INSTALLATION OF WINDOWS

1. Surface Preparation
Ensure surfaces to receive panels are structurally sound, even, smooth, clean, dry, and free from defects detrimental to work.

W-1 - 1.5mm thick Aluminum Framed Powder Coated Fixed Type Window with 10mm Thick. Reflective Tempered Glass (1.20m x 2.40m)

W-2 - 1.5mm thick. Aluminum Framed Powder Coated Fixed Type Window with 10mm Thick. Reflective Tempered Glass (3.60m x 2.40m)

W-3 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type-Cum-Fixed Type Window with 10mm thick. Reflective Tempered Glass (2.40m x2.40m)

W-4 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type Window with 10mm thick. Reflective Tempered Glass (1.20m x 0.60m)

W-5 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type-Cum-Fixed Type Window with 10mm thick. Reflective Tempered Glass (3.60mx2.40m)

W-6 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type-Cum-Fixed Type Window with 10mm thick. Reflective Tempered Glass (1.80m x1.60m)

W-7 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type-Cum-Fixed Type Window with 10mm thick Reflective Tempered Glass(2.40mx1.60m)

W-8 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type Window with 10mm thick. Reflective Tempered Glass (3.60m x 0.60m)

W-9 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type Window with 10mm thick. Reflective Tempered Glass (2.40m x 0.60m)

W-10 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type-Cum-Fixed Type Window with 10mm thick. Reflective Tempered Glass (1.80m x2.40m)

W-11- 1.5mm thick. Aluminum Framed Powder Coated Awning Type-Cum-Fixed Type Window with 10mm thick. Reflective Tempered Glass (1.80mx1.20m)

W-12- 1.5mm thick. Aluminum Framed Powder Coated Awning Type Window with 10mm thick. Reflective Tempered Glass (W-12) (2.40m x 1.20m)

W-13 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type Window with 10mm thick. Reflective Tempered Glass (1.20m x 2.10m)

W-14 - 1.5mm thick. Aluminum Framed Powder Coated Awning Type Window with 10mm thick. Reflective Tempered Glass (3.60m x 1.20m)

W-15 - 1.5mm thick. Aluminum Framed Powder Coated Fixed Type Window with 10mm thick. Reflective Tempered Glass (2.80m x 1.20m)

W-16 - 1.5mm thick. Aluminum Framed Powder Coated Fixed Type Window with 10mm thick. Reflective Tempered Glass (3.60m x 1.20m)

Mirror Glass

Mirror glass shall be of high quality float glass free from imperfections and impurities, 6.3 mm (1/4 inch) thick. Silvering shall be performed by modern continuous operation under controlled conditions. The coating shall be of pure silver and of adequate thickness to provide reflectivity of 83% or more of incident light, and shall be without pinholes or other defects visible to the naked eye.

Refer to plans for locations, dimensions and details.

ITEM 09 : PLUMBING AND SANITARY WORKS

SCOPE OF WORK

The work covered for this section shall consist of furnishing all labor, tools, equipment, materials, and incidentals necessary for the complete installation, testing, and operation of the plumbing and sanitary system within the buildings and premises in accordance with these Specifications and as shown on the drawings or as directed by the Engineer. The septic tank and its effluent and discharge pipelines shall be part of other sections of these specifications.

MATERIAL REQUIREMENTS

SUBMITTAL

1. The Contractor shall submit their work method statement with necessary shop drawings to the Engineer for approval twenty-eight (28) days before the start of the works.

   Shop drawings shall be dated and shall contain the name of the project and the location of the subject item in the shop drawing that is to be installed.

   The Engineer will review and approve or return for correction all shop drawings with reasonable promptness. The Contractor shall make any corrections required and file with the Engineer three (3) corrected copies of the shop drawings.

2. The drawings shall indicate the general arrangement of all piping; however, where actual conditions necessitate re-arrangement in the opinion of the Contractor and/or the Engineer, the Contractor shall prepare and submit to the Engineer for approval, within twenty-eight (28) days before placing the order for materials, shop drawings of the proposed re-arrangement. Because of the small scale of the drawings, shop drawings to indicate all offsets, fittings, and accessories shall be prepared. The Contractor shall carefully examine the drawings and shall carefully investigate actual structural and finish conditions affecting all his work.

3. The Contractor shall be responsible for the proper fitting of materials, equipment, and accessories without substantial alteration and at no cost to the Employer.

4. The Contractor shall be responsible for the proper coordination of the work and shall provide all necessary clearance where necessary.

STANDARDS

Use of materials shall further be governed by other requirements imposed on other sections of these Specifications. Materials shall be subject to tests necessary to ascertain their fitness if the Engineer so requires. All works shall comply with the pertinent provisions of the Plumbing Code of the concerned city or town, the Code on Sanitation of the Philippines, and/or the National Plumbing Code of the Philippines.

MATERIALS

1. Identification of Materials

   Each length of pipe, fittings, traps, fixtures and devices used in the plumbing work shall have cast, stamped or indelibly marked on it, the approved manufacturer's trademark or name, the weight, type and class of product when so required by the standards mentioned above.

2. Alternative Materials

Use of any material not specified in this Specification may be allowed provided such alternate has been approved by the Engineer and provided further that a test, if required, shall be done by an approved agency in accordance with generally accepted standards.

3. Soil, Waste, Drain, Vent Pipes and Fittings

Soil, waste, and vent pipes shall be unplasticized Polyvinyl Chloride (uPVC) pipes. Diameter shall be as indicated on the Drawings. It shall conform to ASTM D 1784 or ASTM D 2729.

Drainage pipes shall be reinforced concrete pipes (RCP), diameter as indicated on the Drawings.

4. Jointing Material

The joint material for uPVC pipes shall be PVC solvent cement as recommended by the approved pipe manufacturer.

5. Water Supply Pipes

Water supply pipes shall be polypropylene random-80 (PPR-80) pipes PN 20 conforming to DIN Standards DIN 1988/DIN 8078, German-made. Jointing shall be fusion welded.

6. Cleanouts, Plugs, and Tee

Cleanouts shall be of the same material as the pipe to be fitted. Cleanouts installed in connection with uPVC hubs and spigot pipes shall consist of a long sweep quarter bend of ¼ as shown on the drawings.

7. Pipe Sleeves

Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete. Pipe sleeves shall be uPVC pipe, Schedule 40.

8. Downspout

All downspouts shall be unplasticized polyvinyl chloride (uPVC) pipe class DWV conforming to ASTM D2729 or ASTM D1784 for sanitary pipes, Series 1000.

9. Splash Block

Provide splash blocks at the outlet of the downspout emptying at grade, which shall be made of pre-cast concrete, with smooth finished countersunk dishes sloped to drain away from the building. Dimensions as shown on the Drawings.

10. Roof Strainers

The Contractor shall provide fittings and install 100mm G.I. mesh wire strainers where shown or indicated on the drawings and/or where the Engineer directs. Each strainer shall fit the size of the corresponding downspout, which is to be installed.

11. Shower, Floor, and Urinal Drain

Shower and floor drains shall be made of a stainless-steel non-tilting grate, perforated or slotted. Urinal drains shall be cast-iron dome-type drains.

12. Pipe hangers, Inserts, and Support

a. Pipe hangers shall be wrought iron, malleable iron pipe hangers spaced not over 1.5meters apart for uPVC pipes and 3.0meters apart for iron pipes. Chain straps, perforated bars, or wire hangers will not be permitted.

Hangers shall have short turnbuckles or other approved means of adjustment. Turnbuckles may be omitted on hangers where space does not permit their use. Trapeze hangers may be used in lieu of separate hangers for pipes running parallel to each other and close together.

b. Inserts shall be of cast iron or cast steel and shall be of a type to receive a machine bolt head or nut after installation.

c. Wrought iron clamps or collars shall be used to support vertical runs of pipes.

13. Unions

Union pipe 50mmØ and smaller shall be malleable iron. Union on water piping 63mmØ and larger shall be flanged pattern and shall be of galvanized (zinc-coated) cast iron. Gaskets for flange unions shall be of best quality fiber, plastic or leather.

14. Valves

Valves shall be cast bronze of brass body. Chrome plated finish for all fixture taps and faucets, and natural finish for all others, like hose bibbs, gate valves, and those that are not tapped directly to a plumbing fixture. Concrete valve boxes shall be installed where required and will be of sufficient size for operating the valve.

15. Fixtures

a. Water Closets

All water closets for toilets as shown on the drawings shall be TANK TYPE, white with complete fittings and mounting accessories.

b. Lavatories

b. 1. Lavatory (Wall Hung)

Shall be a vitreous China, wall-hung lavatory with rear overflow holes, fitting ledge suitable for single faucet holes on centers complete with faucet, standard fittings, trap, and lavatory brackets and other accessories.

b. 2. Lavatory (Countertop Lavatory)

Shall be a vitreous China, oval or round-shaped countertop lavatory with front overflow hole, complete with faucet, supply valve, and fittings with P-trap. Fitting ledge suitable for a single hole on center.

c. Urinals

c. 1. Urinals for all comfort buildings shall be built-in urinal troughs as shown on the drawings.

c. 2. Urinals shall be vitreous china, wall-hung washout urinal, flushing rim, integral trap, 19mm top, and shall be provided with water water-saving flush system.

d. Service Sinks

Service sinks, where indicated or shown on the Drawings, shall be stainless steel, with a single bowl and with complete U.S. or Japan imported fittings.

e. Slope Sinks

Slop sink shall be 24"x20" acid-resistant enamel on Cast-Iron with concealed hanger and faucet.

Hose bibb shall be of brass finish.

f. Soap Holder

Soap holder and toilet paper holder shall be vitreous China, wall-mounted. All toilets/bathrooms will be provided with soap holders, toilet paper holders, and chrome-plated towel racks.

g. Faucet for lavatory

The faucet for the lavatory shall be in chrome finish.

h. Bath and shower fitting

Bath and shower fittings shall be chrome finish.

i. Towel Rail

Towel rail shall be tubular stainless steel, 2.7mmØ, and 0.54m long or as specified in the drawings.

j. Curtain rod

Curtain rod shall be tubular stainless steel, 19mmØ or as specified in the drawings.

k. Grab Bar

Grab bars shall be tubular stainless steel, 25mmØ or as specified in the drawings.

l. Bidet Spray Combination

Installed in every cubicle near the water closet, colored white or its equivalent

16. Concrete, Reinforcing Steel, Pipe, and Steel Plate

Materials for wash pits, catch basins, and manholes shall conform to the requirements as follows:

a. Concrete materials shall conform to the requirements in "Concrete Works" and shall be Class C concrete with a 28-day minimum compressive strength of 21 MPa (3,000 psi).

b. Reinforcing steel shall be as shown on the drawings and shall conform to the requirements of reinforcing steel bars in "Concrete Works."

c. Pipes shall be as shown on the drawings and shall comply with the relevant item of the particular pipe.

d. Steel plates shall be as shown on the Drawings and shall comply with Section "Steel and Metal Works".

17. Non-reinforced Concrete Pipe

Non-reinforced concrete pipe shall be as shown on the Drawings and shall conform to the requirements of non-reinforced concrete pipes, AIC, latest edition. Concrete shall have a 28-day minimum compressive strength of 20.7 MPa.

18. Valve for Drinking Fountain

Valve where drinking fountain will be connected shall be polished brass pipe and shall have a red enameled handle.

EXECUTION

All installation works shall be in conformity with the National Plumbing Code of the Philippines (NPCP).

EXCAVATION, TRENCHES, AND BACKFILLING

1. Trenches for all underground pipelines shall be excavated to the required depth. The bottom of trenches shall be tamped hard and graded to secure the required fill. Bell holes shall be excavated so that pipes will rest on solid ground for their entire length.

Rocks where encountered shall be excavated to a depth of 150mm below the bottom of the pipe, and before the pipe is laid, the space between the bottom of the pipe and the rock shall be filled with sand. Sewer and water pipes shall be laid in separate trenches.

2. After pipelines have been tested, inspected, and approved by the Engineer and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris.

Materials for backfilling shall consist of acceptable excavated soil, borrow of sand, gravel, or other materials approved by the Engineer, and shall be free from trash, lumber, or other debris. Backfill shall be placed in horizontal layers not exceeding 150 mm in thickness and properly moistened to approximate optimum requirements. Each layer shall be compacted by hand or machine tamper or by other suitable equipment to a density that will prevent excessive settlement or shrinkage.

Backfilling shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage thereof.

Water pipes shall have a sand cushion 150mm below and above the pipes.

INSTALLATION OF SOIL, WASTE DRAINS, OR VENT PIPES

1. Horizontal Drainage Pipe and Vent Piping

Horizontal waste pipes 75mmØ and smaller shall have a minimum grade of 6.5mm per 0.30m, and for 100mmØ and larger, 3.2mm per 0.30m. All main vertical soil and waste stacks shall be extended full size above the roof line as vents, except where otherwise specifically shown.

Where practicable, two (2) or more vent pipes shall be connected together and extended as one pipe through the roof. Vent pipes in roof spaces shall be run as close as possible to the underside of the roof with horizontal piping pitched to stacks using fittings as required, without forming traps in pipes.

Vertical pipe vents may be connected to a vent line carrying other fixtures. The connection shall be at least 1.20m above the floor on which the fixtures are located to prevent the use of vent lines as waste. Horizontal waste lines receiving the discharge from two (2) or more fixtures shall be provided with vents, unless separate venting of fixtures is noted.

2. Fittings

All changes in pipe sizes on soil waste lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of forty-five (45) degree wyes. Long sweep quarter bends or elbows may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical, and on the discharge from water closets.

Where it becomes necessary to use short radius fittings in any location, the approval of the Engineer shall be obtained before they are installed.

3. Joints

a. PVC Soil Pipe

All joints in uPVC soils, waste, and vent pipe shall be accomplished by the use of PVC solvent cement.

b. All joints for uPVC shall be accomplished by applying the manufacturer's recommended solvent before connection to the pipe.

4. Cleanouts

Cleanouts at the bottom of each soil stack, waste stack, and where else indicated shall be the same size as the pipe.

Cleanouts on floors shall be by uPVC plug adapter fitted into the hub and fitted with uPVC screw plugged flush with the floor.

Cleanout shall be provided at every change in direction greater than 45 degrees.

5. Flashings

All pipes passing through the roof shall be provided with lead flashings. All flashings shall be built to 40 lbs. bituminous felts and shall extend up to the pipe and down-over to the top of the pipe at least 150mm and along the roof not less than 300mm and shall lap over flashing to make a weatherproof joint.

6. Traps

Each fixture and piece of equipment requiring connections to the drainage system, except fixtures with continuous waste, shall be equipped with a trap. Traps shall be specified to be supplied with the fixtures. Each trap shall be placed as near to the fixtures as possible.
Traps installed on threaded pipes shall have a recessed drainage pattern.

7. Pipe Sleeves, Hangers, and Supports

Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete, except unframed floors on earth.

Pipes shall not be permitted to pass through footings or beams unless noted on the drawings.

Pipe sleeves in floors shall extend not less than 25mm and not more than 50mm above the finished floor. After installation of the pipe, the space around the pipe shall be packed with plastic material and made watertight. Flashing shields for sleeves passing through the waterproofing membrane shall be thoroughly mopped into the membrane. The space between the pipe and sleeves shall be made watertight by inserting approved sealing and caulking materials.

INSTALLATION OF WATER PIPES, FITTINGS, AND CONNECTIONS

1. Gate Valves and Outlets

Gate valves shall be installed close to the point of connection to the existing service line outside the building. The piping shall be extended to all fixture outlets and equipment from the gate valves. Outlets where indicated shall be capped or plugged and left ready for future connections.

2. Mains, Branches, and Runouts

All runs of piping shall be installed as shown on the drawings. The piping shall be cut accurately to measurements and installed at the building site by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the buildings.

All pipes above ground shall be run parallel with the lines of the building unless otherwise shown on the drawings. Branch pipes from service lines may be taken off on top of mains, bottom of mains, or side of mains, using such cross-over fittings as may be required by structural or installation conditions.

All service pipes, valves, and fittings shall be kept at a sufficient distance from the other work to permit finished covering not less than 6.5mm from such other work and not less than 13mm between finished coverings on different services. No water piping shall be buried in floors unless specifically indicated on the drawings or approved. Changes in pipe sizes shall be made with reducing fittings.

The use of long screws and bushings is prohibited.

3. Joints

Joints and connections in the plumbing system shall be gas-tight and watertight for the pressures required by the test.

After cutting and before threading, all pipes shall be reamed and shall have burrs removed. All screwed joints shall be applied with an approved graphite compound or TEFLON tape to facilitate connections. Threads shall be full cut, and not more than three threads on the pipe shall remain exposed.

Caulking of threaded joints or top to prevent leaks shall not be permitted.

Unions shall be provided where required for disconnection. Threaded swing bolts shall be used for branch connections to risers and mains.

4. Unions

Where required, unions shall not be concealed in walls, ceilings, or partitions.

5. Tests

The following tests shall be conducted by the Contractor at his expense under the supervision of the Engineer.

a. Tests for Drainage and Venting System

The entire drainage and venting system shall have necessary openings plugged to permit the entire system to be filled with water to the level of the highest vent stack above the roof. The system shall hold the water for 30 minutes with a drop not greater than 100mm.

b. Sterilization

The entire water supply piping system shall be sterilized with a solution containing not less than fifty (50) parts per million of available chlorine, either liquid chlorine or a solution of sodium hypochlorite. The sterilizing solution shall remain in the system for a period of not less than 8 hours during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chloride content is not more than 0.2 parts per million.

c. Pressure Test for Water Lines

1. After the pipe has been installed, the joints are completed and with joints exposed for examination, all newly installed pipe or any valve section, thereof, shall be subjected to hydrostatic pressure one and one half (1½) the designed working pressure of the system or as specified by the Engineer.

2. The duration of each pressure test shall be at least 20 minutes unless otherwise specified by the Engineer.

3. Each section of the pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be

applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. During the filling of the pipe and before applying the test pressure, all air shall be expelled from the pipeline. To accomplish this, tap shall be made if necessary, at the highest point of the pipe under test and after completion of the test, the taps shall be tightly plugged unless otherwise specified. During the test, all exposed pipes, fittings, valves, joints and couplings will be carefully examined. If found to be cracked or defective, they shall be removed and replaced by the Contractor with sound materials at his expense. The test shall then be repeated until satisfactory results are obtained.

d. Leakage Test for Water Lines

1. A leakage test shall be conducted after satisfactory completion of the pressure test and shall consist of an examination of all exposed joints for leakage as well as an overall leakage test of the completed pipeline.

2. The pressure to be maintained during the test shall be the designed working pressure of the system.

3. The leakage test shall be made only after a minimum of 24 hours after the pipe to be tested has been filled with water.

4. The duration of each leakage test shall be two hours unless otherwise specified by the Engineer.

5. Each section of pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a positive displacement type pump and a reservoir connected to the

pipe in a manner satisfactory to the Engineer.

6. Before starting the leakage test, all air shall be expelled from the pipe. All exposed pipes, fittings, valves, and joints shall be examined for leakage during the test.

7. Allowable leakage rate per 100 joints per inch of Pipe Diameter at Pressure Stipulated.

PRESSURE		LEAKAGE RATE	
psi	kg/cm^2	liters/hr.	liters/2 hrs.
50	3.50	1.45	2.90
75	5.30	1.75	3.50
100	7.00	2.05	4.10
125	8.80	2.30	4.60
150	10.50	2.50	5.00
200	14.00	2.90	5.80

e. Defective Work

1. If the inspection or test shows any defect, such defective work or material shall be replaced and the test shall be repeated until satisfactory to the Engineer.

2. All repairs to piping shall be made with new materials at the expense of the Contractor.

3. No caulking of screwed joints or holes will be accepted.

ASSEMBLY, INSTALLATION AND CONNECTION OF FIXTURES

Fixtures shall be supported and fastened in a satisfactory manner. Where secured to concrete or masonry work walls, fixtures and equipment shall be fastened with brass bolts or machine screws in lead-sleeve type anchorage units or with brass expansion bolts. Expansion bolts shall enter 7.5 cm into solid concrete or masonry works and shall be fitted with loose tubing or sleeves of proper length to bring expansion sleeves into the solid concrete masonry walls.

Where wood screws are used, screws shall go into solid pieces set between studs. Where through-bolts are used, bolts shall be provided with plates or washers at back set, so that they will be concealed by plaster. Bolts and nuts shall be hexagonal, and exposed nuts, cap nuts, and screw heads shall be provided with chromium-plated brass washers.

PROTECTION OF FIXTURES

Pipe openings shall be closed with caps or plugs during installation. Fixtures shall be tightly covered and protected against dirt, water, and chemical injury. At the completion of all works, all fixtures shall be thoroughly cleaned and delivered in a condition satisfactory to the Engineer.

FIXTURES AND FASTENING

All fixtures shall be supported and fastened in a satisfactory manner as follows:

1. Where secured to concrete or concrete hollow block walls, they shall be fastened with one quarter inch brass bolts with twenty threads to the inch and of sufficient length to extend at least 7.5 cm into solid concrete or hollow block work, fitted with loose tubing or sleeve insert and shall be securely anchored and installed flush with the finished wall and shall be completely concealed when the fixtures are installed.

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

GUARANTEE

Upon completion and before final acceptance of the equipment installation, the Contractor shall furnish the Engineer a written guarantee stating that all equipment installed under this Section is free from defects. The guarantee shall be for a period of one (1) year from the date of final acceptance of the work. Any part of the equipment that becomes defective during the term of the guarantee shall be replaced, renewed, and/or made good by the Contractor, at his own expense and in a manner satisfactory to the Engineer.

Guarantees made by the approved manufacturers or suppliers beyond one year shall be transferred to PPA without any expense on his part.

CLEANING UP

Upon completion of the work, all parts of the installation shall be thoroughly cleaned of grease, metal cuttings, and sludge that may have accumulated during the testing operation.

PLUMBING, FIXTURES, AND TOILET ACCESSORIES INSTALLATION

All installation works shall be as shown on the drawings and shall conform to the applicable standards set forth by the Philippine National Plumbing Code. All fixtures shall be fastened and/or supported in accordance with the given requirements.

ITEM 10 : ELECTRICAL WORKS

GENERAL DESCRIPTION

The work to be done under this Item of Specifications consists of fabrication, furnishing, delivery and installation, complete with all details of electrical work, in the subject area and all work materials related to the proper completion of the installation, except for those parts of the work that are expressly stated to be performed by others. All works shall be in accordance with the governing Codes and Regulations and the Specifications, unless the same are inconsistent with such codes, etc., as may later govern. The requirements regarding the materials and equipment required for the complete installation of the work specified herein and indicated on the drawings. The Specifications are intended to provide a broad outline of the equipment required, but are not intended to include all design details and construction specifications.

WORK INCLUDED

The work to be done under this Item shall include the furnishing of all tools, labor, supervision, equipment, fixtures and all necessary materials, each complete and in proper working condition unless one or other is specifically excluded or stated otherwise in this specifications but not limited to the following items of works.

a. All works and material for a complete lighting and power systems including cables and conduits, circuit breakers, panel board and connection to all lighting fixtures and power outlets, air condition, switches, supports and accessories.

b. All steel support for conduits, wires, panel board, boxes, lighting fixtures, etc. as indicated or as required to the completion of the installation.

c. Termination of all electrical system and the complete grounding system.

d. A complete testing and commissioning of all electrical and auxiliary systems. The Contractor shall provide all necessary testing instruments.

e. All items incidentals to and or required for the proper completion such as painting of boxes, conduits and the likes.

f. Coordination with other companies/offices including handling of all material related to material testing and application of electrical permits in the expense of the Contractor.

g. Preparation of necessary shop drawings required for the proper execution of the works subject to the approval of the Engineer.

SUBMITTALS

Obtain approval before procurement, fabrication or delivery of items to the job site. Partial submittals will not be entertained and will be returned without review. Submittals shall include the manufacturer's name, trade name, place of manufacturer, catalogue model of number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference and technical society publication references, and other information necessary to establish contract compliance of each item to be furnished.

a. Shop Drawings

In addition to the requirements of the contract clauses, shop drawings shall meet the following requirements:

1. Drawings shall be a minimum of 210 mm x 297 mm in size or in A3 size, except as specified otherwise.

2. Drawings shall include wiring diagrams and installation details indicating the proposed location layout and arrangement, control panels, accessories, and other items that must be shown to assure a coordinated installation.

3. Wiring diagrams shall identify circuit termination and the internal wiring for each item of equipment and its interconnection.

4. Drawings shall indicate adequate clearances for operation, maintenance and replacement of equipment devices. If the layout is disapproved, revise the layout and resubmit.

b. Manufacturer's Data

Submittals for each manufactured item shall include manufacturer's descriptive literature, equipment drawings, diagrams, performance and characteristic curves and catalog cuts. Each submittal shall have the manufacturer's name, trade name, catalogue model or number, name plate data, size, layout dimensions, capacity, specification references and all other information necessary to establish contract compliance.

c. Standard Compliance

When material or equipment must conform to the standards of organizations such as American National Standard Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturer's Association (NEMA) and Underwriters Laboratories (UL), proof of such conformance shall be submitted to the Engineer for approval.

If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization, which is competent to perform acceptable test and is approved by the Engineer. The certificate shall state that the item has been tested in accordance with specified organization's test methods and that the item conforms to the specified organization's standard. For materials and equipment whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval.

The certificate shall identify the manufacturer, the product and the referenced standard and shall simply state that the manufacturer certifies that the product conforms to all requirements of the project specification and of the referenced standards listed.

DELIVERY AND STORAGE

Equipment and materials shall be properly stored and adequately protected and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Engineer. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Cables shall be sealed, stored and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Damaged or defective items shall be replaced with new items at no cost to the Owner.

CATALOGUED PRODUCTS

Materials and equipment shall be catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be at manufacturer's latest standard design that complies with the specification requirements. When two or more units of the same type, class and size of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name, address and the model of the serial number on a nameplate securely affixed in a conspicuous places, the name plate of the distributing agent will not be acceptable.

MANUFACTURER'S RECOMMENDATIONS

Where installation procedures or any parts thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendation prior to installation. Installation of the items shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or materials.

WORKMANSHIP

The work throughout shall be executed in the best and most thorough manner under the direction of the Contractor and to the satisfaction of the Owner and Engineers, who will jointly interpret the meaning of the drawings and specifications and shall have the authority to reject any work materials which, in their judgment, are not in full accordance therewith

The Contractor shall have on file, for ready access and reference, a set of drawings indicating all work as actually installed incorporating in the same all changes and additions. Upon the termination of the Contract, he shall prepare a set of tracings indicating thereon the Electrical Work as actually and finally installed. These drawings shall be turned over to the Engineers.

The Contractor shall be responsible for keeping stocks of material and equipment stored at the premise in a neat and orderly manner. The exposed surfaces of wirings, conduit system or equipment which have become covered with dirt, plaster or other material during handling and construction shall be thoroughly cleaned by Contractor before such surfaces are prepared for final finish, painting or concealment within the building structure.

The Contractor shall employ skilled craftsmen experienced in installation of the types of electrical materials and equipment specified. Use specialized installation tools and equipment as applicable. Produce acceptance installation free of defects.

MATERIALS / TESTS

All materials to be installed shall be brand new and shall conform to specifications except as otherwise noted on the drawings. All materials where not specified shall be of the best of their respective kind. Samples of said material including its manufacturer's data shall be submitted for approval. Necessary tests on the installations shall be made by the Contractor in the presence of the Engineer. These tests shall include but not limited to ground test, performance test, phase sequence test, etc. Records of approved tests result shall be relayed to the Engineer in writing. This Contractor shall within ten (10) days after the award of the contract, submit a list of materials he proposes to use. All materials installed without prior approval shall be at the risk of the Contractor.

COORDINATION / GUARANTEES / SUSPENSION OR DELAY

The Contractor shall be familiar with the specifications of the other trades and coordinate with them thoroughly so that he can arrange his work and dispose his materials without interfering with the work of other Contractors. The Contractor shall guarantee that the electrical systems shall be free from all defects of workmanship and of materials, and that they will remain so for a period of one year from the date of acceptance by the Engineer. Any remedy to correct defects deemed to be caused by such shall be made at the expense of the Contractor.

The Contractor shall not suspend or delay the work without justifiable cause. Subsequent delays shall be deemed as a sufficient cause for penalties or termination of the contract, in which the Engineer shall have the right to take over the work and all materials on the site and make arrangements necessary to complete the work. It shall be the sole responsibility of the Contractor to ensure that the Electrical subcontractor coordinates their activities with other trades.

SLEEVES / INSERTS / CUTTING / PATCHING

The Contractor shall provide all openings, sleeves, also inserts in walls, floors, and beams as required for his work. All unused openings shall be grouted in. The Contractor shall do all patching requirements necessary, and these shall be done so as to exactly match the surrounding area without the evidence of alteration or patching.

TEMPORARY LIGHT AND POWER

The Contractor shall make all arrangements and pay for the provisions of the necessary electrical power of the type and capacity required for the performance of the work of all trades engaged in the construction of the building.

CODES, INSPECTION, PERMITS AND FEES

The work under this contract is to be installed according to the requirements of the latest edition of the Philippine Electrical Code, the rules and regulations of the local authorities of Port of Ormoc, and the requirements of the local Power Company of Ormoc City Electric Cooperative.

All necessary permits and electrical fees required for this work shall be obtained by and at the expense of the Contractor. The contractor shall furnish the Engineers and the Owner a final certificate of electrical inspection and approval from the proper government authorities after completion of the work. The Contractor shall prepare all as-built and all forms and documents required by the approving authorities.

Power service application, including drawings for the work, shall be obtained by and at the expense of the Contractor. The Contractor shall comply with all requirements of the utility company regarding service applications.

ELECTRICAL CHARACTERISTICS

The electrical characteristics for this project shall be 230V, three-phase (3Ø) wire, and 60Hz or as per system requirements, as shown in the plan.

CLEANING UP

The Contractor shall remove all dirt, debris, rubbish, and waste materials caused by him in the process of his work. He shall also remove all tools, temporary power installation, scaffolding, and surplus materials after completion and acceptance of work.

MATERIAL REQUIREMENTS

NAMEPLATES

Provide laminated plastic nameplates for each panel board, switch, and device. Each nameplate inscription shall identify the function and when applicable, the position. Nameplate shall be melamine plastic, 3.2mm thick, white with black center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the black core. Minimum size of nameplates shall be 25mm x 38mm. Lettering shall be a minimum of 6mm, high normal block style.

EXECUTION

NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

INTERIOR WIRING SYSTEMS

SUBMITTALS

a. Shop Drawings: Submit for the following:

1. Location of panel boards and circuit breaker
2. Conduit support / hanger's installation drawing

b. Manufacturer's data: Submit for the following:

1. Circuit Breakers
2. Switches
3. Conduit and fittings (each type)
5. Device Plates
6. Insulated conductors
7. Floor duplex convenience outlet and utility / junction boxes

PRODUCTS

CONDUIT AND FITTINGS

a. Conduit shall be polyvinyl-chloride conduit (PVC) where specified, shall be heavy wall, high impact resistant Schedule 40, with factory made bends, couplings and fittings. PVC cement for joints shall be of the same brand as for the PVC pipe.

b. No conduits shall be used in any system smaller than 20mm (1/2") diameter electric trade size, nor shall have more than four (4) 90 degree bends in any one run and where necessary, pull boxes shall be provided as directed.

c. No wire shall be pulled into any conduit until the conduit system is completed in all details, in the case of concealed work until all rough plastering masonry has been completed, and in the case of exposed work until the conduit work has been completed in every detail.

d. The ends of all conduits shall have tightly plugged to exclude plaster, dust and moisture while the construction of the building is in progress. All conduits shall be reamed to remove all burrs.

OUTLETS, BOXES AND FITTINGS

a. All outlets whatever kind, for all system, there shall be provided a suitable fitting, which shall be either a box or other device especially designed to receive the type of fitting to be mounted thereon.

b. The Contractor shall consult with the Engineer as to the nature of the various fittings to be used before installing his outlet fittings, and shall conform strictly in the use of fittings, to the nature of the appliance to be mounted on them, so that the work, when the completed will be a finished design.

c. All outlets on concealed conduit work provide galvanized pressed steel outlet boxes on standard make. These boxes shall be in all cases standard and where such boxes are not available on the market, special boxes shall be secured by the Contractor at his owned expense. In general outlet boxes shall be at least 100mm diameter, 53mm deep and No. 16 minimum gauge.

JUNCTION AND PULL BOXES

a. Junction and pull boxes, of code gauge steel, galvanized shall be provided as indicated or as required for facilitating the pulling of wires and cables. Pull boxes as finished places shall be located and installed with the permission and to the satisfaction of the Engineer.

b. All junction and pull boxes on exposed conduit work shall be provided with hubs for threaded pipe entry and covers provided with neoprene gaskets.

WIRES AND CABLES

a. All wires shall be copper, soft-drawn and annealed, shall be 100% conductivity, shall be smooth and true of a cylindrical form and shall be within the actual size called for.

b. All wires and cables shall comply with the requirements of the Underwriters Laboratories, the ASTM and ICEA as they apply to the particular usage.

c. Wires and cables for power and lighting system shall be plastic insulated for 600 volts working pressure type "THHN/THWN-2" unless otherwise noted on plans or specified.

d. Tag Marking

In general, branch circuit conductors and cables shall be properly marked by means of a printed tag taped on each wire indicating origin/load and or panel(s) where load is connected.

e. Splices and Termination Components

If applicable, for wire connectors and for insulating tape. Connectors for 5.5 mm^2 and smaller diameter wires shall be insulated, pressure-type in accordance with (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

DEVICE PLATES

Provide, one piece device plates for outlets and fittings to suit the devices installed. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel or cast metal having round or beveled edges. Plates on finished walls shall be satin finish stainless steel or brushed –finished aluminum, minimum 0.03 inch thick. Screws shall be machine type with countersunk heads in a color to match the finish of the plate. The use of sectional type device plates will not be permitted.

Plates installed in wet locations shall be sealed in gasket. Device plates for telephone and intercommunication outlets shall have a 3/8 inch bushed opening in center.

WALL SWITCHES AND PLATES

Wall switches in general shall be rated 10 amperes at 230 volts or with ampere and voltage ratings as required. Switches shall be flush mounting and of the rocker type, spring operated. The type of switches shall be tumbler operation and the color, plating and appearance of wall plates shall be as selected by the Engineer. Appropriate samples shall be submitted prior to purchase of wall switches and face plates.

WALL RECEPTACLE AND PLATES

a. Receptacle outlets shall be 15 amperes, 230 volts, 2 pole, 3 wire parallel slot, grounding type. Parallel slot outlet rated 15 amps. 125 v grounded type shall be acceptable for use with 230v system. Locking type and other special purpose outlets shall be as indicated in the plans.

b. Provide weather proof receptacle plate cover for each convenience receptacle outlet indicated as weatherproof.

PANELS AND CABINETS

a. Standard panels and cabinets, as much as possible shall be used and assembled on job. All panels shall be dead front construction, furnished with trims for flush or surface mounting. Cabinets shall be of code gauge steel with gutters at least 100mm wide and if necessary, it has to be made wider. The trim for all panels shall be finished in industrial grey enamel over a coat of rust inhibitor.

b. Lighting panels shall be equipped with branch circuit breakers as required and mains as noted on Plans or Panel Schedule.

c. Panel board main bus work shall be ampacity rated to equal or exceed overcurrent protective device immediately ahead of it. All buss work shall be properly secured to withstand available short circuit forces at the location.

d. Distribution panels shall be of the same type as lighting panels except equipped with one pole, two poles and three poles air circuit breakers of sizes, voltages ratings and interrupting capacity as called for on plans.

INDIVIDUAL BREAKERS

a. Provide individual circuit breakers where indicated on plans. Voltage ratings shall be suitable in each case of service application. Enclosures shall be General Purpose, NEMA type I, except where specifically noted on plans or assembled on panel cabinets.

   All protective devices shall meet NEMA and U.L specifications. Short circuit rating shall be as indicated on the plan.

b. Circuit breakers shall consist of a quick-make, quick -break type entirely trip-free operating mechanism with contacts, arc-interrupter, and thermal magnetic trip unit for each pole, all enclosed in a molded-phenolic case. The thermal magnetic trip unit shall provide time-delayed overload protection, and in case of overload or short circuit current in any one pole the circuit trips instantaneously. Circuit breaker shall be trip indicating, when tripped position of breaker handle midway between "ON" and "OFF" positions.

c. All circuit breakers shall be bolt-on type unless noted otherwise.

d. All circuit breakers rated above 225 amps shall have interchangeable trip units. Unless otherwise specified, minimum interrupting rating for 230 volts circuit breakers shall be 10,000 amperes.

PANELBOARD BUSES

All bus panels shall be copper support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or lapping. Provide separate ground bus for connecting grounding conductors; bond to steel cabinet.

EXECUTION

INSTALLATION

a. Wiring Methods

Provide insulated conductors installed in conduits, except where specifically indicated or specified otherwise or required by PEC and NFPA to be installed otherwise. Provide insulated, equipment grounding conductor in feeder and branch circuits, including lighting circuits. Provide insulated, conductor for grounding conductors installed in conduits or raceways.

b. Conduit Installation

Unless indicated otherwise, conceal conduit within finished walls, ceilings, and floors. Keep conduit a minimum of 150mm away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project. Run conduits in crawl space under slab as if exposed.

1. Where conduits rise through floor slabs, curved portion of bends shall not be visible above finish slab.

2. Conduit Support:

   Conduit shall be supported by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded studs, or spring tension clamps on steelwork. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceilings shall be vibration resistant and shock resistant. Holes cut to depth of more than 40mm in reinforced concrete beams or to depth of more than 20mm in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations.

3. Changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

4. The Contractor shall install pull wires in empty conduits in which wire is to be installed by others. The pull wire shall be 2.0mm^2 zinc- coated steel or plastic having not less than 91 kgs tensile strength. Leave not less than 300mm of slack at each end of the pull wire.

5. Conduit Installed in Concrete Floor Slabs

   Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Do not stack conduits. Space conduit horizontally for at least three diameters, except in cabinet locations. Curved portions of bends shall not be visible above the finish slab. Increase slab thickness as necessary to provide minimum 25 mm cover over conduits. Where embedded conduits cross expansion joints, provide suitable watertight expansion fittings and bonding jumpers. Conduit larger than 25mm trade size shall be parallel with or at right angles to main reinforcement; when at right angles to the reinforcements, the conduit shall be closed to one of the supports of the slab.

6. Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by PEC and NFPA 70, where insulated bushings are used, and where bushing cannot be brought into firm contact with the box; otherwise, use minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by PEC and NFPA 70.

7. Flexible Connection:

   Provide flexible connection of short length, 1.8 meters maximum for recessed and semi-recessed lighting fixtures.

c. Boxes, Outlets, and Supports

Provide boxes in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when installed exposed up to 2.1meters above interior floors and walkways, or when installed in hazardous areas. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit. Each box shall have the volume required by PEC and NFPA 70 for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall not be less than 100 mm2 or octagonal, except that smaller boxes may be installed as required for fixture configurations as approved. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers. Provide gaskets for cast-metal boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature. Fixtures shall be readily removable for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports, or make adequate provisions for distributing load over ceiling support members. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved type fastener maximum 600mm from the box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

1. Boxes for use with raceway systems shall be minimum 40mm deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 100mm2, except that 100 by 50mm boxes may be used where only one raceway enters outlet.

2. Pull Boxes:

   Pull boxes shall be constructed of not less than the minimum size required by PEC and NFPA 70 of code-gauge aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified herein. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through common pull box, the Contractor shall tag the feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

d. Mounting Heights

The Contractor shall mount panelboards, and circuit breakers, and main disconnecting panel so the height of the operating handle at its highest position is maximum 1.8 meters above floor. Mount lighting switches 1.4 meters above finished floor, receptacles 300mm above finished floor and other devices. The Contractor shall measure mounting heights of wiring devices and outlets to center of device or outlet.

e. Conductor Identification

Provide conductor identification within each enclosure where tap, splice, or termination is made.

f. Splices

Make splices in accessible locations. Make splices in conductors 5.5 mm^2 and smaller diameter with insulated, pressure-type connector. Make splices in conductors 8.0 mm^2 and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

g. Covers and Device Plates

Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Plates shall be installed with alignment tolerance of 3mm. Use of sectional-type device plates are not permitted. Plates installed in wet areas must be gasketed.

h. Electrical Penetrations

Openings around electrical penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity as tested per ASTM E 814.

i. Grounding and Bonding

In accordance with PEC and NFPA 70. Ground all exposed, noncurrent-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and non-metallic raceways, and conductor of wiring systems. Make ground connection to driven ground rods on exterior of building. Where ground fault protection is employed, ensure that connection of ground does not interfere with correct operation of fault protection.

1. Grounding Conductor

Provide insulated, equipment grounding conductor in feeder and branch circuits, including lighting circuits. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated, conductor for grounding conductors installed in conduit or raceways.

2. Resistance

Maximum resistance-to-ground of grounding system shall not exceed 10 ohms under normally dry conditions. Where the resistance obtained exceeds 10 ohms, contact the Engineer for further instructions.

FIELD QUALITY CONTROL

Furnish test equipment and personnel and submit written copies of test results. Give the Engineer five (5) working days notice prior to each test.

a. Devices Subject to Manual Operation

Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

b. Test on 600 volt wiring

Test 600 volt wiring to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 14mm^2 (6 AWG) and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 25,000 ohms.

c. Grounding System Test

The Grounding system shall be tested to ensure continuity and resistance to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to the Engineer and indicate location of rods as well as resistance and soil conditions at the time measurements were made.

INTERIOR LIGHTING

SUBMITTALS

Data, shop drawings showing mounting heights, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the specified lighting system.

a. Manufacturer's Data

1. 13-Watt white LED bulb including heavy-duty casing and accessories, recessed type.
2. 50Watt, warm white LED Lamp including heavy-duty housing and accessories.
3. 3. Emergency exit light, heavy duty

PRODUCT

LED RECESSED DOWN LIGHT

a. LED Recessed Downlight

A recessed downlight, also known as a recessed light, is a type of lighting fixture that is installed into hollow openings in a ceiling or wall, with the housing and electrical components hidden, leaving only the trim and bulb visible. It provides a focused, directional light, typically aimed downwards, and is popular for its sleek, space-saving design and ability to create a clean, modern aesthetic.

The main body of the fixture is concealed within the ceiling or wall, creating a flush and unobstructed look. Recessed downlights emit a focused beam of light downwards, making them suitable for general illumination, accent lighting, or task lighting. Because they are recessed, they don't take up any visual space in the room, making them ideal for areas with low ceilings or where a minimalist aesthetic is desired. Many recessed downlights use LED bulbs, which are energy-efficient and long-lasting.

LED WALL LAMP

b. LED wall lamp is a lighting fixture that uses light-emitting diodes (LEDs) as its light source and is designed to be mounted on walls. These lamps are energy-efficient, long-lasting, and can be used for various purposes, from general illumination to accent lighting.

LED wall lamps utilize LEDs, which are semiconductor devices that emit light when an electric current passes through them.

LED wall lamps are designed to be mounted directly onto a wall. This makes them suitable for a variety of applications, such as illuminating hallways, bedrooms, living rooms, or even outdoor spaces.

LED wall lamps can be used for general lighting, providing ambient light to rooms, or for accent lighting, highlighting specific features like artwork or architectural details. They can also be used to create a desired mood or atmosphere, with options for dimmable and color-changing capabilities.

EMERGENCY EXIT LIGHT

c. Emergency Exit Light

An emergency exit light is a safety device designed to illuminate the path to an exit during a power outage or other emergencies, ensuring occupants can safely evacuate a building. These lights are typically illuminated signs, often green and white, that display directional arrows indicating the nearest exit and are often battery-powered for use during emergencies.

Emergency exit lights and signs are crucial for guiding people to safety during other emergencies, like fires or other situations where visibility is limited. They are typically connected to the building's electrical system, but also have a backup battery that automatically activates during a power failure.

Emergency exit lights and signs are often mandated by building codes and safety regulations, ensuring they are properly installed and maintained to meet safety standards. They play a vital role in reducing panic during emergencies by providing clear guidance to exit routes, helping to prevent injuries and fatalities.

RECESS AND FLUSH MOUNTED FIXTURES

The Contractor shall provide the type of materials as shown in the plan.

LED BULB

Being the next modern, energy-efficient lighting, it offers brighter lights than both its predecessors improving on lower wattage at the same brilliance and longer life spans. This is definitely a lot of savings in terms of lower electricity bills and maintenance costs.

Powered by light emitting diodes and circuitry, the advantage is that it eliminates the harmful chemicals found in your typical compact bulb. LED making it non-hazardous and also Eco-friendly. With a very low defect rate of 1% a year and lifetime of over 30,000 hours. Therefore, this product will stand the test of time.

Specifically designed that can easily transition to LEDs without necessarily revamping your current lighting setup. LED bulbs have a wide range of applications from lighting households, schools, and offices, illuminating covered parking lots, warehouses.

This LED Bulb provide each and every household or business in the Philippines access to energy efficient and environmentally friendly lighting alternatives set at reasonably low and affordable prices.

EXECUTION

INSTALLATION

Installing or retrofitting a T-8 tube light ensures optimal performance. This guide is intended for qualified electricians or lighting technicians.

It is the responsibility of the contractor, to install, maintain and operate the device in such a manner as to comply with all state and local laws, ordinances and regulations.

No power to the fixture at source. Ensure you are working with standard T-8 Fluorescent Light fixture; unpack the LED Tube Light; Open the fixture housing; Re-connect the Hot (L) wire to one end and Neutral (N) wire to the other end; Check to ensure wiring is done correctly then close the fixture housing; Affix warning labels to fixtures near socket so they are visible to tube light installers. Re-connect power to the fixture and turn on switch.

Recessed and semi-recessed fixtures may be supported from suspended ceiling support system ceiling tees if the ceiling system support rods or wires are provided at a minimum of four rods or wires per fixture and located not more than 150 mm from each corner of each fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of size less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently or with at least two 20mm metal channels spanning, and secured to, the ceiling tees. Provide rods or wires for lighting fixture supports under this section of the specifications. Additionally, for recessed fixtures, provide support clips securely fastened to ceiling grid members, a minimum of one at or near each corner of each fixture.

GROUNDING

Ground non-current-carrying parts of equipment as specified in "Interior Wiring Systems." Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

FIELD TESTS

The Contractor will provide electric power and apparatus / instruments required and carry out the field tests.

a. Operating Test

Upon completion of the installation, conduct an operating test to show that the equipment operate in accordance with the requirements of this section.

b Insulation Resistance Test

Perform as specified in "Interior Wiring Systems", both before and after connection of fixtures and equipment.

c. Ground Resistance Tests
Perform as specified in "Interior Wiring System."

ITEM 11 : MECHANICAL GENERAL REQUIREMENT

GENERAL

This section applies to all items of "MECHANICAL WORKS" except where specified in each individual section.

WORK DESCRIPTION

The work shall include the furnishing of equipment, materials, tools, labor, supervision, and other services required to install, complete, test, and make operational the whole system as described on the Drawings and the Technical Specifications.

Specifically, the work shall involve the following:

a. To supply, deliver, install wires/cables, conduit, circuit breaker, and make operational the split-type and ceiling cassette-type inverter air conditioning units, including bathroom exhaust fans for toilets as shown on the Drawings.

b. To supply and install the refrigerant piping system and condensate drain lines, including necessary insulation and hangers.

c. To supply and install the electrical wiring connections from the AC supply provided by the Electrical Contractor, which is located close to the point of installation. This shall include power, control wiring, and interlocks with the thermostat control.

SUBMITTALS

Submit shop drawings, manufacturer's data, and certificates for equipment, materials, and finish, and pertinent details for each system where specified in each individual section, and obtain approval before procurement, fabrication, or delivery of the items to the job site. Partial submittals are not acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalogue model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, years of satisfactory service, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish. Photographs of existing installations and data submitted in lieu of catalogue data are not acceptable and will be returned without approval. Submittals shall be a minimum of 5 print copies. Submittals of the contractor shall be reviewed and returned within a minimum of 21 days, each stamped with appropriate action.

1. Shop Drawings

Drawings shall be a minimum of 350mm x 500mm in size, with a minimum scale of 1:100, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout, and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for the operation, maintenance, and replacement of operating equipment devices. If the equipment is disapproved, drawings shall be revised to show acceptable equipment and resubmitted.

2. Manufacturer's Data

Submittals for each manufactured item shall be the manufacturer's brochure products, equipment drawings, diagrams, performance and characteristic curves, and catalogue cuts.

3. Standard Compliance

When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), American Society of Mechanical Engineers (ASME), Air Movement and Control Association, Inc. (AMCA), American Refrigeration Institute (ARI), and Underwriters' Laboratories (UL), proof of such conformance shall be submitted to the Engineers for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization that is competent to perform acceptable testing and is approved by the Owner or his authorized representative. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard. For materials and equipment whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval. The certificate shall identify the manufacturer, the product, and the referenced standard and shall simply state that the manufacturer certifies that the product conforms to all requirements of the project specification and of the reference standards listed. The edition or the revised version of such codes and standards current at the date twenty-eight (28) days prior to the date of bid submission shall apply. During Contract execution, any changes in such codes and standards shall be applied after approval by the Owner.

4. Codes, Inspection, Permits, and Fees

a. The work under this contract shall conform to the latest requirements of:

1) Philippine National Building Code

2) Regulations of the Local Municipality

b. Nothing contained in these specifications or shown on the drawings shall be construed as to conflict with the National and local ordinances or laws. All such laws and ordinances are made a part of these Specifications.

c. All construction permits and fees for this work shall be obtained at the expense of the Contractor. The Contractor shall furnish the Owners and Engineers the final certificates of inspection and approval from the appropriate government authorities.

OPERATION AND MAINTENANCE MANUAL

Furnish an operation and maintenance manual for each item of equipment. Furnish three (3) copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that the equipment is performed, and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the name and location of equipment or the building, the name of the Contractor, and the contract number. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing the equipment, and of the local representatives

for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents, with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shutdown; description of the function of each principal item of equipment; the procedure for starting; the procedure for operating; shutdown instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency, safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list. The parts list for equipment shall indicate the sources of supply, recommended spare parts, and the service organizations which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

POSTED OPERATING INSTRUCTIONS

Furnish approved operating instructions for each system and principal item of equipment for the use of the operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequences for each principal item of equipment. Operating instructions shall be printed or engraved and shall be framed under glass or in an approved laminated plastic and posted where directed by the Owner. Operating instructions shall be attached to or posted adjacent to each principal item of equipment and include directions for start-up, proper adjustment, operating, lubrication, shut-down, safety precautions, procedure in the event of equipment failure, and other areas as recommended by the manufacturer of each item of equipment. Operating instructions exposed to the weather shall be made of weatherproof materials or shall be suitably enclosed to be weather-protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

SAFETY

1. Rotating Equipment Safety

    Couplings, motor shafts, gears, and other exposed rotating or rapidly moving parts shall be fully guarded. The guards shall be cast iron or expanded metal. Guard parts shall be rigid and suitably secured and shall be readily removable without disassembling the guarded unit.

INSTRUCTIONS TO OWNER'S PERSONNEL

When specified in other sections, the Contractor shall furnish the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements of the equipment or system specified. Each instructor shall be thoroughly familiar with all the parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of man-days (8 hours) of instruction furnished shall be as specified in other sections. When more than 4 man-days of instruction are specified, approximately half of the time shall be used for classroom instruction. All other time shall be used for instruction with the equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, additional instructions shall be provided to acquaint the operating personnel with the changes or modifications.

DELIVERY AND STORAGE

Equipment and materials shall be handled, stored, and protected to prevent damage before, during, and after installation, in accordance with the manufacturer's recommendations and as approved. Damaged or defective items shall be replaced without cost to the Owner.

STANDARD PRODUCTS/SERVICE AVAILABILITY

1. Materials and Equipment

   Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products, which are of a similar material, design, and workmanship. The standard products shall have been in satisfactory commercial or industrial use for seven years prior to bid opening. The seven-year use shall include applications of equipment and materials under similar circumstances and of similar size as specified for the Project. The equipment shall be sold exclusively by a single, stable distributor with after-sales capability.

2. Experience Required

   The five (5) years of experience must be satisfactorily completed by a product that has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogues, or brochures.

3. Alternative Service Record

   Products having less than a five-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

4. Service Record

   The equipment items shall be supported by service organizations. The Contractor shall submit a certified list of qualified permanent service organizations for support of the equipment, which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

5. Manufacturer's Nameplate
   Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

SAFETY REQUIREMENTS

Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded in accordance with OSHA 29 CFR 1910.219. High temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein. Items such as catwalks, ladders, and guardrails shall be provided where required for safe operation and maintenance of the equipment.

MANUFACTURER'S RECOMMENDATIONS

Where installation procedures or any part are required to be in accordance with the manufacturer's recommendations of the material being installed, printed copies of these recommendations shall be furnished to the Owners and Engineers prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

ELECTRICAL REQUIREMENTS

Electrical components of mechanical equipment and systems, such as motors, starters, and controls, shall be provided under this Item and shall be as specified herein and as necessary for a complete and operable system. Extended voltage range motors will not be permitted. Interconnecting wiring for components of packaged equipment shall be provided as an integral part of the equipment.

ELECTRICAL MOTORS

1. All electrical motors of sizes and types as specified for driving air conditioning and ventilating equipment shall be furnished and erected under this section. All motors shall be of proper power and speed to suit the specified makes of equipment. If other makes of equipment are accepted in any case, the proper adjustment of motor speed and power, including affected changes in electrical system circuit breakers and wiring must be included without additional cost to the Owner. Technical data shall be submitted for approval before the equipment is purchased.

2. All motor ratings shall be as specified on the drawings.

3. Generally, all motors shall be constant speed, squirrel-cage type motors and energy efficient, except as otherwise listed on plans. Single-phase motors shall be capacitor-start induction-run or split-phase type as approved for the service.

4. All belt-connected motors shall have adjustable bases and set screws to maintain proper belt tension and shall be provided with proper belt guards.

5. All motors and accessories shall comply in all respects with NEMA Standards. Types shall be as required by the Local Code.

6. All motors shall be furnished with type "B" insulation and tropical fungus proofing according to NEMA standards.

CHANGES IN WORK DUE TO APPROVAL OF ALTERNATE MATERIALS

Assure the cost of, and the entire responsibility for any changes in the work shown on the Contract Documents which may be occasioned by approval of materials proposed by the Contractor other than those specified.

GUARANTEE

Furnish the Owner a written guarantee covering the satisfactory operation of the mechanical installation in all its parts for a period of one (1) year after the date of final acceptance of work. During this period, repair or replace any defective work, materials, or equipment furnished and installed without any cost to the Owner. Include with this guarantee a certificate from every material supplier engaged in the trade of the project.

AS-BUILT DRAWINGS

1. The Contractor shall, during the progress of work, keep a record of all deviations of the actual installation from that shown on the Contract Drawings.

2. Upon completion of work, the Contractor shall submit two (2) copies of the as-built drawings, signed by the Contractor's Registered Professional Mechanical Engineer and Owner Project Inspector, indicating the work as actually and finally installed, including new information not originally shown in Contract Drawings.

3. Approval of as-built drawings by the Engineer shall be a requirement for final acceptance of the completed works and of final payment.

QUALITY ASSURANCE

1. Surveys and Measurements:

   a. The Contractor shall base measurements, both horizontal and vertical, on established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of the same as related to the work.

   b. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or intent of the drawings and specifications, he shall notify the Owner's representative and shall not proceed with his work until he has received instructions from the Owner's representative upon referring the matter to the Engineer.

2. Drawings and Minor Modification:

   a. Drawings are diagrammatic and indicate the general arrangement of the system and work included in the contract. Drawings are not to be scaled. The drawing and details shall be examined for the exact location of fixtures and equipment by verifying actual site conditions.

   b. The Contractor shall follow the drawings in laying out work and check the drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Owner's representative shall be notified before proceeding with installation. if directed by the Owner's representative, the Contractor shall, without extra charge, make reasonable modifications and the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

   c. Materials and Workmanship

   All materials and apparatus required for the work, except as specified otherwise, shall be new of first-class quality, and shall be furnished, delivered, erected, connected, and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of materials is given, first-class standard articles shall be furnished.

ITEM 12: PAINTING WORKS

GENERAL

Division 1,

"General Requirements," contain provisions and requirements essential to these Specifications; and apply to this section, whether or not referred to herein.

SCOPE OF WORK

This Section covers the surface preparation, coating materials, and application of coating systems required for the Works. The work shall consist of furnishing of all labor, materials, equipment, and other incidentals necessary for the supply of painting materials and the complete painting of surfaces as shown on the drawings in accordance with this Specification and as directed by the Engineer. The term paint as hereinafter used includes emulsion paints, varnishes, oils, pigments, thinner and dryers. All exposed metal surfaces, except metal surfaces embedded in concrete, shall be painted unless otherwise specified.

STANDARD

The following publications listed below, but referred to thereafter by basic designation only, form a part of these Specifications to the extent indicated by the reference thereto: Steel Structures Painting Council (SSPC) U.S. Specification JIS K 5628 Red-lead Zinc Chromate Anti-Corrosive Paint.

SUBMITTAL

1. The Contractor shall submit work method statements with lists of materials to the Engineer for approval twenty-eight days before the start of works. This statement shall include the following items:

    a. Type of paint and manufacturer

    b. Manufacturer's specifications

    c. Storage and delivery of materials

    d. Surface preparation

    e. Finish painting and drying

    f. Touch-up painting, if any

    g. Equipment 279

2. The Contractor, before placing an order for the painting materials, shall submit to the Engineer for approval samples of materials. No placing of orders for material shall be made without his approval.

STORAGE AND DELIVERY

1. The Contractor shall deliver all material to the site in the original labeled, sealed cans and containers, with labels intact and seal unbroken. a. Seals shall remain unbroken until after inspection and acceptance of material by the Engineer. b. The Contractor shall deliver materials in ample quantities sufficiently in advance of the need to avoid any delay or interruptions in the works.

2. Paint thinner shall be stored in accordance with the approved manufacturer's instructions. a. All regulations required for storage of paint shall be observed, and all necessary safety signs required by governing codes shall be posted. b. Any damage caused by failure to exercise proper precautions in paint storage shall be repaired.

MATERIAL REQUIREMENTS

PAINT

Paints for the protective coating system shall be the product of a manufacturer approved by the Engineer.

SCHEDULE OF PAINTING

Paint manufacturers shall be BOYSEN, DAVIES, or an approved equal. M A N U F A C T U R E Boysen: Davies Architectural Items Number: Number a) Exterior Finishes

1. On Concrete Walls Two Coats, Concrete BT01/B715 1350/MEGACRYL Masonry Paint B710 or EL-0020/EL-2000 280

2. Unprimed Ferrous Metal including GI Roofing First Coat: Rush inhibitive ferrous metal primer B320 940 Second Coat: Exterior Enamel B2501 DV-50-00

3. On Concrete Block Wall First Coat: Concrete block primer sealer B701 1350/EL-0020 Second Coat: Concrete Masonry Paint B701 MEGACRYL-ACRYLIC LATEX-PAINT/EL-2000 Third Coat: Concrete Masonry Paint B701 MEGACRYL-ACRYLIC LATEX-PAINT/EL-2000

4. On Wood First Coat: Exterior Wood Primer B800 300 Second Coat: Exterior Enamel B600 400 Third Coat: Exterior Enamel B600 400 b) Interior Finishes Location of the various finishes are listed in the Finish Schedule on the Drawings or else will be confirmed by PPA.

1) On primer & coated metal two coats of interior semigloss enamel or as indicated in the schedule finish B200 600 2) On Plaster First Coat: Pigmented sealer

Second Coat: Enamel undercoater B701 MEGACRYL-ACRYLIC LATEX-PAINT/EL-2000 Third Coat: Interior flat enamel B701 22 281

3) On Wood First Coat: Enamel undercoater B800 1360 Second Coat: or Enamel undercoater B800 300/BIO-FRESH.001 Third Coat: Interior flat enamel B800 300/BIO-FRESH.001

4) Wood Stain Finish Oil Stain with Filler B2700 25 (paste filler) Boiled on top coat 20-91 (top coat)

5) Wood Lacquer Finish Wood Paste Filler w/ natural B60/B1258 77/701/702 Oil top coat of lacquer B60/B1253 77/79/703 c) Non-Architectural items (Piping, Valves, Equipment, etc.)

1) Piping, valves, equipment etc. in rooms are to be painted

2) Galvanized pipes & ducts Primer - one coat B320 940 Finish - one coat B2501/B600 DV-50-00/400

3) Black Steel Pipes Primer - one coat B320 940 Finish - one coat B2501/B600 DV-50-00/400 4) Mechanical Items a) Ungalvanized Ferrous Metal Primer - one coat B320 940 Finish - one coat B2501/B600 DV-50-00/400 b) Galvanized Ferrous metal Primer - one coat B320 940 Finish - one coat B2501/B600 DV-50-00/400 c) Submerged Galvanized Ferrous Metal Primer - one coat B2200 92-00 d) Burried Miscellaneous B2199 Ferrous surface, valves, & flanged joints (excl. pipe) Primer - one coat Coal-tar enamel or match adjacent pipe coating (if any) 282 4.14.3

EXECUTION

SURFACE PREPARATION OF STEEL

1. Steel surfaces shall be cleaned as follows:

a. All round welds, burrs, and sharp surface projections shall be ground smooth, and all weld splatter shall be removed prior to blast cleaning.

b. Sand abrasives, if used, shall be clean and free from salt and extraneous matter. The sand shall pass through a 2.0 mm test sieve and be substantially retained on a 0.18 mm test sieve, with at least 25 percent retained on a 0.355 mm test sieve.

c. Metallic abrasive, if used, shall be sharp, hard, and free from dust, and shall pass through a 1.8 mm test sieve.

d. Blast cleaning operations shall not be conducted on surfaces that will be wet after blasting and before coating, or when the surfaces are less than 10°C above degree point, or when the relative humidity of the air is greater than 95 percent.

e. Any oil, grease, soil, dust, or other foreign matter deposited on the cleaned surfaces shall be removed prior to painting. In the event that rusting occurs after completion of the surface preparation, the surfaces shall be cleaned again in accordance with the specified method.

f. Particular care shall be taken to prevent the contamination of other corrosive chemicals before the application of the paint. Such contamination shall be removed from the cleaned surface by flash blasting, and the paint applied immediately.

g. Care shall be taken to prevent contamination of cleaned and painted surfaces by cleaning operations in an adjacent area.

h. Surfaces not to be painted shall be suitably protected from the effects of cleaning and painting operations.

SURFACE PREPARATION OF WOOD

1. Wood surfaces shall be sanded to a fresh surface. Surface mould, if present, shall be removed by washing, rubbing down, and burning off as necessary. Resinous exudation and large knots shall be removed and replaced with filler or other materials approved by the Engineer. 283 2. Parts of timber to be enclosed in walls shall always be primed unless already impregnated. Priming shall be brushed on, and a minimum of two coats applied to the end grain. When the priming paint is hard, all cracks, holes, open joints, etc., shall be made good with hard stopping and rubbed down with fine abrasive paper. Priming of joinery shall be applied only on site after the Engineer has approved such joinery and before it is fixed. For internal surfaces, primer coats shall be carefully flattened.

SURFACE PREPARATION OF CONCRETE AND PLASTER

Concrete and cement plaster surfaces to be painted shall be prepared by removing efflorescence, dust, dirt, grease, oil, asphalt, tar, excessive mortar, and mortar dropping and by roughening to remove glaze. A zinc sulfate solution shall be applied before the primer coat.

SURFACE PREPARATION FOR FIBER CEMENT SURFACES

Shall be dry and clean prior to application of the specified first-coat material. Oil, grease, or rust stains shall be carefully removed by the use of a suitable solvent. Wire brushing will not be permitted. After the first coat has become dry and prior to application of finish coats, touch-up coats shall be applied to suction spots.

ADDITIONAL REQUIREMENTS FOR PREPARATION OF SURFACES WITH EXISTING COATINGS

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

1. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces, clean with a clean, dry cloth saturated with mineral spirits, ASTM D 235. Allow the surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.

2. Sand existing glossy surfaces to be painted to reduce gloss. Brush and wipe clean with a damp cloth to remove dust.

3. The requirements specified are minima. Also, comply with the application instructions of the paint manufacturer.

4. Previously painted surfaces, specified to be repainted or damaged during construction, shall be thoroughly cleaned of all grease, dirt, dust, or other foreign matter. 284

5. Blistering, cracking, flaking and peeling, or other deteriorated coatings shall be removed.

6. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8.

7. Slick surfaces shall be roughened. Damaged areas, such as but not limited to nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas.

8. Edges of chipped paint shall be feathered and sanded smooth.

9. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting. 10. New proposed coatings shall be compatible with existing coatings.

EXISTING COATED SURFACES WITH MINOR DEFECTS

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding so that when tested in accordance with ASTM D 4214.

REMOVAL OF EXISTING COATINGS

Remove existing coatings from the following surfaces:

1. Surfaces containing large areas of minor defects;

2. Surfaces containing more than 20 percent peeling area; and

3. Surfaces designated by the Engineer, such as surfaces where rust shows through existing coatings.

SUBSTRATE REPAIR

1. Repair substrate surface damaged during coating removal;

2. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smoothly as practical to areas involved with coating removal; and

3. Clean and prime the substrate as specified. 285

SURFACE PREPARATION FOR CONCRETE AND MASONRY - FOR OLD OR PREVIOUSLY PAINTED SURFACES

1. Scrape off loose, scaling, and peeling old paints. Sand the whole surface, including those where old paint still adheres very well.

2. For areas with extreme chalking problems, steel brush, blow air from a compressor, or wipe with a clean rag pre-wetted with water. Let dry, then apply one (1) coat of concrete scaler. Dry for at least 4 hours before applying subsequent coats.

3. For areas affected by molds and mildew, wash the whole surface with water or with hypochlorite washing solution. Scrub using a stiff nylon brush, then rinse with water. Apply fungicidal washing compound. Leave overnight.

4. For areas with mapping problems, properly prepare the surface, then apply concrete sealer. Dry for at least 4 hours.

5. Putty hairline cracks.

STEEL/ALUMINUM DOORS AND WINDOWS

All metal surfaces shall undergo a pre-treatment process which includes: desmutting, water-rinsing, degreasing/etching, water rinsing, zinc phosphating, water rinsing, and acid rinsing. Powder coating application shall be factory applied and shall be done in one operation using an electrostatic powder gun. The materials to be coated should be well connected to earth. Coating thickness should be kept to a minimum of 60 microns for exposed areas. On details which are to be treated mechanically after coating (drilling, sawing, etc.), the coating film must not exceed 100 microns. The powder coating shall be oven cured in the range of 20 minutes at 220° Centigrade (metal temperature measured on the area with the greatest metal thickness). The temperature variation in the oven should not exceed +/- 10° Centigrade. Handling: Coated items should be cooled to no less than 40° Centigrade before handling. Precautions should be taken to avoid damage to the finished coating during stacking, storing, and transportation. Storage and Delivery: Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in a dry location with adequate ventilation, free from dust or water and easily accessible for inspection and handling. Store materials neatly on the floor, properly stacked on non-absorptive strips or wood platforms. Protect finished surfaces during shipping and handling using the manufacturer's standard method. 286

WOOD REPAIR

Badly decayed areas shall be removed and repaired. Areas and pieces decayed beyond repair shall be replaced with new pieces that match the originals in all respects. Moderately decayed areas, weathered, or gouged wood shall be patched with approved patching compounds and shall be sanded smooth. The source or cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content not exceeding 12 percent, as measured by a moisture meter, to its full depth before patching, unless otherwise authorized. Wood that is to be patched shall be clean of dust, grease, and loose paint.

1. Epoxy Wood Repair Epoxy wood repair materials shall be applied in accordance with the manufacturer's written instructions. Health and safety instructions shall be followed in accordance with the manufacturer's instructions. Clean mixing equipment shall be used to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batches shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

2. Epoxy Consolidant and Epoxy Paste Epoxy liquid wood consolidant shall be used:

1) to penetrate and impregnate deteriorated wood sections in order to reinforce wood fibers that have become softened or absorbent.

2) as a primer for areas that are to receive epoxy paste filler. Epoxy paste shall be used to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids.

MIXING AND THINNING

Mixing and thinning of paint shall be done in accordance with the approved manufacturer's printed instructions. The pot life of each paint, as stated by the manufacturer, shall not be exceeded.

WEATHER CONDITION

The paint shall not be applied when the relative humidity is above 85 percent. The paint shall not be applied in rain, wind, fog, dust, or mist.

APPLICATION

Workmanship shall be first-class in every respect. All work shall be done in a workmanship manner so that the finished surfaces shall be free from 287 runs, chops, ridges, waves, laps, and unnecessary brush marks. All coats shall be applied in such a manner as to produce an even film of uniform thickness. Edges, corners, crevices, welds, and rivets shall receive special attention to ensure that they receive an adequate thickness of paint. All painting shall be done by thoroughly experienced workmen. Safety regulations shall be adhered to at all times, including the wearing of respirators by persons engaged in assisting in spray painting. Adjacent areas and installation shall be protected by the use of cloths or other approved precautionary measures. Plain enamel and varnish shall be applied carefully with good, clean brushes or approved spraying equipment, except that the initial coat on any surface shall be applied with a brush. Sufficient time shall be allowed between coats to assure thorough drying, and each coat shall be in proper condition before receiving the next coat. Sanding and dusting as required shall be performed between coats in varnishing work. The finish coat shall be smooth and free from runs, sags, and other defects. Exterior paint shall not be applied on rainy days. All paint when applied shall provide a satisfactory film and a smooth, even surface. Paint shall be thoroughly stirred and kept at a uniform consistency during application. Powdered metallic pigments added at the time of use shall be mixed by adding the powder in small increments to about one-third of the base paint or vehicle, with thorough mixing to obtain a smooth paste. The remainder of the base paint shall then be thoroughly stirred in. Different brands of emulsion paints shall not be mixed prior to application of the materials. Where necessary to suit conditions of surface temperature, weather, and method of application, the package paint may be thinned immediately prior to application in accordance with the approved manufacturer's directions, but not in excess of 125 cc of suitable thinner per liter (one pint per gallon). Before using, the paint shall be mixed to a uniform consistency and shall be stirred frequently during application. Paints other than water-thinned paints shall be applied only to surfaces which are completely free of moisture as determined by sight or touch, and only such combinations of humidity to be painted as will cause evaporation rather than condensation. Surfaces which have been

cleaned, pretreated, and/or otherwise been prepared for painting shall be primed or painted with one coat of finish paint as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surfaces. 288 The first coat of paint on all exterior surfaces shall be applied by brush. Interior prime coats and all other subsequent coats on either exterior or interior surfaces may be applied by brush or spray. Whenever spraying is permitted, all areas inaccessible to spray painting shall be coated by brushing or other suitable means. Brushes to be used for the application of water-emulsions shall be soaked in water for a period of 2 hours prior to use. All cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Paint spots, or stains upon adjacent surfaces, shall be removed, and the entire job left clean and acceptable to the Engineer. No smoking shall be permitted in the vicinity where painting is going on.

TOUCH-UP PAINTING

Touch-up painting shall be done with the same paint as used for the original coat. The resulting minimum dry film shall be the same as for the original coat. Touch-up painting shall include cleaning and painting of field connections, welds, and all damaged or defective paint and rusted areas. During touch-up painting, only loose, cracked, brittle, or non-adherent paint shall be removed during cleaning. All exposed edges shall be feathered. Touch-up painting shall be performed in a manner that will minimize damage to sound paint. Rust spots shall be thoroughly cleaned, and the edges of the existing paint shall be scraped back to sound material.

DRYING

1. No primer or paint shall be forced to be dried under conditions that will cause cracking, wrinkling, blistering, formation of pores that would detrimentally affect the condition of the paint.

2. No dryer shall be added to the paint unless specified in the approved manufacturer's instructions.

3. Painted surfaces shall be protected from dust, dirt, and the elements of the weather until dry to the fullest extent practicable.

4. After drying, any areas of paint damaged from any cause shall be removed, the surface again prepared, and then touched up with the same paint and to the same thickness as the undamaged areas as specified in sub-section 4.14.3.7 above. 289

HANDLING

1. Precautions shall be taken to minimize damage to paint films resulting from stacking for drying.

2. Paint which is damaged in handling shall be scraped off and touched up with the same paint and in the same thickness as was previously applied to the damaged area at Contractor's expense.

INSPECTION

1. All works and materials supplied under this Specification shall be subject to inspection by the Engineer. 2. The Contractor shall correct such works or replace such materials found defective under these Specifications at his own expense.

ITEM 13 : PROJECT BILLBOARD

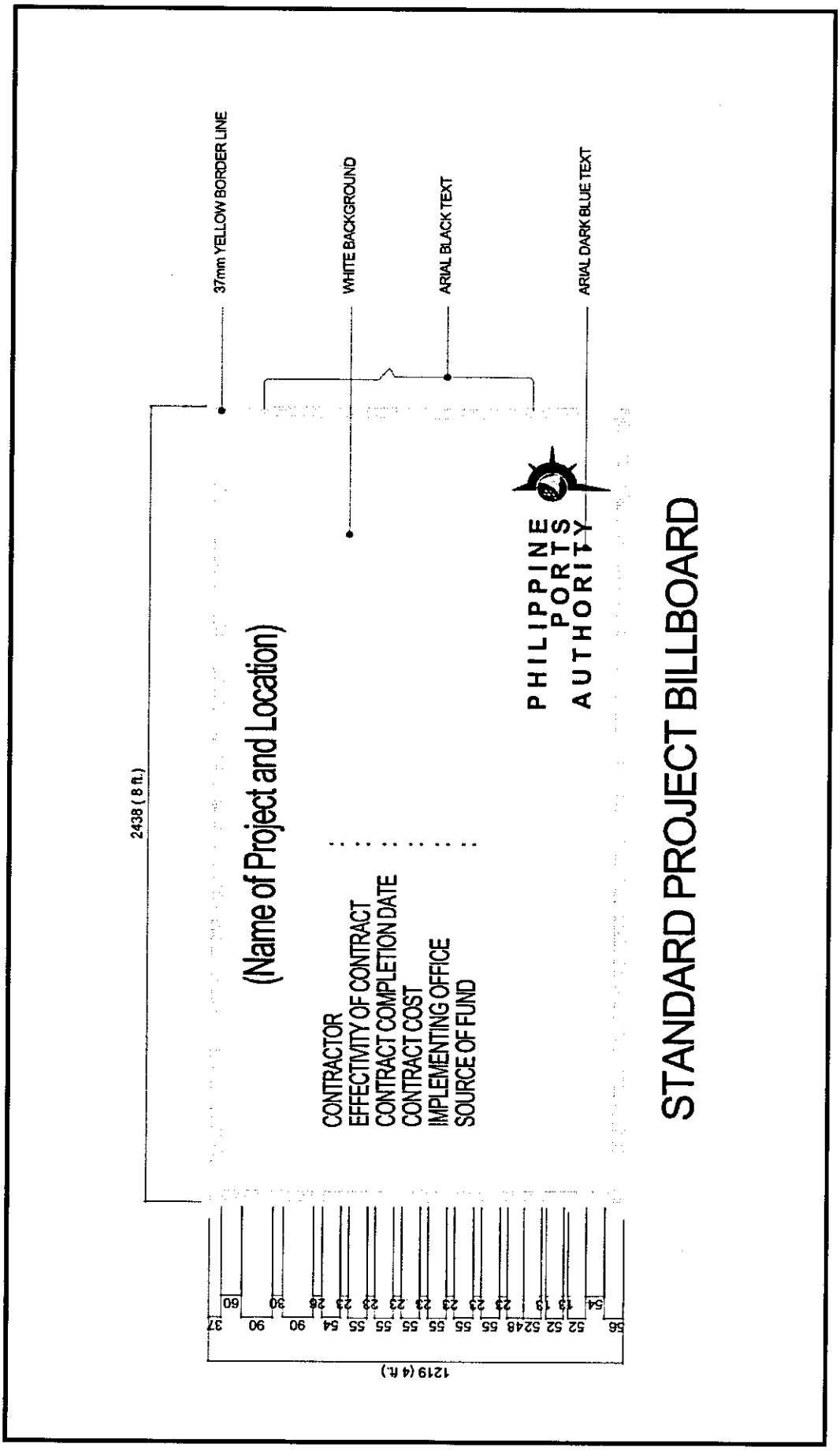
SPECIFICATION

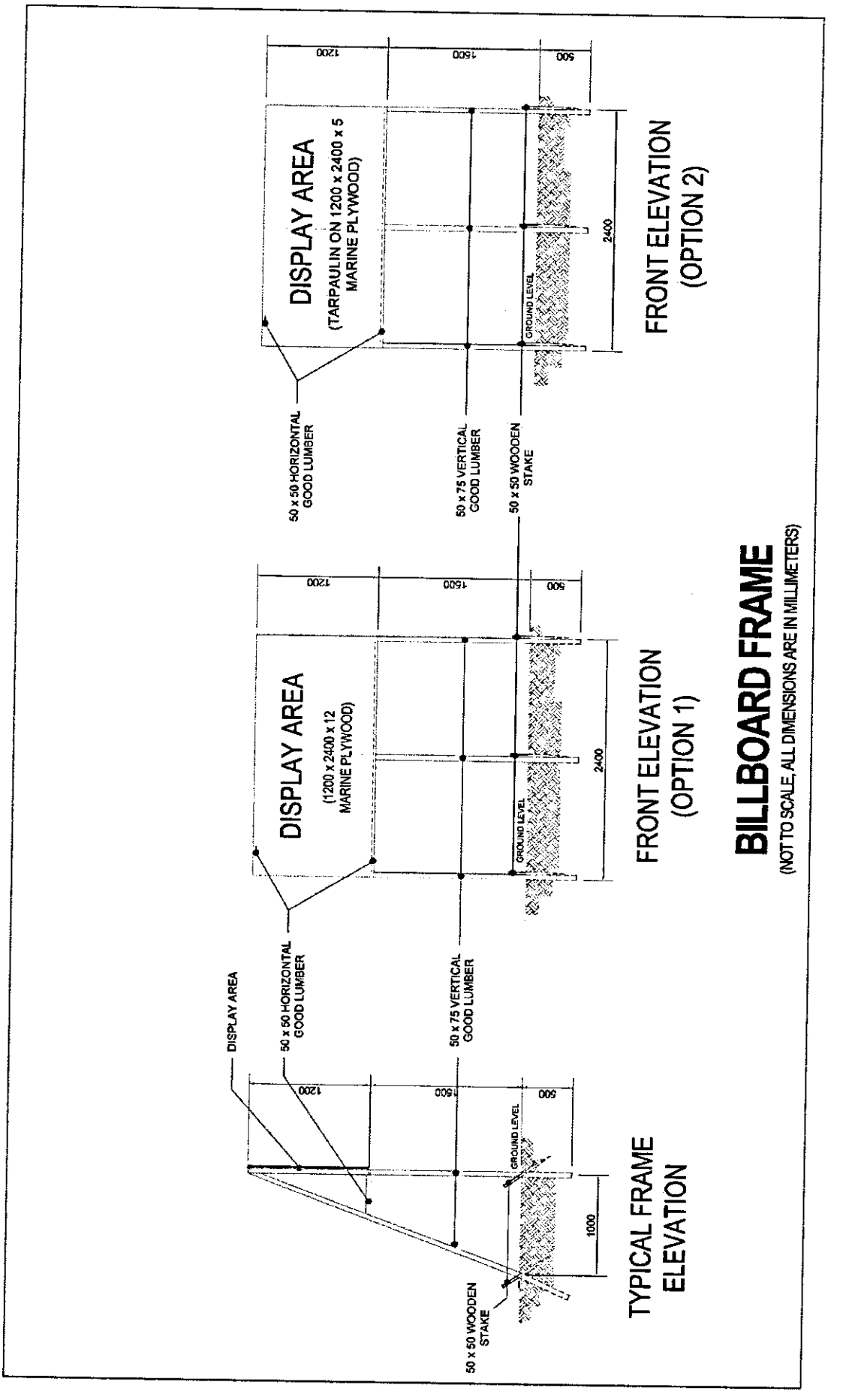
The Project Billboard shall be installed at location(s) designated by the Engineer.

The size and specifications of materials for the standard billboard shall be 4ft. x 8ft. (1,200mm x 2,400mm) using ½ inch (12mm) marine plywood or tarpaulin poster on 3/16 inch (5mm) marine plywood.

Project billboards shall not contain Name(s) and/or picture(s) of any personages.

See attached drawings for further details of the standard billboard.


STANDARD PROJECT BILLBOARD
PHILIPPINE PORTS AUTHORITY
(Name of Project and Location)
CONTRACTOR
EFFECTIVITY OF CONTRACT
CONTRACT COMPLETION DATE
CONTRACT COST
IMPLEMENTING OFFICE
SOURCE OF FUND
37mm YELLOW BORDER LINE
WHITE BACKGROUND
ARIAL BLACK TEXT
ARIAL DARK BLUE TEXT
2438 (8 ft.)
1219 (4 ft.)


BILLBOARD FRAME
(NOT TO SCALE, ALL DIMENSIONS ARE IN MILLIMETERS)
FRONT ELEVATION
(OPTION 2)
DISPLAY AREA
(TARPAULIN ON 1200 x 2400 x 5
MARINE PLYWOOD)
50 x 50 HORIZONTAL
GOOD LUMBER
50 x 75 VERTICAL
GOOD LUMBER
50 x 50 WOODEN
STAKE
GROUND LEVEL
2400
1200
1500
500
FRONT ELEVATION
(OPTION 1)
DISPLAY AREA
(1200 x 2400 x 12
MARINE PLYWOOD)
TYPICAL FRAME
ELEVATION
1000

ITEM 14 : SAFETY SIGNAGES AND BARRICADES

DESCRIPTION

This work includes the furnishing and installation of safety signages and barricades in accordance with the specifications and to the details shown below in the drawings, or as directed by the Engineer.

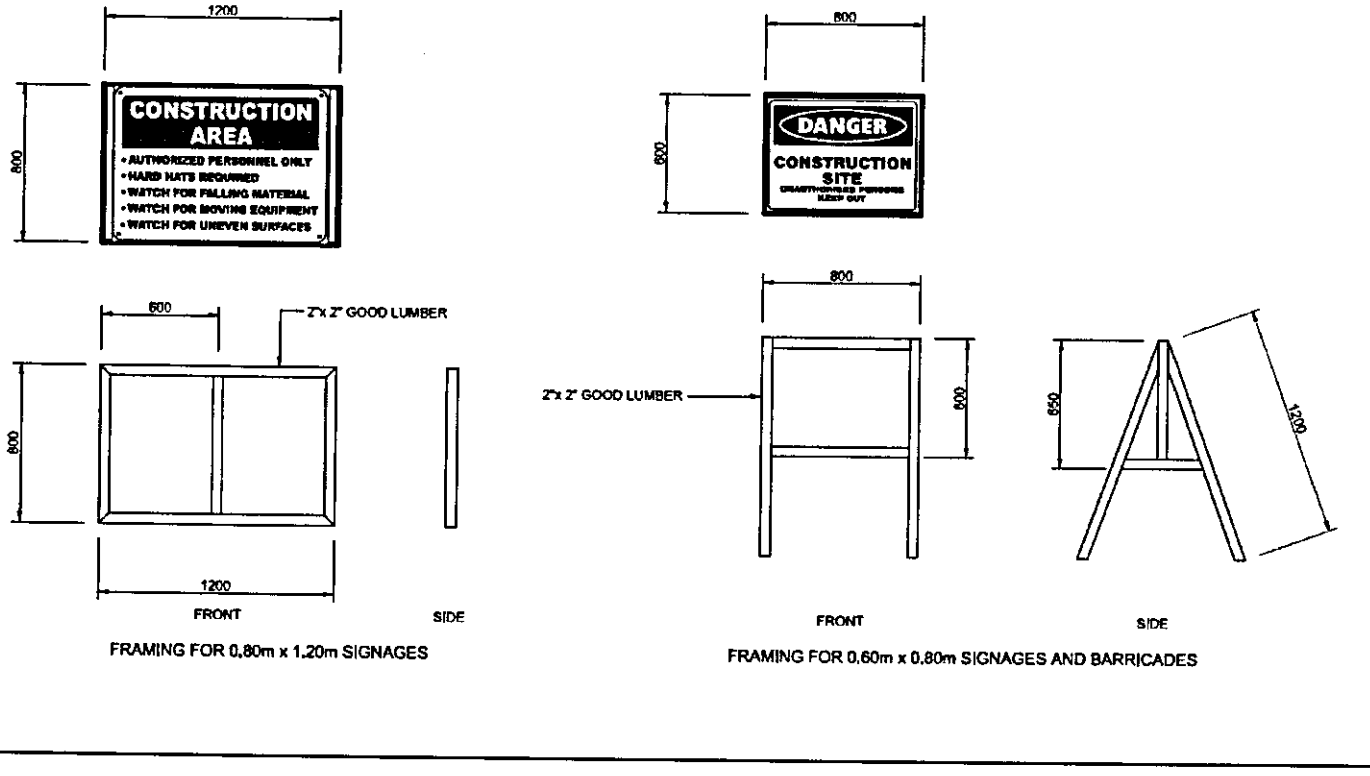
SPECIFICATION

The Signages and Barricades shall be installed at the location(s) designated by the Engineer.

The sizes of the standard signages shall be 2-2/3ft x 4ft (800mm X 1,200mm) for fixed type and 2ft x 2–2/3ft (600mm x 800mm) for mobile type. For barricade standard 2ft x 2–2/3ft (600mm x 800mm) shall be provided.

The materials to be used for signages and barricades are ½ inch (12mm) marine plywood or tarpaulin poster on a 2" x 2" (50mm x 50mm) good lumber frame (see drawing below).

The printing or painting shall be at the discretion of the Engineer.



STANDARD PLAN FOR SIGNAGES AND BARRICADES