliced and made mechanically and electrically secure to one or more single or multiple conductors.

R. Conductor Installation

All power, lighting, control and alarm conductors shall be continuous from outlet to outlet and no splice and shall be made except on outlet boxes. At least 300mm of free conductor shall be left on each conductor at each outlet to make splices or joints, except where it is intended to loop through outlet without splice or joints. Splices shall be mechanically strong and have conductivity equal to that of the conductors. Each splice shall be properly soldered or clamped. Tape as required to provide installation equal to that of the conductors shall be used for stranded wire terminals. All wiring shall be color coded in accordance with the National Electrical Code. Wire and cable shall be pulled in conduit using talc as lubricant.

S. Grounding System

1. General- The Contractor shall install a complete embedded electrical grounding system as shown in the drawings and described herein which shall be permanently and effectively ground conduits and non-current carrying metal parts. The overall resistance to grounds of the entire grounding system shall not exceed 25 ohms by measurement. Resistance to ground of over 25 ohms shall be corrected by driving an additional electride parallel to the original ground rod with no further resistance measurement required.

2. General Conductor – Ground conductor shall be here, soft drawn, stranded copper cables. All joint connections within the grounding system shall be made by means of connector suited for the particular joint. The cable be clean of all dirt, grease, and oxidation before connection are made.

3. Ground Rod – Ground Rod shall be copper-clod steel of not less than 20mm in diameter, 3 meters long, driven full length into the earth. Ground wire shall be secured to the upper end of the ground rod and ground wire attached securely thereto by means of bolted connection. PVC conduit pipes of schedule 20 shall be provided to protect the ground cable from physical damage.

T. Quality Assurance Provisions

1. After the installation is completed and before final acceptance of the project, the Engineer shall conduct the operating test. Equipment shall be demonstrated to operate in accordance with the requirement of this specification. The Contractor shall furnish all instrument, tools and personnel required for the test. All defects is closed as a result of such test hat are due to the fault of the Contractor shall be remedied by the Contractor to the satisfaction of the Engineer.

   Insulation resistance test shall be conducted conforming to the requirements o the Philippine Electrical Code. Transformer test shall include ratio, polarity, coreless, exciting current, high voltage, impulse, low voltage impulse, high voltage applied and induced tests.

U. Guarantee

1. The Contractor shall guarantee all work installed under this contract to be free from all defects for a period of one (1) year after acceptance of the project and shall agree and repair and make good at his own expense. Any and all defect which may develop in his work during the time if said defects arise due to poor workmanship and materials furnish by the Contractor.
2. The contractor must provide as built plan in soft and hard copy for final layout and specifications due to revisions and other changes made from the original plan.

V. Permit and Inspection

1. The Contractor shall obtain, at his own experience, all the necessary permits and Certificate of Electrical Inspection from the proper government authorities and the operation of the system upon completion.
2. The Contractor, shall, at his own expense, all the electrical plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the government approving authorities concerned in issuing permits and certificate of Electrical Inspection.

XV. PLUMBING WORKS

Section VI. Specifications

A. Scope. This section consist of performing essential works in furnishing and installing
Piping materials and other devices and fixtures necessary to construct and complete the plumbing system in accordance with this specification unless otherwise specified in the drawing.

B. General. The work includes furnishing and installing water piping and
Appurtenances, sanitary and drainage piping, vents, plumbing fixtures and miscellaneous devices as shown in the drawings and as specified therein. No plumbing fixture devices, or piping shall be installed that will cause a cross connection or interconnection between potable water piping and polluted drain, soil or waste water piping.

1. Standard Products. Materials and equipment furnished under this specification shall be standard products of manufacturer regularly engaged in the production of such materials or equipment and shall be manufacturer's latest standard design that complies with the specification requirements.'
2. Defective Equipment. Defective equipment or fixtures damage in the course of installation or testing shall be replaced or repaired by the contractor in a manner approved by the Engineer.

3. Proposed Changes. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the work, and the reasons thereof, shall be submitted as soon as practicable after contract award to the Engineer for written approval. Approved departures shall be made at no additional cost.

4. Utilities. Water and drainage piping shall be extended to points outside the building as indicated. Pipes shall be capped or plugged for final connection with the service pipes.

5. Code Compliance. All materials and installation shall comply with the National Plumbing Code unless modified by the specifications.

C. Materials.
1. Soil, Waste, Drain, Vent Pipes and Fittings.
1.1 Underground soil, waste and drain piping shall be PVC Piping conforming To the National Plumbing Code
1.2 Above ground soil waste, drain and vent piping shall be polyvinyl chloride Pipe conforming to ASTD 2729 or as had shown in the drawing.
1.3 Flashing. Vent pipes shall be flashed and made watertight at the roof with 4 pound sheet lead or 16 ounce sheet copper, Flashing shall extend not less than 200mm from the vent pipes in all directions. Flashing shall be turned down into the pipes or hubs.
1.4 Traps. Each Fixtures and pieces of equipment requiring connections to the drainage system shall be equipped with a metal trap. Traps installed on threaded pipe shall be recess drainage pattern.

D. Water Pipe and Fittings
1. Galvanized Steel pipe for below or above ground cold and hot water lines shall conform to ASTM A120. Fittings shall be malleable-iron, zinc-coated, screwed, unless otherwise indicated in the plan. Note: Use updated materials for water lines, PPR pipes with equivalent fittings will be used. Present samples for approval.

2. Valves shall be brass or bronze with rough bodies and finished trimmings, except that valves on chromium-plated brass pipe shall be finished and chromium-plated.
3. Hose Bibbs shall be of rough brass body, with composition disc. Hand wheel, 19mm hose end and 12mm female inlet.

E. Insulation. Insulations shall be ¾-inch thick mineral fiber insulation provided with a 7-1/2 ounce standard canvass jacket material.

F. Plumbing and Fixture Trim. Plumbing and fixture trim shall be provided complete with fittings. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping system at the wall, unless otherwise indicated. Floor plates, wall plates, and escutcheons shall be as required by the fixtures specified. Stops shall be provided at each fixture. Plumbing fixtures compound shall be used for fixture connection between earthenware fixtures and flanges on soil pipe. Closet volts shall be not less than 6mm in diameter and shall be equipped with chromium-plated nuts

and washers. The exposed piping, fittings, and trimmings shall be chromium-plated or nickel-plated brass with polished bright surfaces.

1. Water Closets shall be as any approved quality or its equivalent. Tank Fittings shall be of approved equivalent.

2. Built-in Urinal Gutter. Built-in urinal gutter and step shall be glazed tile finish except for the step which shall be unglazed and shall be in accordance with the plans and specifications. Where shown on the drawings, the Contractor shall complete set of “American Standard” R-303, Universal Strainer with beehive grid, brass chrome-plated, for 50mm diameter C.I. Soil Pipe installation or any approved equivalent.

3. Lavatories including fittings shall be as manufactured by any approved quality or equivalent.

4. Built-in Slop Sink. Built-in slop sink shall be in accordance with the detailed drawings and as specified herein.

    a. Floor and Wall ----------Glazed Tiles
    b. Fittings and accessories ----------Sink Faucet
    100mm x 100mm
    x 50mm brass strainer
    50mm diameter P-Trap

G. Other Fixtures. Other fixtures, fittings and accessories shown on or not shown on the drawings but necessary to complete the work shall be provided by the Contractor and approved by the Engineer/Architect before purchase and implementation.

H. Installation
    1. Water Pipe and Fittings
        1.1 Pipes shall be installed as indicated in the drawings. The pipes shall be cut accurately to measurement, established at the building by the Contractor and shall be taken not to weaken the structural portion of the building. All piping above ground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Use PPR pipes for water lines.

        1.2 Joints. After cutting and before threading, all pipes shall be reamed and shall have burrs removed. All screw joints shall be made with graphite and oil or with an approved graphite compound applied to make threads only. Threads shall be full cut, and not more than three threads on pipe shall remain exposed. Caulking of threaded joints to prevent leaks shall not be permitted. Unions shall be provided where required for disconnections.

        1.3 Fittings. Branches in piping and changes in pipe sizes shall be provided with necessary fittings as shown in the drawings.

        1.4 Valves. Valves shall be provided on all supplied fixtures as specified. Where valves are indicated on the drawings in connection with run-outs, risers, branches and mains, they shall be in accordance with this specification.

        1.5 Insulation. All hot water piping, if any, after being tested shall be cleaned and insulated with a minimum of 19mm insulation. Chromium plated supply piping line to plumbing fixtures shall not be installed.

I. Plumbing Fixtures. Fixtures secured to concrete masonry wall shall be cleaned and insulated with aluminum of 19mm brass bolts with 20 threads to the inch and of sufficient length to extend at least 75mm into solid concrete or hollow block work; fitted with a loose tubing or sleeve inserts; shall be securely anchored and installed flushed with the finished wall; and shall be completely concealed when the fixture are installed.

1. Fixture support and fastenings. All fixtures and equipment shall be supported and fastened in a satisfactory manner.

2. Where through bolts are used, they shall be provided with plates or washer at the back set so that head, nuts and washers will be concealed by plaster. Bolts and nuts shall be hexagonal and exposed bolts, nuts, cap nuts and screw heads shall be provided with chromium plated brass washers.

J. Waste, Drain and Vent Pipe and Fittings

1. Pipes. Horizontal soil and waste pipe shall be a grade of 20% where possible, but in any case not less than 1%. Vent pipes in roof spaces shall be run as close as possible to underside of roof, with horizontal piping pitches down to stacks without forming traps in pipes using fittings as required. Where circuits vent pipe from any fixtures or line of fixture shall be connected to a vent line carrying other fixtures, the connection shall be at least 120mm above floor on which the fixtures are located to prevent the use of any vent lines as waste.

2. Fittings. All changes in pipe sizes on soil, waste lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of forty five (45) degree wyes, half wye, long sweep, quarter bend, sixth, eight or sixteenth bends, except that sanitary tees may be used on vertical stacks. Where it becomes necessary to use short radius fittings in any other locations, the approval of the Engineer shall be obtained before they are installed.

3. Union connections. Slips joint shall be permitted only in traps or in the inlet side of the trap. Tucker or hub drainage fittings shall be used for making union connection wherever practicable in connection with dry vents.

4. Joints. All joints shall be air and water tight. For joining pipes the following materials shall be used:

4.1 All PVC pipes shall be joined by the manufacturer's recommended adhesive as approved by the Engineer.

4.2 Cast Iron Pipe. All joints in bell and spigot cast iron soils, waste and vent pipes, or between east iron pipes, waste and vent pipe and threaded pipe or caulked ferrules shall be firmly packed with oakum or hemp and caulked with lead at least 25mm deep.

4.3 Threaded joints shall be American National Standard Taper screw threads with graphite and oil compound applied to the male thread. Connections between pipes and soil pipe shall be similar and the threaded pipe shall have a ring or hard coupling screwed on to form spigot end.

K. Excavation and Backfill

1. Excavating. Trenches for all underground pipes shall be excavated to the required depth and grade as shown in the drawings and in accordance with earthwork.

2. Backfilling. Pipe lines shall have been tested, inspected and approved by the Engineer prior to backfilling. Backfill materials and operation shall be in accordance with section on earthwork.

L. Quality Assurance Provisions

1. Tests. The Contractor shall conduct all tests required and shall furnish all equipment, labor and materials necessary. All defects disclosed as the result of the test shall be repaired or remedied and the system retested, until the results are satisfactory to the Engineer.

1.1 Water piping shall be subjected to a hydrostatic pressure test of 100 pounds per square inch.

1.2 Sanitary Piping. Before the installation of any fixtures, the end of the system shall be capped and all lines filled with water to the roof and allowed to stand 30 minutes without leakage. After the fixtures are set, a smoke or equivalent test shall be made using an approved apparatus. Test within building shall be made piping exposed. Underground piping shall be tested before backfilling.

XVI. ELECTRONICS WORKS

A. Scope. The work contained in this section includes furnishing of all labor, equipment, tools and materials and performing all operations, including cutting, channeling and chasing necessary for the installation of complete wiring and conduit system, electrical equipment and electric service connection in accordance with this specification unless otherwise required in the drawings.

B. Requirements.
General. Unless indicated or specified otherwise herein, all materials and workmanship shall conform to the specifications and to the applicable standards, codes, regulations and specifications listed herein. Workmanship shall be of the highest grade. Electrical and Electronics materials shall be new and approved by the Underwriters Laboratories, Inc. wherever standards have been established by the agency. Defective equipment or equipment damage in the course of installation shall either be replaced or repaired as directed by the Engineer. The contract drawings indicate the extent and general arrangement of the conduit and wiring system. If nay departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons thereto shall be submitted as soon as practicable to the Engineer for approval. No departure shall made without the prior written approval of the Engineer.

C. Materials
Standard Products. The materials shall be the standard product of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that complies with the specifications requirements, and with warranty for any repairs or replacements..

D. Approval of Materials
The Contractor shall submit for approval a complete description of all materials to be used in the work. The description shall include catalog numbers, illustrations, diagrams, dimensional data, etc., as required to describe fully the materials.

E. Conduit and Conduit Fittings
Conduit shall be of standards and approved by Engineer and complying to the desired specifications and requirements.

F. Wires and Cables
1. Conductors in conduits shall be copper, moisture and heat-resistant rubber or thermo-plastic insulated. In dry locations, wires and cables shall be type TW for sizes 8 sq.mm and smaller and type THW for sizes 14 sq.mm and larger. In damp or wet locations as defined by the National Electrical Code/Philippine Electrical Code, wires and cables shall be type THW, for sizes 8 sq.mm and smaller; and type RHW with neoprene jacket for sizes 14 sq.mm and larger. All conductors shall have 600 volts insulation unless otherwise specified in the drawings. Wire shall be stranded copper for 8 sq.mm and larger sizes. The number and sizes shall be as specified in the drawings.

G. Outlets
1. Each outlet in the wiring or raceway system shall be provided with an outlet box to suit the conditions encountered. Boxes for exposed work or in wet locations shall be of the cast metal type having threaded hubs. Boxes for concealed work shall be the cadmium-plated or zinc-coated sheet metal type. Each box shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of the National Electrical Code/Philippines Electrical Code. Boxes shall not be less than 40 mm deep unless shallower boxes are required by structural conditions that are specifically approved by the Engineer. Ceiling and bracket outlet boxes shall not be less than 100 mm octagonal except that smaller boxes may be used where required by the particular fixtures to be installed. Switch and receptacle boxes shall be approximately 100 mm x 54 mm x 40 mm. Boxes installed in concealed locations shall be set flushed by the finished surfaces and shall be provided with the proper extension rings or plaster covers where required. Boxes shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction, or shall be fastened directly with wood screws on wood. Location of outlets shown on the drawings are approximates; the Contractor

shall study the building plans in relation to the spaces and equipment surrounding the outlet so that the lighting fixtures are symmetrically located according to the room layout. When necessary, with the approval of the Engineer, outlets shall be relocated to avoid interference with mechanical equipment or structural features.

F. CCTV and Structured Cabling

1. CCTV cameras and other accessories must comply with the required specifications according to the Engineers details and of standard, quality tested materials. Includes such features as weatherproof, with IR for night time recording and with complete Accessories.

2. All installation to be properly conducted by trained and authorized technicians and Supervised for correct installation. Refer to the Engineer for any revisions on site.

3. After installation sales includes testing of units and other facilities related for Approval of Engineer and owner before turn-over of product.

XVII. MECHANICAL WORKS

A. Scope. The work contained in this section includes furnishing of all labor, equipment, tools and materials and performing all operations, including cutting, channeling and chasing necessary for the installation of complete wiring and conduit system, electrical equipment and electric service connection in accordance with this specification unless otherwise required in the drawings.

B. Requirements.
General. Unless indicated or specified otherwise herein, all materials and workmanship shall conform to the specifications and to the applicable standards, codes, regulations and specifications listed herein. Workmanship shall be of the highest grade. Electrical and Electronics materials shall be new and approved by the Underwriters Laboratories, Inc. wherever standards have been established by the agency. Defective equipment or equipment damage in the course of installation shall either be replaced or repaired as directed by the Engineer. The contract drawings indicate the extent and general arrangement of the conduit and wiring system. If nay departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons thereto shall be submitted as soon as practicable to the Engineer for approval. No departure shall made without the prior written approval of the Engineer.

C. Materials
Standard Products. The materials shall be the standard product of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that complies with the specifications requirements, and with warranty for any repairs or replacements. Details of fixtures are as follows:

C.1 Fire Hose Cabinet
This includes installation and commissioning of Fire hose cabinet and all accessories included as a Completed set. All Fire code standards must be applied and followed. Only approved and Licensed materials must be installed and subject for inspection. 100 ft. minimum hose reel length is required as well as new and sealed Extinguishers. Rough ins and pipes to be of superior Quality.

D. Approval of Materials
The Contractor shall submit for approval a complete description of all materials to be used in the work. The description shall include catalog numbers, illustrations, diagrams, dimensional data, etc., as required to describe fully the materials.

E. Conduit and Conduit Fittings
Conduit shall be of standards and approved by Engineer and complying to the desired specifications and requirements.

F. Warranty and Guarantee
All fixtures to be properly tested and evaluated before turn-over and acceptance. And with Approval of Engineer and owner for acceptance. Warranty and after sales support to be provided by contractor and or Installation company.

XVIII. PAYMENT AND MEASUREMENT

A. Payment shall be made at the Contract unit price or lump sum price of the various pay items in the Bid Schedule, which payment shall constitute full compensation for furnishings all materials, labor, equipment, tools, and other construction contingencies including profit, fees, and other expenses comprising the total and complete cost of all the work involved in each work item as shown in the plans, and as specified in this technical specification and the special provisions and as directed by the Engineer. When the contract does not include a contract pay item for associated or ancillary work requires to complete the work specified in the Bid Schedule, the cost shall be considered as included in the price paid for the listed bid

B. Measurement for Payment of work covered by the various sections of the Technical Specifications shall be based on the net quantity required for the work based on the drawings unless otherwise directed by the Engineer. Allowance for any bulking, shrinkage, consolidation or loss of material shall be deemed to have been taken into account in the Contractor's unit prices. Only actual quantities of work performed shall be measured and paid for. In the cases of lump sum bid items, the value of the actual work performed shall be calculated by the Engineer and shall be the basis for progress payments.