

Section VI - Technical Specifications

Technical Specifications

Maintenance of Physical Port Facilities, Port of Lucena, Lucena City

1. DEMOLITION AND REMOVAL WORKS

1.1 DESCRIPTION

The work includes the furnishing of all labor, materials and equipment required to carry out the demolition and removal of obstructions, portions of existing piers including extraction/cutting of timber and r.c. piles at required depth and demolition of miscellaneous buildings, pavements, fences, utilities, navigation aids and wrecks etc., as required for the execution of the Contract.

The Contractor shall submit the proposed methodology or procedure of demolition work with detailed drawings and calculations if necessary, to the Engineer for approval, before the execution of the Works.

The Contractor shall keep all pavements and landing areas to and from the site of the disposal area clean and free of mud, dirt and debris during and after the execution of disposal. Disposal of debris and materials shall be as directed by the Engineer

For off-shore obstructions to pile driving and dredging, survey shall be executed by the Contractor with the Engineer before any demolition and removal of wrecks commence and shall be as directed by the Engineer.

1.2 GENERAL PROVISIONS

1. The Contractor shall be deemed to have satisfied himself of the site conditions, and to have included in his unit prices provision for all risks that may arise during or in connection with the work.
2. The demolition work shall be carried out by approved methods and equipment such as concrete breakers, gas-cutters, hydraulic jacks, compressed air disintegrators, etc., however, no blasting shall be used unless approved in writing by the Engineer and after obtaining the written permission of the concerned Authorities.
3. The Contractor shall provide suitable equipment, skilled labor and appropriate temporary works such as scaffoldings to ensure safety in his demolition works as well as in the adjacent area.
4. The Contractor shall demolish all the structural members above the level on which the subsequent and permanent works under this Contract will begin. To this end, the temporary construction works such as excavation shall be conducted by the Contractor.
5. Materials coming from the demolition works, except general earth, shall remain the property of the Procuring Entity, the designated part of which

shall be stored by the Contractor at places specified by the Engineer's authorized Representative.

1.3 INTERFERENCE WITH PORT OPERATIONS

1. During the execution of the work, the Contractor shall not interfere with the shipping, navigation and other traffic in the port.
2. The Contractor shall make arrangements with the operations people on the schedule of demolition and related works to keep port operation activities undisturbed at all times.
3. Prior to commencement of the demolition works, the Contractor shall inform/announce to port users the schedule of disconnection of utilities.

1.4 STORAGE AND DUMPING

Prior to the commencement of the demolition work, the Engineer shall submit to the Contractor a list in which all the materials to be salvaged and overhauled, as property of PPA and the location of their storage shall be described. Materials embedded in concrete units shall not be salvaged.

The Contractor shall separate materials to be salvaged from debris. Salvaged materials shall be loaded, transported and unloaded by the Contractor at the specified locations.

Debris, if it does not contain any pollutant in the opinion of the Contractor may be dumped at the offshore area.

The Contractor may dump debris on land areas but out of the site, which areas shall be procured and prepared at his own expense. In this case, safety measures shall be undertaken in the transporting, unloading, covering and others as requested by the Engineer.

1.5 EXECUTION

1. Prior to the commencement of demolition works, the alignments of the new construction works to existing pier shall be checked.
2. The width and alignment of portion of existing structure to be demolished shall be marked by paint.
3. With these lines as guides, concrete shall be broken and reinforcing bars cut, such that panels or portions of the structure can be lifted out for disposal elsewhere outside of the operational work area.
4. Extract concrete piles with care in order not to damage existing or adjacent structures, equipment or materials.
5. Piles (timber/concrete) for demolition/extraction shall be done with care and/or to the required level indicated in the plan as shown in the drawings.
6. Rocks removed from existing slope protection shall be stored for reuse in new construction.

7. Demolish buildings, pavements, curbs, fences, utilities, services, navigation aids and the like as determined in the field for each project and as shown on the drawings or as directed by the Engineer.
8. Materials coming from the demolish works shall be properly disposed by the Contractor.

1.6 SAFETY

At the end of each day's work, the site shall be left in safe condition, so that no part is in danger of toppling, or falling or creating hazards to personnel or equipment.

1.7 MEASUREMENT AND PAYMENT

Demolition and removal, unless otherwise noted, shall be measured by number or unit quantities or lump sums as appropriate for each class of work for each category. Cost of disposal of debris shall be incidental to the work and shall not be paid for separately.

Demolition and removal of existing pavement shall be measured and paid for under this section unless such pavement falls within or above the new subgrade, in which case, measurement and payment shall be under "Roads and Pavements."

1. The price listed above shall be full compensation for all labor, materials, tools and equipment and all incidental works necessary for the successful completion of work.

2. REINFORCED CONCRETE

2.1 GENERAL

All works falling under this category shall include reinforced concrete for all kinds and parts of any reinforced concrete structure.

2.2 MATERIALS

a.) Cement

Cement used shall be Type I Portland conforming to the requirements of the latest revision of ASTM C 150 "Standard Specifications for Portland Cement".

b.) Coarse Aggregates

Coarse Aggregates shall be washed, well graded, hard pieces of gravel, crushed gravel or rock conforming to the requirements of ASTM C 33 "Standard Specification for Concrete Aggregates".

c.) Fine Aggregates

Fine Aggregates shall be washed sand, stone screenings or other inert materials of same characteristics, or any combination thereof composed clean, hard, strong, uncoated grains and free from injurious amount of dust, lumps of clay, shale, alkali, and organic matter. It shall conform to the requirements of ASTM C33 "Standard Specifications for Concrete Aggregates". Beach sand shall not be used unless approved by the Engineer.

d.) Admixtures

Unless otherwise required by field conditions admixtures may be used subject to the expressed approval of the Engineer. The cost thereof shall be considered as already included in the unit cost bid of the Contractor for the concrete.

2.3 STORAGE OF MATERIALS

- a.) Cement shall be stockpiled as closely as possible in weatherproof storage sheds, stacks suitably elevated above ground to prevent cement absorption of moisture.
- b.) Aggregates shall be placed in stockpile in a manner preventing segregation thereof and contamination with foreign materials.
- c.) Reinforcing steel bars shall be stored properly, covered and protected from humidity to prevent rusting and contamination with oil, dirt or other objectionable matters.

2.4 DESIGNED STRENGTH OF CONCRETE

Concrete for structural parts or members such as bearing piles or columns shall develop a minimum 28-day compressive cylinder strength of 4,500 psi., and for deck or floor slabs, beams and girders of the structure shall develop a minimum 28-day compressive cylinder strength of 3,500 psi., unless otherwise indicated in the drawings.

Concrete for non-structural parts or members such as partition walls and slab on fill shall develop a minimum 28-day cylinder strength of 3,000 psi., unless otherwise indicated in the drawings.

2.5 TRIAL BATCH FOR CONCRETE

Thirty (30) calendar days before the start of concreting works, the Contractor shall submit design mixes and the corresponding test result made on sample thereof. Sampling and testing shall be in accordance with the ASTM Standard procedures for sampling and testing, for the particular design strengths) required.

The particulars of the mix such as the slump and the proportionate weights of cement, saturated surface dry aggregates and water used shall be stated. Test results shall show 28-day strengths) fifteen (15) percent higher than the ultimate strength(s) required.

The design mix for concrete to be used shall be submitted together with at least three (3) standard cylinder samples for approval at least one (1) month prior to

the start of each concreting schedule. Such samples shall be prepared in the presence of the Engineer.

Standard laboratory strength test for the 7, 14 and 28 days periods shall be taken to all concrete samples in addition to routine field tests, at cost to the Contractor. Only design mixes represented by test proving the required strength for 7, 14 and 28 days tests shall be allowed.

The cost of sampling, handling and transporting samples from jobsite to the laboratory and the cost of subsequent tests made until the desired mix is attained shall be for the account of the Contractor.

2.6 CONCRETE PROPORTION AND CONSISTENCY

Concrete proportion should produce mix consistencies that will work readily into angles and corners of the forms and around reinforcements irrespective of the method of placing employed, without permitting the materials to segregate or excess water to collect on the surface of the concrete and with separated individual particles of aggregates showing coating of mortar with proportionate amount of sand. The total aggregate in the proportion used shall be such that when sieved, the weight passing the No.4 standard sieve shall be thirty percent (30) of the total.

The methods used for measuring materials going into the concrete mix shall permit easy checking and control of proportions at any time during the work.

2.7 MIXING OF CONCRETE

All concrete used shall be machine-mixed at the site. Each batch shall be mixed at the mixer's design speed, for at least 1-1½ minutes after all concrete materials are simultaneously placed in the mixer. The ideal rotation speed of the mixer shall be between 14 and 20 rpm.

All mix contents of the mixer shall be thoroughly removed before any succeeding batch is placed.

The materials for the first batch shall contain sufficiently excess cement, sand and water to coat the inside walls of the mixer without reducing the required mortar content of the mix.

The mixer shall be provided with devices for accurately measuring and controlling the amount of water used in each batch and for automatically recording the number of revolutions of the mixer.

Hand mixing of concrete will only be allowed in case of mixer breakdown, in which case it shall be stopped as soon as pouring for the particular section is completed, or at a construction joint as directed by the Engineer.

Re-tempering or remixing of partially hardened concrete with the addition of water will not be permitted.

2.8 PLACING OF CONCRETE

- a.) Concrete shall be placed in the presence of the Engineer only after the forms, reinforcing bars and other spaces to receive the concrete have been inspected and approved by him.
- b.) Concrete shall be placed only when wind and weather conditions will allow proper placement and curing of the concrete. Notice of any concreting operations shall be served to the Engineer at least three (3) days ahead of each schedule.
- c.) Mixed concrete shall be deposited in its final position within a practicable time. Each succeeding fresh deposit for particular structural member shall be placed at a practicable rate to prevent cold joints. Each successive fresh deposit of concrete shall be vibrated vertically at uniformly spaced points and levels, of such duration and intensity to compact the concrete thoroughly but shall be discontinued the moment segregation of materials is noticed.
- d.) Where concreting operations involve a fall more than 1.50 meters (4.92 feet), the fresh concrete shall be poured through approved sheet metal conduit or pipes. The pipes shall be kept full of concrete and its lower end kept below the surface of concrete throughout the pouring operations.
- e.) Deposition of concrete shall be in such a way as to prevent segregation of the materials and the displacement of the reinforcement. Placing shall be done preferably with the use of buggies, buckets or wheel-borrows. Troughs, conveyors and pipes and the manner of use of each one shall be with the expressed permission of the Engineer.
- f.) Each layer of concrete shall be placed approximately normal as possible in uniform layers not exceeding 0.30 meter, unless otherwise ordered. The rate of placing concrete in the forms shall preferably be 0.025 meter (0.082 feet) vertical rise per minute.

2.9 CONSTRUCTION JOINT

During stoppage of concrete pouring operations, and when jointing of old concrete becomes necessary, the following point should be observe:

- a.) Construction joint not indicated in the drawings shall be located as to least affect the strength of the structure. Such locations will be as pointed out by the Engineer.

2.10 FORMS AND FALSEWORK

All forms and falsework to be used in the work must be designed, and constructed by the Contractor, for rigidity and adequacy for carrying the loads of the fresh concrete and/or additional superimposed construction loads. The Authority may from time to time verify the adequacy and safety of such temporary works and may require the Contractor to submit detailed designed drawings of forms and falseworks proposed to be used. Approval of such drawings or design of forms, however, shall not relieve the Contractor of his liability on resulting imperfections or damages to the finished concrete, or other damages which may directly result therefrom.

Forms may be re-used but shall be scrapped by a wire brush of all clinging mortar. Bulges should be planed and realigned prior to its use.

Prior to placing concrete form surfaces should be oiled for easy form removal. However, the oil coating should not be so thick as to stain and soften the concrete surface. Oil coatings should be applied before rebars are placed.

2.11 CURING AND WATERPROOFING

All concrete shall be cured for at least 14 days after the date of placing in accordance with the approved and accepted methods.

2.12 FINISHING OF CONCRETE SURFACES

Concrete surfaces shall conform accurately to the form, alignment, grades and sections shown in the drawings or as prescribed by the Engineer. It shall be free from bulges, ridges, honeycombing or roughness of any kind, and shall be of a reasonably smooth wood float finish.

2.13 TREATMENT OF SURFACE DEFECTS

All irregular concrete surfaces, voids, holes, honeycombs exposed after removal shall be repaired by the Contractor in such a way that the repaired surface will be acceptable under paragraph 2.12 above.

2.14 ARCHITECTURAL FINISH

All exposed concrete exterior surfaces shall be given an architectural finish as directed by the Engineer.

2.15 PLACING OF REINFORCEMENT

Metal reinforcement shall be placed as accurately detailed on drawings and properly secured by approved means.

All bars shall be cold bent unless approved otherwise by the Engineer. Minimum distance between parallel bars shall be one and one half (1 1/2) times the diameter for round bars and twice the side dimension for square bars. The clear distance between bars shall not be less than 2.54 cm. (1 in.) nor is less than one and one third (1 1/3) times the maximum size of the coarse aggregate, whichever bigger.

All reinforcing steel shall be cleaned of all rust or scale and deleterious materials which tend to destroy the bond between the concrete and the steel.

2.16 REINFORCING BAR SPLICES

Generally, splice/s of reinforcement at points of maximum stress specially in slabs, beams and girders shall be avoided. Such splice/s may however be approved by the Engineer in writing provided the lap is bonded or butt welded is sufficient to transfer tensile stress between bars by at least 125 of the specified yield strength of the reinforcing bar. For adjacent bars splices shall be staggered.

2.17 READY-MIXED CONCRETE

Where ready-mixed concrete is used, the requirements specified for batching, mixing and transporting shall be in accordance with the requirements set forth in ASTM C94 Specifications for Ready-Mixed Concrete unless otherwise specified.

- a.) The Contractor shall notify the Engineer seven (7) days in advance before any continuous phase of concreting operations is started. Upon notification, the Engineer shall have the right to inspect the ready-mixed concrete supplier's plant/equipment and all materials and/or sources thereof. The Contractor must coordinate with the supplier and must provide safe and adequate guidance for the Engineer or his representative in conducting such examinations.
- b.) For all ready-mixed concrete delivered to site of work, discharge shall be completed within one hour after the addition of cement to the aggregates or before, the drum is revolved 25 times, whichever comes first. Under conditions contributing to the stiffening of concrete especially during hot weather, the time required between the introduction of cement to the aggregates and discharge of the mix may still be reduced by the Engineer.
- c.) Truck mixers shall be equipped with counters indicating the number of revolutions of the drums which shall be automatically actuated at the time of starting mixers at mixing speed.
- d.) Each batch or truck delivery of concrete shall be mixed inside the drum for not less than 70 revolutions of the drum at the rate of rotation designated by the equipment manufacturer. Additional mixing if ordered by the Engineer shall be at the speed designated as agitating speed by the manufacturer of the equipment.
- e.) Concrete for individual batches or deliveries should be of uniform consistency, mix and grading. If slump tests of a minimum 2 samples taken within 15 minutes of each other at approximately 15 and 85 discharge load give values differing more than 2.54 cm. (1 in.) when the specified slump is 76 mm. (3 in.) , use of the particular mixer in the work shall be stopped until corrections are made to prevent such conditions, which shall be confirmed by further slump tests.
- f.) Every batch of ready-mixed concrete delivered at the job site shall be accompanied by a ticket furnished in accordance with Section 15 of ASTM 94. The time when the materials were batched shall also be indicated.
- g.) Non-agitating equipment or combination truck and trailer equipment for transporting concrete will not be permitted.
- h.) The Authority reserves the right to verify from time to time the quality and quantity of materials used in every cement batch from the batching plant. The Contractor shall be aware of this provision and make the proper arrangement with the concrete supplier.

2.18 TEST ON CONCRETE

Test on concrete shall be in accordance with the following:

- a.) Concrete samples for tests shall be secured and molded in accordance with ASTM C 172 - "Method of sampling Concrete", and ASTM C31 - "Method of making Curing, Concrete Compression and Flexure Test specimens in the field".
- b.) Strength tests on samples shall be made in accordance with ASTM C39 - "Standard Method of Test for Compressive Strength of Molded Concrete Cylinder".

Not less than four (4) cylindrical specimens shall be made for each test of which at least two (2) shall be reserved for 28-day test. Not less than one (1) test shall be made for every fifty (50) cubic meters of concrete but in no case less than one (1) test for each day's concreting.

Samples shall be taken by the Contractor under close supervision of the Engineer; and shall be delivered as soon as practicable for testing, at his expense, to the designated laboratories.

The average strength of test samples representing any definite class of concrete used as well as the average of any five (5) consecutive strength tests representing the class of concrete shall be equal to or greater than the specified strength and not more than one (1) strength test in ten (10) shall have an average value less than 90 of the specified strength.

If the test results indicate strength values less than the required, the Project Manager shall have the right to order a change in the concrete proportion used for the remaining work, or in the procedure of curing the concrete.

2.19 LIQUIDATED DAMAGES

For failure to meet the specified strength required for concrete, designed, prepared and laid by him, the Contractor shall pay the AUTHORITY a liquidated damages, not as penalty or forfeiture the following, to be applied only to the quantity of concrete which the particular sample/s represent.

- a.) Payment of 30 percent contract unit cost per cubic meter of concrete affected, for test resulting to strength between 90 to 100 percent of specified strength;
- b.) Payment of 50 percent contract unit cost per cubic meter of concrete affected, for test resulting to strength between 80 to 90 percent of that specified strength;
- c.) Non-payment and removal and replacement at cost to the Contractor of all concrete affected for resulting to strengths below 80 percent of that specified, all in accordance with ACI - 318, and at cost to the Contractor.

2.20 FIELD TESTS

Field tests as may be deemed necessary to check on the quantity of the materials and mixtures and the manner of construction employed shall be conducted by the Project Engineer assigned to the project. And when such tests result to values less than that tolerated by standards set in applicable provisions of the ASTM Specifications referred to herein, or contrary to accepted good Engineering practice, the Contractor shall comply to any instructions given by the Project Engineer to upgrade the materials used and method of construction employed.

3. MASONRY WORKS

3.1 SCOPE OF WORK

The work shall include all labor, materials, equipment and plant and other facilities and the satisfactory performance of all works necessary to complete all masonry work shown on the drawings and as specified herein.

3.2 MATERIALS REQUIREMENTS

- a. Concrete hollow blocks shall have a minimum compressive strength of 50kg/cu.cm. or 4.9 MPa and shall conform to the requirements of ASTM C90. Unless specified otherwise, all concrete hollow blocks shall be of the non-load bearing type. All units shall be sound and free from cracks or other defects that interfere with the proper placing of the unit or impair its strength.
- b. Cement mortar shall be one (1) part portland cement and three (3) parts of sand by volume.

3.3 CONSTRUCTION REQUIREMENTS

Do not wet blocks before using. Blocks must be dried when laid. The first row of blocks must be thoroughly anchored to the concrete walls, columns or slabs and shall be laid in full bed of mortar. Courses shall be laid straight and uniform with regular running bond and with vertical faces truly vertical and set true to line. Each block shall be adjusted to its final position in the wall while the mortar is still soft and plastic enough to ensure good bond. The position of the block shall never be shifted after the mortar has stiffened. No re-alignment of a block shall be attempted after a higher or following course has been laid.

All horizontal and vertical reinforcing bars shall be anchored into the concrete walls, columns or slabs as shown on the plans or as directed by the Engineer. Dowel bars shall be properly spaced and placed into the walls, columns or slabs, hooked to the vertical and horizontal reinforcing bar.

All units shall be laid with a mortar composed of one part cement and three parts of sand. Unless otherwise required by the Engineer, horizontal and vertical joints shall be 10 mm thick with full mortar coverage on the face shells and on the web surrounding the cells to be filled. Joints shall be level or plumb

and in alignment from top to bottom of wall, and shall be brushed to remove all loose and excess mortar.

Reinforcing bars shall be at least 12 mm in diameter, unless specified otherwise in the plans. Vertical bars shall be spaced 0.60 meter, and horizontal bars at every third course, unless shown otherwise on the plans. Reinforcing bars shall have a minimum lap of 40 bar diameter. All horizontal reinforcement must be tied to the vertical reinforcement at their intersection.

All exposed surfaces of concrete hollow blocks, unless otherwise specified on the plans, shall be finished with cement plaster. Cement mortar shall be mixed only in such quantities as are required for immediate use and mixture which has developed initial set shall not be used. Mixing shall be continued until a homogenous mixture of the required cement mortar which has partially hardened shall not be allowed. Bond shall be used where horizontal reinforcements are to be placed. At door and window opening, the jamb blocks and beam blocks over openings and below window sills shall be reinforced as shown on the plans or as directed by the Engineer.

4. WATERPROOFING

4.1 SCOPE OF WORK

This Item shall consist of furnishing all waterproofing materials, labor, tools, equipment and other facilities and undertaking the proper installation works required as shown on the plans and in accordance with this specification.

4.2 MATERIAL REQUIREMENTS

- a. Primer shall be of asphalt cold applied, free from water and other foreign matters, and shall conform to the specifications requirement defined in ASTM D-41.
- b. Built-up membrane shall be made of smoothly woven fibers that are impervious to acid, heat, dampness and totting. It should permit complete penetration of asphalt compound or bituminous coating in the woven glass fiber.
- c. Preformed membrane shall be self-sealing flexible cold applied bituminous sheets bonded to 0.15mm thick polyethylene film.
- d. Mopping Materials
 - 1) Type A soft adhesive self-sealing asphalt for structure below ground level
 - 2) Type B where asphalt is not exposed on temperature exceeding 51.7 Celsius structure above ground level.
 - 3) Type C where asphalt is exposed on vertical surface in direct sunlight or above temperature of 51.7 Celsius structure above ground level.

4.3 CONSTRUCTION REQUIREMENTS

Roof decks, balconies, toilet and bathrooms, gutters, parapet walls and other areas indicated on the plans to be waterproofed shall first be rendered with cement-based waterproofing before any type of waterproofing is applied.

a. Application Procedure

- 1) Prior to application of membrane concrete surfaces should be sound and cured without the use of curing compound. Apply a coat of concrete neutralized to remove oil dirt and other contaminants.
- 2) Apply asphalt primer at the rate of one gallon per 100 square feet evenly by spraying or by paint brush.
- 3) Application shall be done one direction strip by and overlapping each other to assure uniform thickness.
- 4) Allow primer to dry until it is ready to receive next coat or layer as specified in the manufacturing instructional manual.
- 5) As soon as primer coating is workable, lay a single layer of preformed or built-up membrane conforming to size and shape of the surface area to be covered.
- 6) Carefully lay side and end laps in order to assure an even thickness throughout the whole surface area to be covered.
- 7) When the whole surface area is completely covered apply a single coat of asphalt primer at the rate of 3 to 4 gallons per (100 square feet).
- 8) Meshes of treated woven glass fibers shall not be completely closed or sealed by the primer coat, but shall sufficiently open to allow successive moppings of the ply material to seep through.
- 9) Cover ply not more than the minimum amount of surfacing necessary to prevent sticking on ply.
- 10) After application surface shall be uniformly smooth, free from irregularities folds and knots.
- 11) Repeat the procedure until 5 plies has been satisfactorily installed or as many as many layers required or as specified in the plans.
- 12) Where weather disturbance interrupt the work and exposing the membrane to moisture remove the layer exposed to moisture and repeat procedure until completion of the process.

b. Protective Coating

- 1) Where laying of the built-up or preformed membrane conforms with the number of plies required as shown on the plans lay a mixture of sand mastic in the proportion of one part asphalt or bituminous material and four parts coarse screened sand by volume. With a steel trowel at an average of 3 mm thick over the surface of membrane.
- 2) Then at the rate of one gallon per (100 square feet) apply aluminum heat reflecting finish thoroughly over the dried sand mastic coating.

c. Metal Cap Flashing

- 1) Provide cap flashing gauge 24 G.I. where shown on the plans.
- 2) Where cap flashing is connected to preformed lock in through-wall form upper edge of cap flashing to engage in preformed lock. Mallet lock down tight to provide a spring action against base flashing.
- 3) Then at the rate of one gallon per (100 square feet) apply aluminum heat reflecting finish thoroughly over the dried sand mastic coating.
- 4) Where cap flashing is terminated in raked joints or in prepared masonry or stone reglet fasten flashing with wedge every 12 inches and fill reglet on vertical surfaces continuous with plastic cement and on horizontal surfaces, continuous with molten lead.

5. CEILING

3.1 SCOPE OF WORK

The work shall include all labor, materials and equipment necessary to install ceiling materials, complete as shown on the drawings and as specified herein.

3.2 MATERIALS REQUIREMENTS

- a. Ceiling shall be 0.70mm thk. Jameca Lay Perfor Border Type, powder coated bone white on CMT runners and 5mm thk. Marine Plywood on 50mm by 50mm ceiling joists as specified herein or as indicated in the drawings.
- b. Ceiling materials and accessories shall be carefully handled and stored to prevent damage to the surface and edges.

6. DOORS AND WINDOWS

6.1 SCOPE OF WORK

The work shall include the supply and installation of all doors and windows as indicated in the drawings.

6.2 MATERIALS REQUIREMENTS

a. Doors

- 1) Flush doors shall be hollow core from Tanguile kiln-dried frames with 6mm thick marine plywood as indicated. Other flush doors shall have a Tanguile kiln-dried wood louver for ventilation purposes.
- 2) Swing aluminum door shall have a polyester powder coated aluminum frame (exterior) or epoxy/polyester powder coated aluminum frame (interior) as indicated in the drawings.
- 3) Wood door frames shall be of the design, size and thickness as indicated. This shall be set plumb and true, and well-braced to prevent distortions. Frames in masonry or concrete walls shall be secured as indicated, and shall be Guijo or Yakal, good grade

b. Windows - All windows shall be of polyester powder coated frame (exterior use) or epoxy/polyester powder coated (interior) aluminum window frame. It shall be of fixed window, half-fixed and half-open sliding window, half-fixed and half-open sliding window below a fixed window as indicated in the drawings.

c. Glass - Glass shall be provided in locations as indicated and the corresponding type specified on architectural drawings. Each glass have the manufacturer's label showing the type, thickness, and quality of glass. Labels shall not be removed until the glazing has been approved.

- 1) Clear glass shall be 6.35 mm thick for doors and 5.50 mm thick for windows. It shall be heat-strengthened for fixed window panes with a clear rubber sealant nearly and properly installed.
- 2) Reflective type glass shall be 6.35 mm thk. For doors and windows and shall be heat strengthened tempered glass.
- 3) Wired glass or fire-rated glass shall be 6.30 mm thick.
- 4) Glazing materials and accessories such as weather-stripping, glazing sealant, gasket, channel, beads, clips, primer, masking tape, edge spacer and others shall comply with all pertinent codes and regulations and shall be as recommended by the glass manufacturer as approved by the Engineer.

6.3 INSTALLATION

All doors and windows shall be leveled, hung plumbed and fitted accurately. It shall be installed without forcing or distortion so that sills and heads are level and jambs are plumb. Frames shall be securely anchored into the supporting construction.

Apply hardware's with fastenings of the size, quality, quantity and finish to provide workable system. After installation, protect hardware from paint, stains, blemishes and other damages until acceptance of the work. After hardware is checked. Keys shall be tagged, identified and deliver to the Owner. All errors in cutting and fittings, and all damages to adjoining work shall be corrected, repaired and finished as directed.

Work instruction on glass fittings and installation should strictly follow a standard precautionary measure to avoid damage or breakage on glass and to secure total work safety. Glass shall be provided with caution stickers to call attention. Upon completion of the building, cracked, broken or imperfect glass or glass which has been set improperly shall be replaced. Glass surface shall be thoroughly cleaned, with labels, paint spots, putty, and other defacements removed, and shall be clean at the time the work is accepted.

7. FINISHES

7.1 SCOPE OF WORK

The work covered by this section consist of furnishing all labor, materials, equipment, tools and incidentals necessary to undertake, complete all finishing works and painting for the buildings as indicated on the drawings and as specified herein.

Wall, floor, ceiling and other finishing works shall include but are not limited to the following:

1. Plain cement plaster (steel trowel) finish painted with acrylic latex paint for exterior and interior CHB (Concrete Hollow Blocks) wall;
2. Glazed tile wainscoting for toilet;
3. Vinyl tile finish;
4. Vitrified ceramic tiles for toilet floor;
5. Pebble wash-out finish;
6. Non-skid Ceramic Tiles
7. Plain cement steel trowel floor finish with non-metallic floor hardener;
8. Rubbed concrete finish, painted with acrylic latex paint for exposed R.C. Ceiling (bottom of roof slab and beams)
9. Fiber Cement Board for Ceiling

7.2 SUBMITTAL

1. Shop drawings for all finishing and painting works for the building shall be submitted in advance to allow twenty eight days for review and approval. Shop drawings shall indicate materials and details of finishing works. The Contractor shall be responsible for all errors of detailing and fabrication, and for the correct finishing work items shown on the shop drawings.
2. The Contractor, before placing order for the finishing materials shall submit to the Engineer for approval representative samples of finishing materials. No placing of orders for material for finishing works shall be made without his approval.
3. Samples of all walls finishes, measuring not less than 1000 mm x 1000 mm shall be submitted to the Engineer for approval as to its finish texture and workmanship.

7.3 MATERIAL REQUIREMENTS

5.3.1 WALL FINISHES AND COUNTERTOPS

1. Plain Cement Plaster Finish
 - a. Sand shall be clean and hard material. Sand shall be free from deleterious substances and conforming with the requirements of ASTM C 33.
 - b. Cement shall be Portland cement conforming with the requirements of ASTM Designation C 150.
 - c. Water shall be clean and potable.
 - d. Bonding compound shall conform to ASTM C 631.
 - e. Hydrate lime shall conform to ASTM C 206.
 - f. Synthetic fibrous reinforcement shall conform to BS 5139 or ASTM C 1116.
2. Wall Ceramic Tiles
 - a. Wall tiles shall be 100 mm x 100 mm glazed ceramic wainscoting Color as per Engineer's approval.
 - b. Trimmers and moulding shall be lustrous, glazed with size and color corresponding to wall tiles.
 - c. Portland cement, sand, bonding compound, lime and water shall conform with Sub-section 4.13.2.1.1 above.
3. Marble

- a. Marble shall be local natural mined and polished for toilet countertops, fascia and splashboard. Dimensions as shown on the Drawings.
- b. Shall be sound material with uniform and favorable working qualities and with very limited natural faults.
- c. Color, veining and quality shall be approved by Engineer.
- d. Veining shall run vertically on all vertical surfaces and direction of veining shall continue in same directions over horizontal surfaces except as directed by the Engineer.
- e. Marble components shall be factory fabricated and finished and delivered ready for installation without further preparation or modification.
- f. Sealer
 - 1) Shall be a commercial penetrating type free from harmful alkali or acid content and especially prepared for marble work.
 - 2) Shall have a Ph factor between 7 and 9.
 - 3) Shall not discolor.
 - 4) Shall produce a slip resistant surface.
 - 5) Shall have a flash point not less than 35 degree C.
- g. Cleaning fluid
 - 1) Shall be commercial neutral liquid type especially prepared for marble work.
 - 2) Shall have a Ph factor between 7 and 9.
 - 3) Shall be free from crystallizing salts or water soluble alkaline salts.
 - 4) Shall be biodegradable and phosphate free.

7.3.2 FLOOR FINISHES

1. Vinyl Tile Finish

- a. Vinyl tiles shall be 3 mm thick x 300 mm x 300mm. Samples of the tile for color selection shall be submitted and approved by the Engineer.
- b. Waterproof contact adhesive shall be as recommended by the tile manufacturer and approved by the Engineer.

2. Vitrified Ceramic Unglazed Tiles

- a. Vitrified ceramic unglazed floor tiles shall be 100 mm x 100 mm, white for toilets and as shown on the drawings or to be designated by the Engineer.
- b. Portland cement, sand and water shall conform with the requirements specified in Sub-section 8.2.1.1 above.

- c. Vitrified ceramic unglazed floor tiles shall be delivered in the manufacturer's original unbroken packages or containers that are labeled plainly with the manufacturer's name and brand. Containers shall be grade scaled. Materials shall be stored in dry weather tight enclosures, and shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness.

3. Plain Cement Floor Finish

- a. Portland cement, sand, bonding compound and water shall conform with the requirements specified in Sub-section 8.2.1.1 above.
- b. Mortar shall be one part of Portland cement to three parts sand.
- c. Hardener shall be non-metallic floor hardener, delivered in cartons, cans or bags to the construction site with the labels installed and seals unbroken.

4. Non-skid ceramic floor tiles

Non-skid ceramic tiles shall be 100mm x 200mm white ceramic tiles to be used [for kitchen] as shown on the Drawings.

5. Pebble Washout Finish

- a. Pebble shall be no. 10, and in black color, sound pea gravel, clean, hard, wash river gravel, well selected and graded, rounded non-slip type and not flaky.

Portland cement shall be the best commercial standard conforming to ASTM C 150, type I. Black cement of U.S. brand shall be added to Portland cement base for desired effect.

7.3.3 CEILING FINISHES

1. Rubbed Concrete Finish

Portland cement, sand, bonding compound and water shall conform with the requirements specified in Sub-section 8.2.1.1 above.

2. Gypsum Ceiling Board

Gypsum board to be used for ceiling shall be 13 mm thick and 1.2 m wide and shall conform with ASTM C36. Joint treatment materials and fastening system shall be as recommended by the gypsum board manufacturer and as approved by the Engineer.

3. Fiber Cement Board

Plain fiber cement board on metal frame shall be 6mm thick for interior ceiling and 9 mm thick of exterior ceiling.

4. Fiberglass Ceiling Board

Fiberglass ceiling board shall be fashionetone, fissured design, and 600mm x 600mm x 19mm in dimension.

7.4 EXECUTION

7.4.1 WALL FINISHES

1. Plain Cement Plaster Steel Trowel Finish

a. Preparation of Surfaces

All surfaces shall be cleaned and projections, dust, loose particles and other materials, which would prevent good bond, shall be removed.

Plaster shall not be applied directly to concrete and masonry surfaces coated with bituminous compounds and surfaces previously painted or plastered.

All surfaces shall be thoroughly wetted before plastering.

b. Trial Mix

A trial mix of at least three (3) different water-cement ratios for a proposed mix shall be prepared under full scale conditions and adequate workability. The proportions by weight of cement to the weight of sand shall not be less than one part of Portland cement to two parts of sand.

The proportion of cement-sand and water necessary to produce the cement plaster of the required consistency shall be subject to the approval of the Engineer. Such approval may be withdrawn at any time and a change in proportions may be required. Based on the approved mix proportions, the Contractor shall prepare a list showing the number of kilograms of the various materials to be used in the cement plaster finish mix.

No cement plaster finish shall be started without an approved trial mix by the Engineer.

c. Cement Plaster Finish Application

A brown coat with sufficient pressure shall be applied to fill the gaps, and to secure a good bond. Moistened for 48 hours, each coat of cement plaster shall be kept after application and allow to dry.

A finish coat shall be applied after the brown coat has set. The brown coat shall be moistened before application of the finish coat. Finish coat shall be floated to plumb, even planes and surfaces.

Final plaster finishes shall be rubber sponged.

d. Tolerance

The Contractor shall finish plaster work plumb, level, square and true within tolerance of 3 mm in 3 meters, without cracks and other imperfections.

e. Patching and Cleaning

Upon completion of the building, and when directed, all loose, cracked, damaged or defective plastering shall be cut out and re-plastered in a satisfactory and approved manner.

2. Wall Tiles

a. Mortar Preparation

All mortar setting beds shall be mixed by volume in the proportion of 1 part Portland cement and 3 parts dry sand and not more than 1/10 part hydrated lime.

Mortar materials shall be measured in approved containers, which will insure that the specified proportions of materials will be controlled and accurately maintained during the progress of the work. Measuring materials with shovels, "shovel count", will not be permitted. Unless specified otherwise, mortar shall be mixed in proportions by volume, in an approved mortar box.

The quantity of water shall be controlled accurately and uniformly. The aggregates shall be introduced and mixed in such manner that the materials will be distributed uniformly throughout the mass. A sufficient amount of water shall be added gradually and the mass further mixed until a mortar of the elasticity necessary for purpose intended is obtained. Mortar boxes, pans and wall surfaces shall be kept clean and free from debris or dried mortar. The mortar shall be used before the initial set of the cement has occurred. Re-tempering of mortar in which cement has started to set will not be allowed.

b. Application of Wall Tile

Interior masonry shall be clean, thoroughly dry, sound and sufficiently rough to provide strong mechanical bond. Surfaces shall be evenly damped immediately prior to the application of the scratch coat.

Scratch coat shall be applied to masonry, as backing for wall tile, not less than 24 hours or more than 48 hours before starting the tile setting. The scratch coat shall not be less than 6 mm from the face of the masonry. The scratch coat shall be applied with sufficient pressure to ensure a proper bond with the base for the setting bed. While the mortar is still plastic, the scratch coat shall be cut with a trowel at all internal vertical angles for the

depth of the coat with the full height of the tile bed and shall be cross scratched, in 25 mm centers for the extent of the tile bed.

Immediately before the application of mortar setting bed, the scratch coat shall be moistened thoroughly but not saturated. Temporary screeds shall be applied to the scratch coat with mortar to provide a true and plumb surface, the proper distance back from the finished wall line. The setting bed shall be applied, rotted and floated flush with the screeds over an area not greater than the area to be covered with the tile while the bed remains plastic. The thickness of the setting bed shall not exceed 15 mm and the mortar shall not be re-tempered. The setting bed shall be cut with a trowel at all internal corners as specified for the scratch coat.

Mounted tiles shall be soaked in clean water a minimum of one hour before they are set. Absorptive mounted tiles shall be damped by placing sheets on a wetted cloth in a shallow pan before setting. A skim coat of neat Portland cement mortar, mixed with water to the consistency of a pasty, thick cream, shall be applied 0.8 mm to 1.6 mm thick to the mortar setting bed, or to the back of each tile as laid. The tiles shall then be pressed firmly on the setting bed and tamped until flush and in the 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. Where cutting of tiles is necessary it shall be done at the internal angles of the walls or wainscots. Cutting and drilling tiles shall be done neatly without marring the surfaces. The cut edges of tiles against trim, built-in fixtures, and similar surfaces shall be ground and jointed carefully. The tiles shall fit closely with plumbing fixtures and around electric outlets, pipes and fittings, so that the plates or escutcheons will properly overlap the tiles. Wainscots shall be within one half of the heights indicated without cutting of the tiles.

Bases, caps, bull-nose corners, and all other trimmers moulded or shaped features, and accessories shall be backed thoroughly with mortar and set firmly into place. All lines shall be kept straight and true, and all finished surfaces brought to true and even planes, straight and plumb, and internal corners squared and external corners rounded.

Horizontal joints shall be maintained level and vertical joints plumb and in alignment. The completed work shall be free of broken, cracked, damaged or otherwise faulty tiles.

Joints shall be parallel and uniform in width, plumb, level and in alignment. End joints in broken-joint work shall be made as far as practicable, on the center line of adjoining tiles. Except in special arrangement and design, as indicated or specified, square tiles shall be set with straight joints, and oblong tiles shall be set with broken joints.

Joint widths shall be uniform and spaced to accommodate the tile in the given spaces with a minimum of cutting. Tiles shall be wetted, if they have become dry, before applying grout. Joints 3mm or less in width shall be grouted with a neat Portland cement grout of the consistency of thick cream. Other joints shall be pointed with mortar consisting of one part Portland cement and two parts pointing sand. The grout for walls and other vertical surfaces shall contain non-staining white Portland cement. Grout and pointing mortar shall be forced into joints by using trowel, brush or finger application.

Before the grout or mortar sets, the joints of cushion edge tiles shall be struck or tooled to the depth of cushion, filling all skips or gaps, and the joints of square edge tiles shall be filled completely flush with their surface. Dark cement shall not show through grouted white joints. Care shall be taken to avoid scratching glazed finishes. All mortar or grout shall be removed before it has set or hardened.

c. Cleaning and Curing

All completed tile work shall be thoroughly sponged and washed diagonally across joints, and finally polished with clean, dry cloth. Acid cleaning of unglazed tile, when necessary, shall not be done within ten days after setting tile. All metal shall be covered with an approved grease and the tile shall be wetted with clean water, before tile is cleaned with 10% muriatic acid solution. After acid cleaning, the tile shall be flushed with clean water, and the grease coating on metal shall be removed. Acid cleaners shall not be used on glazed tile.

d. Protection

Tiled walls outside corners (external angles) shall be protected with board corner strips in areas used as passage ways by workmen. Extreme care should be taken not to disturb walled tiled until mortar has fully set.

7.4.2 FLOOR FINISHES

1. Vinyl Tiles

No vinyl tile work shall start until the Engineer has approved the time when such work shall start.

The Contractor shall furnish and install all vinyl tiles and base where and as shown on the drawings or as specified. The temperature shall be maintained at 22°C for 48 hours before, during and 48 hours after the application of tiles.

Vinyl tile shall be laid in accordance with the approved manufacturers recommended method of laying.

Waterproof contact adhesive shall be applied both on the floor and tile, spread evenly and allowing 10 minutes drying time prior to installation.

Tiles shall be laid with close, straight joints, bedded in contact adhesive in accordance with method approved and rolled with roller of sufficient weight to press tile firmly in place and provide smooth, plush surfaces at the joints. Tiles shall be fitted close to all pipes, base and other intersection surfaces.

All finished floors shall be protected in a manner that will prevent the finish from any damage. The Contractor shall remove and replace any defective materials and/or workmanship or damage of the finished floors.

2. Vitrified Ceramic Tiles

a. Mortar Preparation

Mortar mix proportion and preparation shall be in accordance with the requirements in paragraph b of sub-section 8.3.1.

b. Surface Preparation

Surfaces to receive the tiles shall be clean, free of dust, dirt, oil, grease, and other deleterious substances. Floor tile operations in spaces receiving wall tile shall not be started until wall tile installation has been completed. Before tile is applied with a dryset mortar bed, the structural floor shall be tested for levelness or uniformity of slope by flooding it with water. Areas where the water ponds shall be filled and leveled with mortar and shall be retested before the setting bed is applied.

c. Placing of Setting Beds and Floor Tile

Mortar setting beds shall have a minimum thickness of 20 mm for floors. The structural concrete slab shall be soaked thoroughly with clean fresh water on the day before the setting bed is to be applied. Immediately preceding the application of the setting bed, the structural slab shall again be wetted thoroughly, but no free water shall be permitted to remain on the surface.

A skim coat of neat Portland cement mortar shall then be applied not more than 4 mm thick. The mortar shall be spread until its surface is true and even and thoroughly compacted, either level or sloped uniformly for drainage, as the case requires. A setting bed, as large as can be covered with tile before the mortar has reached its initial set, shall be placed on one 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 beveled edge.

All mounted tiles shall be soaked in clean water a minimum of one hour before they are set. Absorptive mounted tile shall be

dampened by placing sheets on a wetted cloth in a shallow pan before setting. No free water shall remain on the tiles at the time of setting. Before the initial set has taken place in the setting bed, a skim coat of neat Portland cement mortar, 0.7mm to 1.6mm thick, shall be trowelled or brushed over the setting bed and/or the back of the tile, or a thin layer of Portland cement, 0.79 mm to 2 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 beaten into the mortar until true and even with the plane of the finished floor line. Beating and leveling shall be completed within one hour after placing tiles or sheets. Borders and defined lines shall be laid before the field or body of the floor. Where floor drains are provided, the floors shall be sloped to drain properly to the drains. Intersections and returns shall be formed accurately.

Cutting of tile, where necessary, shall be done along the outer edges of the floor. As far as practicable, no tiles of less than half size shall be used. Cutting and drilling of tiles shall be done neatly without marring the tile surfaces. The cut edges of tile against trim, bases, thresholds, pipes, built-in fixtures, and similar surfaces shall be ground and jointed carefully. Tile shall fit closely and neatly at all plumbing fixtures and around electrical outlets, pipes and fittings so that cover plates or escutcheons will overlap the tiles properly.

Tiles shall be secured firmly in place and loose tiles or tiles sounding hollow shall be removed and replaced. All lines shall be kept straight, parallel, and true, and all finished surfaces brought to true and even planes. The inner edges of borders shall be kept straight and, where practicable, shall form right angles at all returns. The paper and glue shall be removed from mounted tile, without using excess water, within one hour after installing the tiles.

Joints shall be parallel and uniform in width, plumb, level and in alignment. End joints in broken-joint work shall be made as far as practicable, on the center lines of adjoining tiles. Except in special arrangement and design, as indicated or specified, square tiles shall be set with straight joints, and oblong tiles shall be set with broken joints.

Joint widths shall be uniform and spaced to accommodate the tile in the given spaces with a minimum of cutting. Tiles shall be wetted, if they have become dry, before applying grout. Joints 3.2 mm or less in width shall be grouted with a neat Portland cement grout of the consistency of thick cream. Other joints shall be pointed with mortar consisting of one part Portland cement and two parts pointing sand.

The grout or mortar for joints on floors shall be white Portland cement or as specified by the Engineer. Grout painting mortar shall be forced into joints by using trowel, brush or finger application. Before the grout or mortar sets, the joints of cushion edge tile shall be struck or tooled to the depth of the cushion, filling all skips or gaps, and the joints of square edged tiles shall be filled completely flush with their surface. Dark cement shall not be seen through grouted white joints.

All surplus mortar or grout shall be removed before it has set or hardened.

d. Cleaning and Curing

Floors shall be covered with waterproofed paper with all joints lapped at least 96 mm and allowed to damp cure for at least 72 hours before foot traffic is permitted thereon.

All completed tile work shall be thoroughly sponged and washed diagonally across joints, and finally polished with clean, dry cloth. Acid cleaning of unglazed tile, when necessary, shall not be done within ten days after setting the tile. All metal shall be covered with approved grease and the tile shall be wetted with clean water, before tile is cleaned with 10% muriatic acid solution. After acid cleaning, the tile shall be flushed with clean water, and the grease coating on metal shall be removed.

Finished tile floors shall be covered with clean building paper before foot traffic is permitted on them. Board walkways shall be placed on floors that are to be continuously used as passage ways by workmen. Thresholds shall be covered with boards. Tiles vertical outside corners (external angles) shall be protected with board corners strips in areas used as passage by workmen.

3. Plain Cement Floor Finish with Non-metallic Floor Hardener

a. Trial Mix

No plain cement floor finish work shall be started without the approval of the Engineer of the trial mix.

b. Application

The concrete sub-floor shall be cleaned and projection, dust, loose particles and other materials which would prevent good bond shall be removed. The sub-floor surface shall be moistened but not soaked, dry cement shall then be sprinkled over it and the mortar shall be spreaded on the setting bed. The surface shall be tamped to assure a good bond over the entire area and screeded to provide a smooth and level bed at proper height.

Mortar mix shall be one part Portland cement to three parts sand. Following the placing of leveling concrete on the floor and after the concrete is free from excess water, a dry mixture of 2

parts of floor hardener and 1 part Portland cement shall be uniformly dusted over the floor. Three kilograms of floor hardener shall be used for every square meter of flooring or in accordance with approved manufacturer's specifications. The dry mixture shall be floated thoroughly into the surface which shall be finished by steel trowelling and cured by water or curing compound for seven (7) days.

4. Pebble washout Finish

a. Trial Mix

No exposed aggregate or pebble wash-out finish shall be started without the approval of the Engineer of the trial mix.

b. Preparation of Surface

All surface shall be cleansed and projections, dust, loose particles and other material which would prevent the good bond shall be removed.

c. Placing

The well graded "pea" gravel shall be trowelled or floated into the cement-mortar finish (1:2 mix), pressed into it to an even surface after the mortar has been placed even but before the initial set.

All exposed gravel, covering about 90-95% of the mortar surface shall not be fully embedded into the cement mortar bedding.

At the proper time, "pea" graven finish of mortar splatter shall be cleaned and exposed with brush and water leaving it clean in its natural color and texture.

5. Protection

a. Before turnover of the building to the Owner, wash pebble surfaces with 1 part muriatic acid to 6 parts clean water.

b. Apply an overlapping strokes of watershield using brush or by low pressure spraying. Dries to a tack-free surface in 4-6 hours and cures to form an effective water repellant film in approximately 24 hours.

c. Protect finished surface with specified hardeners and sealants.

8. PLUMBING WORKS

8.1 SCOPE OF WORK

The work shall include furnishing of all materials and equipment and perform all labor necessary to complete installation, testing and operation of the plumbing system in accordance with the applicable drawings and this specification.

It is not intended that the drawings shall show every pipe, fittings, valves and appliances. All such items, whether specifically mentioned or not, or indicated on the drawings, shall be furnished and installed if necessary to complete the system in accordance with the best practice of the plumbing trade and to the satisfaction of the Owner.

8.2 REQUIREMENTS ON PERMITS

Execute the work in full accordance with the requirements of all governmental agencies having jurisdiction thereof as well as with the requirements and/or recommendation of the National Plumbing Code of the Philippines and all applicable laws, codes and ordinances.

Secure and pay for all necessary approvals, permits, inspection, royalties for the use of any patented devices or system, and other similar obligations before starting work, and turn over the official records of the granting permits to the Owner without additional cost.

8.3 MATERIAL

Plumbing Fixtures - Toilet and bath accessories shall be as manufactured or distributed by "American Standard". The Contractor shall furnish and install all indicated toilet and bath accessories including all required fittings as approved and accepted by the Engineer.

- a. Water closet
- b. Lavatory
- c. Floor drain
- d. Soap holder and paper holder - All toilet/bath rooms will be provided with soap holder, toilet paper holder and chrome plated towel racks,
- e. Faucet for lavatory shall be in chrome-finish.
- f. Bath and shower fitting shall be in chrome-finish.
- g. Towel Rail shall be tubular stainless steel, 2.7mm diameter, and 0.54m long.

Pipes and Fittings:

- a. Soil, waste and vent pipes shall be Cast-iron (CI) pipes, service weight, Schedule 40. Diameter shall be as indicated in the drawings. It shall conform to ASTM A716 or A74.
- b. Water pipes shall be Galvanized Iron (GI) pipes, schedule 40. Diameter shall be as indicated in the drawings. It shall conform to ASTM A120.

- c. Drainage pipes shall be reinforced concrete pipes (RCP). Diameter shall be as indicated in the drawings.
- d. Downspout shall be polyvinyl chloride (PVC) pipes, schedule 40 75mm diameter or specified in the plans. It shall conform to ASTM D2729.
- e. Clean-outs shall be provided in all soil, storm or waste lines at every change in direction greater than 45 degrees, size same as the pipe served.

Clean-outs shall be extended to an easily accessible place or where indicated on the drawings.

- f. Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete. Pipe sleeves shall be PVC pipe, Schedule 40.
- g. Pipe hangers, inserts and supports shall be provided to all horizontal runs of pipes and shall be hung with adjustable wrought iron or malleable iron pipe hangers spaced not over 1.5 meters apart for PVC pipes and 3.0 meters apart for iron pipes.
- h. Gate valve shall be bronze with screwed ends and will be used as shut-off valves,
- i. Angle, check and globe valves shall be bronze and type suitable for applications.
- j. Floor drains shall be stainless steel with strainer size 100mm x 100mm with stainless fastening screws.

Use of materials not specified in these specifications may be allowed provided such alternatives have been approved by the Owner.

8.4 EXECUTION

All installation works shall be in conformity with the NPCP.

Plumbing fixtures shall be installed on locations as shown. Surface of fastening devices exposed after installation shall have the same finish as the attached accessory. Accessories shall be protected until the installations are accepted.

The fixtures shall be securely anchored and installed flush with the finished walls, and shall be completely concealed when the fixtures are installed.

Piping shall be installed as shown on the drawings, as recommended by the manufacturer and as directed during installation, straight and as direct as possible, forming right angles or parallel line with building walls and other pipes, and neatly spaced. Before being placed in position, pipes and fittings shall be cleaned carefully. All pipes shall be maintained in a clean condition.

All piping shall be properly supported or suspended on stands, clamps, hangers, or equivalent of approved design. Supports shall be installed in such a manner to permit pipe free expansion and contraction while minimizing

vibration. Do not install pipes in a manner that interferes with other pipes, ducts, conduits, equipment and adjacent structure of the building. All pipes shall be cut accurately to measurement and shall be worked into place without springing and forcing. Changes in pipe shall be made with reducing fittings. The position, arrangement and connection of pipes, fixtures, drains, valves and similar items indicated on the drawings shall be followed as closely as possible.

Trenches for all underground pipes shall be executed to the required depth and grade as shown on the drawings or as directed by the Engineer. Pipelines shall have been tested, inspected and approved by the Engineer prior to backfilling.

Plumbing system and equipment, after complete installation, shall be given an in service test. All defects disclosed by test shall be rectified and the test repeated. All labor, material and equipment used for tests shall be provided by the contractor. Piping shall be subjected to a hydrostatic pressure test, field leakage test and disinfection.

The Contractor shall furnish to the Owner a written guarantee covering the satisfactory operations of the plumbing installation. This shall be for a period of one year after the date of acceptance. During this period, the Contractor shall repair or replace any defective work and pay for any repair or replacement lost. All damages due to improper use or caused by the Owner or his representatives/employees shall be at the Owner's expense.

9. ELECTRICAL WORKS

9.1 SCOPE OF WORK

- a) The work to be done shall consist of fabricating, trenching, furnishing, delivering and installing of electrical materials/fixtures completed in accordance with all the details of the electrical works as shown on the drawings including materials, labor, tools and equipment and all incidental works as found necessary.
- b) Refer to electrical plans/drawings for location and extent of work involved.

9.2 GENERAL REQUIREMENTS

- a) All works shall be done in accordance with the requirements of the publications and agencies having jurisdiction, as well as the requirements of the approved standards.
 1. National Fire Protection Association - (NFPA)
 2. National Electrical Manufacturer Association - (NEMA)
 3. Underwriter Laboratories, Inc. - (UL)
 4. Philippine Electrical Code - (PEC)
Philippine National Standard - (PNS)
 5. Federation Specification :

Circuit Breaker, Molded Case, Branch
Circuit and Service

- | | | | |
|----|--|---|--------|
| 6. | American National Standard Institute | - | (ANSI) |
| 7. | American Society for Testing and Materials | - | (ASTM) |
| 8. | Illuminating Engineering Society | - | (IES) |
- b) The electrical power will be tapped from the nearest available utility company power system. The Contractor shall coordinate the exact route of the supply cable and distribution with the PPA Engineer and authorized/proper authority in the area Voltages shall be 220 volt, single phase, 60 Hertz, AC.
- c) The Contractor shall employ a licensed Registered Electrical Engineer or Master electrician to perform or to supervise and to conduct for continuous inspection of all electrical work.
- d) The Contractor shall first obtain approval from the Authority before procurement, fabrication or delivery of electrical materials to the site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the Manufacturer's Name, Trade Name, Place of Manufacture, Catalog Model or Number, Nameplate Data, Size, Layout Dimensions, Capacity, Project Specification and Paragraph Reference, Technical Society Publication References and other information necessary to establish contract compliance of each item to be furnished.
- e) All excavations, fill and backfill and concrete works involved herein, shall be carried to the required elevations and shall conform to the provisions of specification under Earthwork and Concrete Construction of this tender document.
- f) The materials and equipment to be furnished shall be standard products of reputable manufacturer engaged in the reproduction of such materials and equipment.
- g) All permits and electrical fees required for this work shall be obtained at the expense of the Contractor. The Contractor shall furnish the Engineer-in-Charge, the final Certificates of Inspections and approval from the proper government authorities after the completion of work. The Contractor shall prepare all as- built plans and all other paper works as required by the enforcing authorities.

9.3 MATERIALS REQUIREMENT

- a. All electrical materials, fixtures and equipment under by this Contract shall be furnished and installed by the Contractor.
- b. All materials, fixtures and equipment to be supplied shall be as shown in the drawings and shall be in accordance with the requirements of these specifications which shall apply to manufacturing, testing and supply of

same materials and equipment.

- c. All electrical materials whether specifically described or not shall be of the best grade and all workmanship shall be of first class in every aspect.

All electrical equipment and materials supplied shall be suitable in every respect for operation in a hot tropical climate near the sea and suitable for operation at ambient temperature up to 40° C.

Any electrical materials and equipment found not meeting the requirements of relevant standards, or of these specifications shall be rejected by the Engineer.

All materials used in this Contract shall meet the requirements described in this specification, or otherwise approved by the Engineer and shall comply with the approved standard.

9.4 PRODUCTS

WIRES AND CABLES

The conductor material to be furnished and installed shall be of copper wire Heat Resistant Thermoplastic type "THHN ". All conductors shall be rated 600 volts insulation and shall be standard for all sizes.

LIGHTING FIXTURES AND ACCESSORIES

Fixture shall conform to NEMA standard as illustrated in the plans. Illustration shall be indicative of the desired general type and shall not restrict selection of fixture to any particular manufacturer. Locally fabricated or manufactured fixture of similar design with equivalent light distribution and brightness characteristics having equal finish and quality, shall be acceptable as approved.

Die-cast aluminum housing with electrocoat gray finish shall have adjustable mogul base socket (street side), multi-photometric distribution available, and photo-electric control (PE), completely wire to the following components: 400 watts High Pressure Sodium Lamp (HOPS), HPF reactor ballast, single voltage 240 volt, with capacitor and igniter.

70 watts High Pressure Sodium Lamp (HPS)- Pole Park Light enclosed on a fiberglass dome cover and glass bottom diffuser. Mounting post shall be tapered 3000 mm height as shown on the drawing.

LAMP POST

The lamp post/s shall be furnished installed and tested for the perimeter and park lighting as shown in the plans. The post/s shall be dimensioned for a wind velocity of 185 km/hr. It shall be locally fabricated or manufactured. The post shall be zinc electroplated, prime-coated with red lead and shall be painted at site with the final coating preferably aluminum paint to be approved by the Engineer.

HANDHOLE

The handhole shall be of the type noted in the drawings and shall be constructed in accordance with the applicable details as indicated.

DUCTBANK

The contractor shall construct underground ductbank of individual conduit encased in concrete as shown in the drawing.

PANEL BOARD

The contractor shall furnish and install panel board as shown on the drawing. Panel Board shall contain molded case circuit breaker flush mounted type, magnetic contactor, push button switches and 5,5 mm² bare soft drawn copper grounding conductor. Connection shall be made by connecting one end to the body of the panel and the other end to the copper weld ground rod.

9.5 EXECUTION

- a. The Contractor shall furnish and install electrical materials as shown in the drawings. A licensed Electrical Engineer or Master Electrician is required to implement the installation of the electrical system. A licensed electrical contractor shall oversee/conduct the installation of the Main Circuit Breaker above 200 amperes.
- b. Electrical installation shall conform to the requirements of Philippine Electrical Code (PEC) and the other approved standards.
- c. The contractor shall install all electrical works with the supervision of the qualified Registered Electrical Engineer (REE) or Master Electrician. All electrical installation applications regardless of capacity and voltage whether new, addition or revision shall be accompanied by electrical plans signed and sealed by a duly licensed Professional Electrical Engineer (PEE).

9.6 INSTALLATION

Lamp Post: shall be mounted/ anchored to a reinforced concrete foundation with base plates, anchor bolts standard nuts and washers as shown in the drawing.

Pole Setting: Depth as shown in the drawing.

Construction of reinforced concrete lamp post foundation , hand holes and duct bank with steel covers shall be in accordance with the shape and dimensions as shown in the drawing.

Excavations / backfilling required before /after installation of lamp post and parking area lighting and trench shall conform to the provisions of Earthwork and Concrete Construction.

Grounding : Each lamp post shall be grounded at the base by ground lugs and ground conductor connected to a ground electrode . The grounding electrodes shall be cone pointed, sectional copper clad steel 15 mm Φ by 1000 mm meter long.

Service Entrance, Overhead : Rigid Steel Conduit Pipe (RSCP) from the service equipment to the service entrance fitting weather head outside the building.

Service Entrance Conduit Underground: (Unplasticized Polyvinyl Chloride), (UPVC). The underground portion shall encased in concrete and shall be installed as shown on the drawing.

9.7 WORKMANSHIP

The work throughout shall be executed in the best and most thorough manner under the direction of and at the satisfaction of the Registered Electrical Engineer or Master Electrician, who will interpret the intent meaning of the drawings and specification and shall have the power to reject any work and materials which in his judgement, are not in full accordance therewith.

9.8 TESTING OPERATIONS

When the electrical installation is completed, the Contractor shall test the installed electrical materials and equipment in the presence of Registered Electrical Engineer or Master Electrician. The system shall be free from any defects, shorts or grounds. All necessary instruments and personnel required for the testing shall be furnished by the Contractor at no extra cost to the Authority.

10. PAINTING AND COATING

10.1 GENERAL

The work included in this section consists of the furnishing of all labor, materials, tools and all appurtenant work in connection with painting and coatings in accordance with these specifications. All paints and coatings shall be applied by painting subcontractors and workmen approved by the Engineer.

10.2 SCOPE

The following surfaces to be painted except where otherwise specified or shown:

- a) Metal surfaces and above ground piping.
- b) All exposed concrete.
- c) All structural and miscellaneous metal.
- d) All equipment furnished without factory finished surfaces.
- e) All exposed steel mullions, tubular frames, door frames, steel sash and metal windows
- f) All sheet metal and ferrous metal trim.
- g) Interior and exterior surfaces of the building including all concrete block masonry.

The following surfaces are not to be painted:

- a) Ferrous metals having approved plating or factory paint finishes.

- b) Non-ferrous metals, unless otherwise specified or indicated; galvanized metal shall not be considered a non-ferrous metal.
- c) Equipment with factory finished surfaces unless otherwise specified.

No concrete, wood, metal or any other surface requiring protection shall be left unpainted even not specifically defined herein.

10.3 RIGHT OF REJECTION

Exterior painting or interior finishing shall be done under conditions which shall not jeopardize the appearance or quality of the painting or finishing in any way. The Engineer shall have the right, to reject all material or work that is unsatisfactory, and require the replacement of either or both at the expense of the Contractor.

10.4 PROTECTION OF THE WORK

The Contractor shall endeavor to protect the work of others during the time is in progress. The Contractor shall be responsible for any and all damage to any other work in the course of the painting job.

Protective coverings shall be used to protect floors, fixtures, and equipment while painting. Care shall be exercised to prevent paint being spattered onto surfaces which are not to be painted.

10.5 WORKMANSHIP

All painting work shall be first class and in accordance with the best standard practices of the trade.

The Contractor shall examine carefully all surfaces to be painted and before beginning any work, shall make sure that the work of other trades has been installed in a workman like condition ready to receive paint. Metal surfaces shall be clean, dry and free from mill scale, rust, grease, oil or any other substance which could affect the quality of the painting.

Paint shall be applied in the right consistency and each coat shall be brushed evenly free of brush marks, sags and runs.¹ Care shall be exercised to avoid lapping of paint on glass or hard wares. Paint shall be sharply applied to required lines. Finished paint surfaces shall be free from defects or blemishes. Surfaces from which such paint cannot be removed satisfactorily shall be painted or repainted, as required to produce a finish satisfactory to the Engineer.

Succeeding paint coating shall be applied only when the previous coat is hard and dry. All painting materials shall be used strictly in accordance with the manufacturer's directions, spread or flowed smoothly with proper film thickness and without runs, sags skips or other defects.

10.6 STORAGE OF MATERIAL

All painting materials and equipment not for immediate use shall be stored in a room approved by the Engineer for that purpose. The receiving, opening and mixing of all paint materials shall be done in this room.

Necessary precautions shall be taken to prevent fire. Rags, waste, and other materials, soiled with paint shall be removed from the premises at the end of each day's work or stored in metal containers with metal covers.

10.7 PREPARATION OF PAINT

Paint containers shall be delivered to the jobsite in manufacturer's unopened containers and shall be opened only when required for use. Paint shall be mixed only in the designated room or space in the presence of the Engineer or his representative. Paint shall be thoroughly stirred or agitated to uniformly smooth consistency suitable for proper application. Unless otherwise specified or approved, no materials shall be reduced, changed, or used except in accordance with manufacturer's label or tag on container. In all cases, paint shall be prepared and handled in a manner that will prevent deterioration and contamination with pollutants.

10.8 CLEAN-UP

Upon completion of work, the Contractor shall remove all surplus materials. All paint spills shall be removed and entire premises shall be cleaned of all rubbish, and debris, caused by the work. Finished surfaces shall be presented clean and free from blemishes and is acceptable in every way. All glass shall be cleaned of paint spots and polished before the job is presented for acceptance by the owner.

10.9 MATERIALS

- a) **Materials** - A complete list of materials proposed for use shall be submitted by the Contractor for the Engineer's approval. The Contractor may substitute other paint materials for those specified in Section 27.12 provided written approval from the Engineer is received stating that said proposed substitute materials are equal to that specified and are approved for use. The painting material shall be delivered to the job site in its original containers properly labeled without evidence of tampering, substitution of contents, or of deterioration.
- b) **Color and Samples** - All finish colors shall be as selected by the Owner. In multicoated work using color pigmented paints, each coat shall have sufficient variation of color to easily distinguish it from preceding coat.

Using specified or approved materials, 3 sample panels of each finish, including all coats thereof shall be prepared and submitted for the Owner's approval. Complete work shall match approved colors and samples.

10.10 PREPARATION OF SURFACES

- a) **General** - Except as otherwise specified, surfaces to be painted shall be clean, smooth and dry. The Contractor shall report to the Engineer in writing any surface which cannot be properly prepared for painting. If work is commenced before defects have been reported and corrected,

any resulting unsatisfactory finish shall be rectified at no cost to the PPA.

- b) Concrete and Masonry - All concrete and masonry surfaces shall be cured thirty days prior to painting. Dirt, dust, oil, grease, efflorescence and other deleterious matter shall be removed and surface roughened when necessary to insure good paint adhesion. The method of surface preparation shall be left to the discretion of the Contractor, but results obtained shall be satisfactory to the Engineer. Before application of resin emulsion paint, surfaces shall be prepared in accordance with manufacturer's directions. Before application of oil base or latex paints, surfaces shall be tested for presence of alkali; if alkali is present, neutralize as recommended by the manufacturer of the paint materials to be applied.
- c) Plaster - Dirt, dust, loose plaster and other deleterious matter which would prevent good paint adhesion shall be removed. All holes, cracks and depression shall be neatly filled with patching plaster, mixed and applied to match existing plaster. Patches shall be sanded flush and smooth and properly sealed before applying prime coat. After priming surfaces, suction spots shall be touched up with additional prime coat material until surfaces evidence a uniform coating. Enamel undercoats on smooth plaster shall be sandpapered by hand (with No. 00 sandpaper) and dusted clean before applying succeeding coat.
- d) Metal - Dirt, scale and rust shall be removed by scraping, wire brushing and sanding or sandblasting as required. Oil and grease shall be removed with mineral spirits or appropriate solvent. Before painting ferrous metal surfaces, including galvanized ferrous metal, surfaces shall be pre-treated with approved phosphoric acid etching cleaner in accordance with the manufacturer's direction to produce a chemically clean surface. Unless already performed in accordance with specifications of other sections, abrasions and bare spots in shop prime coatings shall be touched up with metal primer matching the shop coatings. Enamel undercoats shall be sandpapered by hand (with No. 00 sandpaper) and dusted clean before applying succeeding coat.
- e) Woodwork - Unless already properly sanded, woodwork shall be sandpapered smooth by hand. Before priming surfaces, knots, pitch pockets and sap streaks shall be thoroughly cleaned of residue and touched up with shellac varnish coating. After priming surface, nail holes, cracks and depressions shall be neatly filled with putty or other approved filler, colored to match required finish. Enamel undercoats shall be sanded by hand (with No. 00 sandpaper) and dusted clean before applying succeeding coat.

10.11 APPLICATION OF PAINT

- a) General - All painting and finishing shall be performed by skilled craftsmen. Each coat of paint shall be applied with the right consistency, evenly, free of laps, sags and runs and cut sharply to required lines. Paint shall be applied only under dry and dust free conditions that will insure properly finished surfaces, free of defects and blemishes unless otherwise directed by the engineer. Paint shall not be applied when temperature is likely to be above 90°F. Sufficient time shall be allowed

between application of coats. All primer and intermediate coats shall be unscarred and completely integral at time of application of each succeeding coat. The Engineer shall be notified when each coat has been applied and is ready for inspection; until coat is inspected and approved by the Engineer, no succeeding coats shall be applied. Whenever the coats of a dark colored paint are specified the first coat shall contain sufficient powdered aluminum to act as an indicator for proper coverage when applying the second coat

- b) Method of Application - Paint should be applied by brush, spray, or other application method approved by the Engineer.
- c) Priming and Back painting
 1. Priming - Before installation, all surfaces of millwork which are to be painted shall be primed giving particular attention to sealing of cross-grained surfaces. In all cases, all work shall be primed as soon as possible after installation, as required, or in case of prefabricated items, at fabricators shop or mill before shipment, if practicable. Except as otherwise specified, priming shall consist of first coat herein after specified under "Finishes".
 2. Back-Painting - Woodwork, millwork and casework to be installed against concrete masonry or plaster shall be back painted with one coat of exterior oil paint.

10.12 PAINTING SYSTEMS

Williams/ Architectural Items No.	MANUFACTURER	
	Dutch Boy	Sherwin
	<u>Number</u>	<u>Or Equivalent</u>
a) Exterior Finishes		
1. On Concrete Walls Two Coats, Concrete Masonry Paint	A69EXZ	55BOO
2. Unprimed Ferrous Metal Including G.I. Roofing		
First coat: Rush inhibit Ferrous Metal primer	20724	B16RXI
Second coat: Exterior Enamel	20-125	A71EX2
3. On Concrete Blocked Walls		
First coat:		

Concrete block primer Sealer	103	B56WX3
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Second coat : Concrete Masonry Paint	55BOO	A69EX2
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Third coat: Concrete Masonry Paint	55BOO	A69EX2
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4. On Wood

First coat: Exterior wood primer	25F	A71EX3
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Second coat : Exterior Enamel	10X	A71EX3
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Third coat: Exterior Enamel	10X	A71EX3
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b. Interior Finishes

Location of the various finishes are listed in the Finish Schedule on the drawings or else will be confirmed by the PP A.

1. On primer and coat metal two

Coats of interior semigloss Enamel or as indicated in the Schedule finish	22101	B7WX3
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2. On Plaster

First Coat: Pigmented sealer	103	B56WX3
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Second Coat : Enamel undercoater	103	A2WX2
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Third Coat Interior flat enamel	22-101	B7WX3
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3. On Wood

First Coat:

	Enamel undercoater	.001	A2WX2
	Second Coat:		
	Enamel undercoater	.001	A2WX2
	Third Coat:		
	Interior flat enamel	23-001	B7WX3
4.	Wood Stain Finish		
	Oil Stain with filler	23-11	A48N2
	Boiled on top coat	36-001	A38NX23
5.	Wood Lacquer Finish		
	Wood paste Filler w/ natural	23-11	A48N2
	Oil top coat of lacquer	68-064	970EX0
c)	Non-Architectural Items (Piping, Valves, equipment, etc.)		
1.	Piping, valves equipment Etc. in rooms are to be painted		
2.	Galvanized pipe and ducts		
	Primer - one coat	70-56	B50ZX
	Finish - one coat	22-101	B7WX3
3.	Black Steel Pipes		
	Primer - one coat	0.41	B16RX
	Finish - one coat	22-101	B7WX3
4.	Mechanical items		
a.	Ungalvanized Ferrous Metal		
	Primer - one coat	37-745	B16RX1
	Finish - one coat	22-101	B7WX3
b.	Galvanized Ferrous Metal	70.56	B50AX1
	Primer - one coat	22-101	B7WX3
	Finish - one coat		
c.	Submerged Galvanized Ferrous Metal		
	Primer - one coat	60-709	C45NX19
d.	Berried Miscellaneous Ferrous surface, valves and flange joints (excl. pipe)		
	Primer - one coat	Coal-tar enamel or match Adjacent pipe coating (if any)	

11. STEEL AND METAL WORKS

11.1 GENERAL

Division 1, "General Requirements," contains provisions and requirements essential to these specifications; and applies to this Section, whether or not referred to herein.

11.1.1 SCOPE OF WORK

The work includes the furnishing of all labor, materials, equipment and other incidentals necessary for the fabrication and installation of structural steel and miscellaneous metal works as specified in relevant items of these specifications and as indicated on the drawings.

11.1.2 SUBMITTAL

1. Before placing orders for materials for the steel and metal works, the Contractor shall submit to the Engineer for approval shop drawings for all steelwork. All project shop drawings shall show the dimension of all parts, method of construction, bolts, welding sectional areas and other details.
2. The detail of connections shown on the shop drawings shall be such as to minimize formation of pockets to hold condensation, water or dirt. A minimum gap between abutting angles and the like shall be provided wherever possible to eliminate any traps and facilitate maintenance painting.
3. No materials shall be ordered nor fabrication commenced until the shop drawings are approved by the Engineer.

11.1.3 STORAGE OF MATERIALS

Structural materials, either plain or fabricated, shall be stored above the ground upon platforms, skids, or other supports. Materials shall be kept free from dirt, grease, and other foreign matter and shall be protected from corrosion.

11.2 MATERIAL REQUIREMENTS

1. Unless specified herein all steel structures and metals shall conform with the requirements of Section 3.15, "Steel and Metal Works." Connections where details are not specified or indicated herein, shall be designed in accordance with the American Institute of Steel Construction (AISC), Manual of Steel Construction, latest edition.
2. Structural steel works consisting of channels, gusset plates and other structural steel shape shall be as indicated on the drawings and shall be structural carbon steel conforming to ASTM A 36. Shapes shall be as given in AISC, Manual of Steel Construction.
3. High strength structural bolts, shall conform to ASTM A 325, Types 1 or 2. Nuts shall conform to ASTM A 560, Grade A, heavy hex style, except nuts 38 mm (1-1/2 inch) may be provided in hex style. Washers shall conform to

ANSI B 18.22.1, Type B.

4. Electrodes for arc welding shall be E70 series conforming to American Welding Society Specifications A5.1.
5. Tests are required under the ASTM Standards for steel to be used in the Works and shall be carried out in the presence of the Engineer and at least four (4) days notice must be given to him of the dates proposed for such tests. Four (4) calendar days notice on which fabricated steelwork will be ready for inspection in the Contractor's yard.
6. Standard bolt shall conform to ASTM A 307 Carbon Steel Externally Threaded Standard Fasteners.

11.3 EXECUTION

9.3.1 FABRICATION REQUIREMENTS

1. Workmanship

Fabrication shall be performed within the permissible tolerance by the approved fabricator. All workmanship shall be of the best quality with respect to internationally recognized standards of practice.

2. Cutting

Low-carbon structural steel may be cut by machine-guided torch instead of by shears or saw. Harmful notches, burrs, irregularities, etc., shall not be developed at the cut surface.

3. Contact Faces

Contact surfaces between bases or other elements bearing directly upon bearing plates shall be ground or milled as necessary for full effective bearing. Edges for welding shall likewise be properly prepared.

4. Bolt Holes

Bolt holes shall be according to engineering practice and as specified in these specifications. Gas burning of holes will not be permitted.

5. High Strength Bolt Assembly Preparation

Surfaces of high strength bolted parts in contact with bolt heads and nuts shall not have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the surface of a high strength

bolted part has a slope of more than 1:20, a beveled washer shall be used to compensate for lack of parallelism. High strength bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible materials. When assembled, all joint surfaces including those adjacent to washers shall be free of scale except tight mill scale, and shall be free from dirt, loose scale, burrs, and other defects that would prevent solid seating of parts. Contact surfaces of friction-type joints shall be free from oil, paint, lacquer or galvanizing.

6. Welding

All welding shall be done only by welders certified as to their ability to perform in accordance with accepted testing requirement. Welding of parts shall be in accordance with structural standards and the Standard Code for Arc and Gas Welding in Building Construction of AWS, and shall only be done where shown, specified, or permitted by the Engineer. Damage to galvanized areas by welding shall be thoroughly cleaned with wire brushing and all traces of welding flux and loose or cracked zinc coating shall be removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint. The paint shall be properly compounded with a suitable vehicle in the ratio of one part zinc oxide to four parts zinc dust by weight. As an alternative to the above, the Contractor may submit for approval the use of a galvanizing rod or galvanizing solder to repair damaged areas. The welding machine shall be a stable welder, and have suitable functions for the dimension of materials to be welded. The auxiliary tools used for welding shall perform sufficiently and adequately. The welding machine used for field welding shall be of readily adjustable for electric current.

7. Shop Assembly

Structural units furnished shall be assembled in the shop. An inspection shall be made to determine that the fabrication and the matching of the component parts are correct. Jigs shall be used for the assembly of units as much as possible to maintain appropriate position of mutual materials. Approval of the Engineer shall be required when drilling temporary bolt holes or welding temporary support to the assembled structure. The tolerances shall not exceed those allowed by codes and each unit assembled shall be closely checked to insure that all necessary clearances have been provided and that binding does not occur in any moving part. In order to maintain accurate finished dimensions and shape, appropriate reverse strain or restraint shall be provided as required. Assembly and disassembly work shall be performed in the presence of the Engineer, unless waived in writing by the Engineer any errors or defects disclosed shall be immediately remedied by the Contractor.

Before disassembly for shipment, component parts of the structures shall be match marked to facilitate erection in the field.

11.3.2 FABRICATION TOLERANCES

1. Dimensional Tolerances for Structural Work

Dimensions shall be measured by means of an approved calibrated steel tape at the time of inspection. Unevenness of plate work shall not exceed the limitation of the standard mill practice as specified in the American Institute of Steel Construction, "Manual of Steel Construction".

2. Camber

Reverse camber in any structural steel members in excess of 1/1,000 of the span length shall cause rejection. The minimum dead load camber for any structural steel member shall be as allowed by Code, or otherwise specified.

11.3.3 INSPECTION AND TEST OF WELDING

1. Inspection of Welding

Inspection of welding shall be executed for the following work phases.

a. Before Welding

Scum, angle of bevel, root clearance, cleaning of surface to be welded, quality of end tab, drying of welding rod.

b. During Welding

Welding procedure, diameter of coil and wire, type of flux, welding current and voltage, welding speed, welding rod position, length of arc, melting, cleaning of slag of each level under surface chapping, supervision of welding rod.

c. After Execution of Welding

Assurance of bead surface, existence of harmful defects, treatment of crater, quality of slag removal, size of fillet, dimension of extra fill of butt welding, treatment of end tab.

2. Testing of Welding

Twenty percent (20%) of welds contributing in the overall strength of the structure and which will be inaccessible for the inspection in service shall be tested. Welding shall be tested by ultrasonic test to the extent specified herein or as directed by the Engineer. Where partial inspection is required, the ultrasonic test shall be located at random on the welds so as to indicate typical welding quality. If ten percent (10%) of the random ultrasonic tested indicate

unacceptable defect, the remaining eighty percent (80%) of the welding shall be tested. Repair welding required shall be ultrasonic tested after the repairs are made.

11.3.4 CORRECTIONS

In lieu of the rejection of an entire piece or member containing welding which is unsatisfactory or which indicates inferior workmanship, corrective measures may be permitted by the Engineer whose specific approval shall be obtained for making each correction. Defective or unsound welds or base steel shall be corrected either by removing and replacing the entire weld, or as follows.

1. Excessive convexity or overlap shall be reduced by grinding.
2. Undercuts, lack of weld shall be repaired with necessary reinforcement of weld after removal of any foreign materials such as slag, dust, oil, etc.
3. Any defects such as slag inclusions, incomplete fusion, or inadequate joint penetration, shall be completely removed, cleaned and re-welded.
4. Cracks in welds or base steel, shall be removed to sound steel throughout their length and 5cm beyond each end of the crack, followed by welding. The extent of the crack, depth and length, shall be ascertained by the use of acid etching, magnetic particle inspection or other equally positive means. The removal of welded steel shall be done by chipping, grinding, oxygen cutting, oxygen gouging, or air carbon arc gouging and in such a manner that the remaining welded steel or base steel is not nicked or undercut. Defective portions of the welding shall be removed without substantial removal of the base steel.

11.3.5 INSTALLATION

1. Installation Program

a. Prerequisite Condition

Prior to executing steel fabrication and field installation, the Contractor shall prepare a comprehensive installation program including engineering supervision organization, fabrication procedures, field installation procedures, material application, machinery applications, inspection procedure, scope and standard of quality judgment, and submit to the Engineer for approval.

b. Special Technical Engineering

Special technical engineering different from contract specifications can be applied upon receiving approval of the Engineer.

2. Installation Requirement

a. Setting of Anchor Bolt and Others

1. Anchor bolts shall be set in accurate position by using templates.
2. The setting method shall be proposed to the Engineer for his approval before setting starts.
3. The threads of bolt shall be cured with an appropriate method against rust and/or any damage before tightening.
4. Non-shrink mortar shall be placed under base plates, well cured to obtain the sufficient strength before bearing loads are applied to base plates.

b. Temporary Bracing

1. Temporary bracing shall be installed as necessary to stay assemblies and assume loads against forces due to transport, erection operations or other work.
2. Temporary bracing shall be maintained in place until permanent work is properly connected and other construction installed as necessary for support, bracing or staying of permanent work.
3. Extent and quality of temporary bracing shall be as necessary against wind and other loads, including seismic loads not less than those for which the permanent structure is designed to resist.

c. Adequacy of Temporary Connections

During erection, temporary connection work shall be securely made by bolting and/or welding for all dead load, wind and erection stresses.

d. Alignment

No permanent bolting or welding shall be done until the alignment of all parts with respect to each other shall be true within the respective tolerances required.

e. Field Welding

1. Any shop paint or surfaces adjacent to joints where field welding is to be executed shall be wire brushed to remove paint/primer.

2. Field welding shall conform to the requirements specified herein, except as approved by the Engineer.
- f. High Strength Bolts
 1. Final tightening of high strength bolts shall be done by using manufacturer's power operated equipment without any overstress to the threads.
 - g. Correction of Errors
 1. Corrections of minor misfits by use of drift pins, and reaming, chipping or cutting will be permitted and shall be provided as part of erection work.
 2. Any errors to be corrected or adjusted, preventing proper assembly, shall be immediately reported to the Engineer, and such corrections or adjustments shall be made as necessary and approved by the Engineer.
 3. Cutting or alterations other than as approved will not be permitted.
 - h. Erection
 1. Erection and installation shall be as per approved shop drawings.
 2. Each structural unit shall be accurately aligned by the use of steel shims, or other approved methods so that no binding in any moving parts or distortion of any members occurs before it is finally fastened in place.
 3. Operations, procedures of erection and bracing shall not cause any damage to works previously placed nor make overstress to any of the building parts or components. Damage caused by such operations shall be repaired as directed by the Engineer at no extra cost to the Employer.

12. CARPENTRY AND JOINERY

12.1 SCOPE OF WORK

The work shall consist of furnishing all tools, labor, equipment, and materials, unless otherwise specified to complete all carpentry and joinery works shown on the Drawings and specified herein.

12.2 GENERAL REQUIREMENTS

Lumber Grades - Lumber shall be of the best grade available, of the respective kinds required for the various parts of work; well seasoned, thoroughly dry and free from loose or unsound knots, sap, shakes or other imperfections impairing its strengths, durability and appearance. All exposed woodwork shall be smooth by dressed and sandpapered unless otherwise indicated or specified.

Framing lumber shall be of the rough dimensions unless otherwise shown on the drawings.

Substitution of Lumber - Any lumber equally good for the purpose intended maybe substituted for the kind specified, subject to prior written approval of the Engineer. Provided, however, that in the substitution of the cheaper kind of lumber than that specified, a reduction in the contract price equal to the difference in the costs of the two kinds of lumber shall be made.

Delivery and Storage - The Contractor shall deliver lumber to the site in undamaged condition. Lumber shall be stacked in such a manner as to insure proper ventilation and drainage, and shall be supported at least 150 mm aboveground- Lumber shall be protected against dampness before and after delivery, and enough protection shall be provided to prevent damage from the weather. Lumber shall be stored under cover in well ventilated enclosure, not exposed to extreme changes of temperature and humidity; and in a manner as to provide air-circulation around all surfaces of each pile to insure thorough air-seasoning. Lumber or millwork in buildings shall not be finished until concrete, masonry work, and plaster are dry. Lumber shall be delivered at least thirty (30) days before use.

Grading of Plywood - Each sheet of plywood shall bear the mark identifying the plywood as to wood species, glue type, and grade.

12.3 MATERIALS

- a. Lumber - Lumber for various uses shall be one of the species listed for the purpose indicated unless otherwise specified in the drawing. For any use not specified, the lumber shall be the best commercial grade normally used for the purpose, subject to the approval of the Engineer.

All framings shall be done as far as possible with carefully fitted mortise and tenon joints.

All doors, windows, transoms, or other opening where so indicated on plans, shall have frames and sills of the dimensions shown or as hereafter detailed, and all frames coming in contact with concrete shall be anchored by means of 20-d nails, spaced not more than 0.20m, apart, all around the contact surfaces. All frames shall be rabbetted, molded and cut with saw and cut under for water drips.

SPECIE	USE
Yakal	- All door jambs, headers and transom bars, wood plates, and all other woodwork in contact with concrete or masonry and where indicated.
Apitong (pressure treated)	- All truss members and rafters, and where indicated, all wood framings and carpentry; except when in contact with concrete.
Tanguile (Kiln dried)	- All exterior and interior millwork, siding, finish and trim, framework,

and all other woodworks not
specifically mentioned;
except when in contact with concrete.

- b. Plywood - shall conform to Commercial Standard PSI and shall be of local manufacture.

Plywood to be varnished shall be Tanguile or Kalantas veneers (as indicated), ribbon grained, water resistant. Class B and of the thickness indicated.

Plywood to be painted shall be Tanguile veneer ordinary rotary-cut, water resistant, Class C and of the thickness indicated.

Plywood exposed to the outside elements or where indicated shall be waterproof or marine plywood and of the thickness indicated.

- c. Fastenings - Fastenings shall be common nails, glue or specified, flat-head wood screws (F.H.W.S), round-head wood screws (R.H.W.S), bolts or lag screws where specified or called for shall be used. Conceal fastenings as much as possible; where not possible, locate them in inconspicuous places. Where nailing is permitted through woodwork smooth-finished face, conceal nail heads.

Nails - shall be of the smooth shank, zinc coated, common wire nails of local manufacture, and of types and sizes best suited for the purpose.

Wood Screws - shall be brass or cadmium plated, of the best available commercial quality, and of types and sizes suited for the purpose.

12.4 PRESSURE TREATED LUMBER

Preservative Treatment - All lumber indicated to be pressure treated, shall contain any of the following net retention of solid preservative.

Boliden salts - 45.5 kg. dry chemical per cubic foot of wood.

Wolman salts - 0.31 kg. dry chemical per cubic foot of wood.

Tenalith salts - 0.34 kg. dry chemical per cubic foot of wood.

prepared concentrated preservatives solution shall be applied to the end-cut or bored surfaces.

12.5 ROUGH CARPENTRY

All work shall be well fitted, accurately set, and rigidly secured in place. Anchors and bolts (with nuts and washers) straps and tie rods shall be provided as required.

Cutting and fitting to accommodate other work shall be done in the required manner; and cut or damaged work shall be patched and made good.

Framing and structural lumber shall be well-seasoned, straight, square-edge stocks, and free from loose or unsound knots, bark edges or other defects that will impair its strength.

Plates for walls and partitions shall be of the same width as the studs and shall form continuous horizontal ties.

Structural members shall not be cut, bored or notched for the passage of pipes or conduits without prior approval of the Engineer. All members damaged by such cutting or boring shall be reinforced by means of specially formed and approved sheet metal or steel shapes or remove or replaced with new member as directed.

Anchors, connectors and fastenings not indicated or specified otherwise shall be of the size and types necessary to suit the conditions encountered. Size, type and spacing of nails, screws or bolts for installation of manufactured building materials shall be as recommended by the product manufacturer unless indicated or specified otherwise. Rough hardware, exposed to weather or in contact with exterior walls or masonry or slabs shall be zinc-coated except as specified otherwise.

All lumber surfaces in contact with concrete or masonry shall be given a brush coat of bituminous paint before installation.

12.6 JOINERY WORK

All lumber used for the joinery work shall be of the kinds and grades specified and shall be of the contours, patterns and profiles indicated.

All joints shall be made, installed tight and securely fastened in a manner approved by the Engineer. Exterior joints shall be inhered and interior angles coped. Panels shall be fitted to allow for shrinkage, avoid swelling, and insure that the work remain in place without warping, splitting and opening of joints.

Interior trims shall be approved standard stock moldings, except where special patterns or profiles are indicated.

Joints for cabinet work shall be glued in addition to nails or other fastening device required. Nailing shall be concealed where practicable. Where face nailing is used, nails shall be set for putty stopping.

All exposed surfaces shall be machined or hand sanded finished to an even smooth surface. No hammer marks or other unsightly marks shall be allowed on any wood panel or veneer.