b. 2. Temporary bracing shall be maintained in place until permanent work is properly connected and other construction installed as necessary for support, bracing or staying of permanent work.

b. 3. Extent and quality of temporary bracing shall be as necessary against wind and other loads, including seismic loads not less than those for which the permanent structure is designed to resist.

c. Adequacy of Temporary Connections

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

d. Alignment

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

e. Field Welding

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

e. 2. Field welding shall conform to the requirements specified herein, except as approved by the Engineer.

f. High Strength Bolts

Final tightening of high strength bolts shall be done by using manufacturer's power operated equipment without any overstress to the threads.

g. Correction of Errors

g. 1. Corrections of minor misfits by use of drift pins, and reaming, chipping or cutting will be permitted and shall be provided as part of erection work.

g. 2. Any errors to be corrected or adjusted, preventing proper assembly, shall be immediately reported to the Engineer, and such corrections or adjustments shall be made as necessary and approved by the Engineer.

g. 3. Cutting or alterations other than as approved will not be permitted.

h. Erection

h. 1. Erection and installation shall be as per approved shop drawings.

h. 2. Each structural unit shall be accurately aligned by the use of steel shims, or other approved methods so that no binding in any moving parts or distortion of any members occurs before it is finally fastened in place.

h. 3. Operations, procedures of erection and bracing shall not cause any damage to works previously placed nor make overstress to any of the building parts or components. Damage caused by such operations shall be repaired as directed by the Engineer at no extra cost to the Employer.

GALVANIZING

PREPARATION

All mild steel parts exposed to weather shall be hot-dipped galvanized after fabrication in accordance with the requirements of ASTM A 123 or ASTM A 153. Prior to galvanizing, the surfaces shall be cleaned of dirt, weld splatter, grease, slag, oil, paint or other deleterious matters. The steel surfaces shall be chemically de-scaled and cleaned with the same abrasive blast or other suitable method as approved by the Engineer.

COATING

The zinc coating shall consist of uniform layers of commercially pure zinc free from abrasions, cracks blisters, chemical spots or other imperfections, and shall adhere firmly to the surface of the steel. The weight of zinc coating per square meter of actual surface shall not be less than 550 grams. Any surface damaged subsequent to galvanizing shall be given two coats of approved zinc rich paints.

PAINTING

This work shall consist of the preparation of the metal surfaces, the application, protection and drying of the painted surfaces, and supplying of all tools, tackle, scaffolding, labor and materials necessary for the entire work. Painting shall be applied in the field or shop as approved by the Engineer.

Unless otherwise specified or approved, all painting work for structural steel shall comply with the requirements of this Section.

SHOP PAINTING

All structural steel shall be given a shop primer after fabrication and cleaning before delivery to the site.

All steel work shall be thoroughly dried and cleaned of all loose mill scale, rust and foreign matters by means of sand blasting or other suitable methods approved by the Engineer before shop painting shall be applied. Each individual piece shall be painted prior to assembly. Portions where
field welding or field contact with concrete is required shall not be painted.

Except for galvanized surfaces and items to be encased in concrete, clean ferrous metal surfaces shall be given one coat of Amerlock 400 Epoxy Primer at 100 Microns or approved equal. Additional coat shall be applied to surfaces that will be concealed or inaccessible for finish painting by Amerlock 400, Top Coat at 150 Microns with color or equivalent.

FIELD PAINTING

After erection, the Contractor shall thoroughly prepare and clean the entire surface of all structural steel from all dirt, grease, rust or other foreign matters. The entire surface of all members shall then be field painted.

MATERIALS

1. Structural Steel Work

   a. After surface preparation, steelwork shall be given one coat of approved prefabricating primer.

   b. Before final assembly of steelwork at the fabricator's shop, two shop coats of special red lead primer shall be applied to the surface of sections to be in permanent contact, meeting faces and all other concealed surfaces. After final assembly, but before delivery to the project site, the steelwork shall likewise be given two shop coats of special red lead primer.

2. Galvanized Steelwork

   All galvanized steelwork shall be treated with zinc chromate two-pack etch primer followed by one coat of non-etch zinc chromate primer.

3. Miscellaneous Metal Work

   Unless otherwise specified in other Sections of the Specifications or shown on the drawing, miscellaneous metal works such as ladders, structural steel ladder rungs, etc. shall be given two shop coats of epoxy primer and two coats of epoxy enamel.

CONSTRUCTION METHODS

1. Cleaning of Surfaces

   Surfaces of metal to be painted shall be thoroughly cleaned; removing rust, loose mill scale, dirt, oil or grease, and other foreign substances. Unless cleaning is to be done by sand blasting, all weld areas, before cleaning is started, shall be neutralized with a proper chemical, after which they shall be thoroughly rinsed with water.

   Three methods of cleaning are provided herein. The particular method to be used shall be as directed by the Engineer.

2. Hand Cleaning

   The removal of rust, scale, and dirt shall be done by the use of metal brushes, scrapers, chisels, hammers or other effective means. Oil and grease shall be removed by the use of gasoline or benzene.

   Bristle or wood fiber brushes shall be used for removing loose dirt.

3. Sandblasting

   All steel shall be cleaned by sandblasting. The sandblasting shall remove all loose mill scale and other substances. Special attention shall be given to cleaning of corners and re-entrant angles. Before painting, sand adhering to the steel in corners and elsewhere shall be removed. The cleaning shall be approved by the Engineer prior to any painting which shall be done as soon as possible before rust forms.

4. Flame Cleaning

All metal, except surface inside boxed members and other surfaces which shall be inaccessible to the flame cleaning operation after the member is assembled, shall be flame cleaned in accordance with the following operations.

a. Oil, grease, and similar adherent matter shall be removed by washing with a suitable solvent. Excess solvent shall be wiped from the work before processing with subsequent operations.

b. The surface to be painted shall be cleaned and dehydrated (free from occluded moisture) by the passage of oxyacetylene flames which have an oxygen to acetylene ratio of at least 1.0. The oxyacetylene flames shall be applied to the surfaces of the steel in such a manner and at such speed that the surfaces are dehydrated; dirt, rust loose scale in the form of blisters or scabs, and similar foreign matters are freed by the rapid, intense heating by the flames. The number arrangement and manipulation of the flames shall be such that all parts of the surfaces to be painted are adequately cleaned and dehydrated.

c. Promptly after the application of the flames, the surfaces of the steel shall be wire brushed, hand scraped wherever necessary, and then swept and dusted to remove all free materials and foreign particles.

d. Paint shall be applied promptly after the steel has been cleaned and while the temperature of the steel is still above that of the surrounding atmosphere.

5. Weather Conditions

a. Exterior Coatings

Coatings to surface shall not be applied during foggy or rainy weather, or under the following surface temperature conditions: below 4°C, or over 35°C, unless approved by the Engineer.

b. Interior Coatings

Coatings shall be applied when surfaces to be painted are dry and the following surface temperatures can be maintained: between 18 to 35°C during the application.

6. Application

a. Paint shall be factory tinted and mixed. All paint shall be field mixed before applying in order to keep the pigments in uniform suspension.

b. Field Painting

When the erection work is complete, including all bolting and straightening of bent metal, all adhering rust, scale, dirt, grease or other foreign materials shall be removed as specified above.

As soon as the Engineer has examined and approved each steel and metal works structures, all field bolts, all welds, and any surfaces from which the top or first coat of paint has become worn off, or has otherwise come defective shall be cleaned and thoroughly covered with one coat of paint.

Surfaces to be bolted and surfaces which shall be in contact with concrete, shall not be painted. Surfaces which shall be inaccessible after erection shall be painted with such field coats as are required. When the paint applied for retouching the shop coat has thoroughly dried, and the field cleaning has been satisfactorily completed, such field coats as are required shall be applied. In no case shall a succeeding coat be applied until the previous coat is dry throughout the full thickness of the paint film. All small cracks and cavities which were not sealed in a watertight manner by the first field coat shall be filled with a pasty mixture of red lead and linseed oil before the second coat is applied.

The following provision shall apply to the application of both coats. To secure a maximum coating on edges of plates or shapes, bolt heads and other parts subjected to special wear and attack, the edges shall first be striped with a longitudinal motion and the bolt heads with a rotary motion of the brush, followed immediately by the general painting of the whole surface, including the edges and bolt heads.

The application of the second field coat shall be deferred until adjoining concrete work has been placed and finished. If concreting operations have damaged the paint, the surface shall be re-cleaned and repainted.

c. General Manners

Painting shall be done in a neat and workmanlike manner. Paint may be applied with hand brushes or be spraying, except aluminum paint which preferably shall be applied by spraying. By either method the coating of paint applied shall be smoothly and uniformly spread so that no excess paint shall collect at any point. If the work done by spraying is not satisfactory to the Engineer hand brushing shall be required.

d. Brushing

When brushes are used, the paint shall be so manipulated under the brush as to produce a smooth, uniform, even coating in close contact with the metal or with previously applied paint, and shall be worked into all corners and crevices.

e. Spraying

Power spraying equipment shall be used to apply the paint in a fine spray. Without the addition of any paint, the sprayed area shall be immediately followed by brushing, when necessary, to secure uniform coverage and to eliminate wrinkling, blistering and air holes.

f. Removal of Paint

If the painting is unsatisfactory to the Engineer the paint shall be removed and the metal thoroughly cleaned and repainted.

# ITEM 11 : DRAINAGE WORKS

## SCOPE OF WORK

The works shall consist of excavation, backfilling and construction of lateral drains, construction of manholes, reconnection to existing lateral and other related works in accordance with the dimensions, size, elevation and grade as shown on the drawing and shall conform with the Specification.

At least thirty (30) days before the start of any construction related to drainage works, the Contractor shall submit to the Engineer for his approval, shop drawings of the drainage work he intends to construct. The shop drawings shall include the materials and the general method of installation he intends to employ.

## *MATERIAL REQUIREMENTS*

BACK FILL

Fill shall be in accordance with Item "Reclamation and Fill".

GRAVEL BEDDING

Gravel Bedding/gravel base shall be in accordance with the specifications of Crushed Course Aggregates in "Reinforced Concrete".

SAND BEDDING

Sand bedding shall be in accordance with Item "Reinforced Concrete (Fine Aggregates)".

CONCRETE

Mixing/Casting and steel reinforcements shall be in accordance with Item "Reinforced Concrete" while the dimensions shall be as shown on the Drawings.

CEMENT MORTAR

Cement mortar shall consist of one part Portland cement to two parts of fine aggregate with water added as necessary to obtain the required consistency.

REINFORCED CONCRETE PIPE

The fabrication of reinforced concrete pipes shall conform to the Specifications of ASTM C 76 while the testing requirements shall conform to ASTM C 497. The Engineer reserves the right to inspect and test the pipe delivered for intended purpose. Defects that are discovered after acceptance of delivery of the pipe but before installation shall be a cause for rejection.

Standard reinforcement details and concrete strength shall be in accordance with DPWH "Standard Two Meter Concrete Pipe Culvert".

STEEL GRATING

All materials shall be compliant with ASTM A36 or equivalent and Hot Dip Galvanizing shall be in accordance with ASTM A123 with minimum average coating of 610gms/sq.m.

The gratings shall be fusion welded type and non-manually fabricated with loading capacity equivalent to HS20-44. Loads and deflection shall be in accordance with AS3990 and the fabrication shall be covered by the requirements of AWS D1.1.

***EXECUTION***

EARTHWORKS

All earthworks for concrete pipe culvert shall conform to the lines, grades and elevations shown on the drawings or as directed by the Engineer.

The lateral drain shall be excavated to the depth, grade and width established by the Engineer. The bedding surface shall provide a firm foundation of uniform density throughout the entire length. Soft, spongy, or otherwise unstable material encountered that will not provide a firm foundation for the concrete drainage shall be removed to the full width of the trenches and replaced by suitable material to a depth of not less than 30 cm. 100mm thick gravel bedding shall be used as foundation or otherwise as specified.

PIPE LAYING

The pipe shall be tested for water-tightness of joints before backfilling the trench. Unsatisfactory work shall be corrected without additional cost to the PPA. The collar shall have set sufficiently prior to backfilling.

Methods of installation and typical bedding for pipe conduits if not included in the plans, shall conformed to DPWH "Standard Two Meter Reinforced Concrete Culvert".

LATERAL DRAIN

Concrete cover and the steel gratings shall be set to the required elevations as shown on the drawings to fit the adjoining surfaces and shall be installed after the adjoining concrete is struck off and finished, and the fit on the frames shall be such that there is no rocking.

All completed structures shall be thoroughly cleaned of any accumulations of silts, debris or foreign matter of any kind, until finally accepted and put into service.

CATCH BASIN INLETS, MANHOLES AND OUTLETS

Lid frames shall be set to the required elevations as shown on the drawings to fit the adjoining surfaces. Lids shall be installed after the adjoining concrete is struck off and finished, and the fit on the frames shall be such that there is no rocking.

Where reconstruction of existing catch basin inlets, manholes, outlets, or similar structures are indicated, the work shall be in accordance to the details and elevations as shown on the drawings, including re-installation of existing metal frames, grates and lids, or replacing of concrete covers instead of grates that may have been lost or found lacking. All completed structures shall be thoroughly cleaned of any accumulations of silts, debris or foreign matter of any kind, until finally accepted and put into service.

FIELD DENSITY TEST

Field Density tests to determine the percent of compaction of the fill material shall be conducted until a field density of at least 95 percent of the maximum dry density in accordance with AASHTO T180, Method D has been achieved. In place density determination shall be made in accordance with AASHTO T191.

CLEARING AND DISPOSAL

Dumping or disposal of un-used excavated materials shall be coordinated to PMO. If the excavated materials are determined for disposal, the contractor will provide all necessary works and expenses for its completion in concurrence by the Engineer.

# ITEM 12 : MASONRY WORKS

## GENERAL

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 includes the furnishing of all labor and materials to complete the work as shown on the drawings and specified herein. The works shall include but not necessarily be limited to the following:

1. Supply and installation of concrete hollow block (CHB) walls with reinforcement

2. Plastering

3. Installing temporary works like scaffolding, platforms, steps, etc.

GENERAL PROVISIONS

The following publications of the issues below but referred to thereafter by basic designation only form a part of these specifications to the extent indicated by the reference thereto:

American Society for Testing and Materials (ASTM) Publications:

A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

A 33 Concrete Aggregates

C 129 Specification for Non-Load Bearing Concrete Masonry Units C

144 Specification for Aggregate for Masonry Mortar

C 270 Mortar for Unit Masonry

## MATERIAL REQUIREMENTS

Materials shall conform to the respective specifications and other requirements specified below

CONCRETE HOLLOW BLOCKS (CHB)

CHB shall be of standard manufacture, machine vibrated with fine and even texture and well-defined edges and conforming with the requirements of ASTM C 129. Unless otherwise specified on the Drawings, It shall have a minimum compressive strength of 4.14 MPa (600 psi). CHB shall be non-load bearing uniform and essentially smooth as normally achieves by standard molding methods and shall be free from any cracks, flaws or other defects.

BEDDING MORTAR

Mortar shall be composed of 1 part of Portland cement, 3 parts of sand and ½ part of lime. It shall have a compressive strength of [14 MPa (2,000 psi)] at 28 days and shall comply with property specifications for type N mortar set forth in ASTM Specification C 270 and as modified herein, proportioned and tested in an approved laboratory at the expense of the Contractor. When tested

for water retention, the mortar shall have a flow after suction, of 75 percent or more when mixed to an initial flow of 125 to 140 percent. When tested for compressive strength, mortar shall be mixed to a flow of 100 to 115 percent. Aggregate for mortar shall conform to ASTM C 144.

PLASTER

Plaster shall comply with the same specification as those for bedding mortar and will include the use of synthetic fibrous reinforcement of type and dosage recommended by the manufacturer.

REINFORCING STEEL BARS AND RODS

Minimum yield strength of reinforcement shall conform with the specifications in Section of Reinforced Concrete.

SAMPLES AND TESTING

1. The following shall be submitted for approval and in addition, representative samples shall be taken periodically from on-the-site stockpiles as required for testing or checking during the progress of the work.

| | | |
|---|---|---|
| Anchors and ties | : | Two of each type proposed for use |
| Concrete Hollow Blocks | : | Shapes, sizes and kinds in sufficient numbers to show full range of quality and texture. |

2. Sampling and testing, unless otherwise specified, shall be performed by an approved independent commercial testing laboratory at the expense of the Contractor. Certified copies of laboratory test reports, including all test data, shall be submitted at least 10 days before delivery of the units or mortar materials represented by the tests to the project site.

3. Mortar shall be laboratory-proportioned and tested. Certified copies of approved laboratory-established proportions shall be submitted with the required test reports and test data. Approved laboratory-established proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in mortar for the work unless additional evidence is furnished that the mortar meets the specified requirements.

**EXECUTION**

1. GENERAL

No unit having a film of water on its surface shall be laid. Masonry shall be laid plumb, true to line, with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and relaid with fresh mortar. Courses shall be so spaced that backing masonry will level off, flush with the face work at all joints where ties occur. Chases and rake-out joints shall be kept free from mortar or other debris.

2. Anchorage to concrete. Anchorage to abutting columns shall be provided only where indicated. Details shall be as indicated including anchorage to underside of beams and slabs.

3. Cutting and fitting, including that required to accommodate the work of others shall be done by masonry mechanics. Wherever possible, full units of the proper size shall be used in lieu of cut units. Cut edges shall be clean, true and sharp. Openings shall be carefully cut,

formed or otherwise neatly made for recessed items and for electrical, plumbing, or other mechanical installations so that wall plates, cover plates, or escutcheons required by the installation will completely conceal the openings and will have bottoms in alignment with lower edge of masonry joints. Webs of hollow masonry units shall be cut to the minimum required for the installation. Reinforced masonry lintels shall be provided as indicated above openings over 300mm wide, for pipes, ducts and cable trays, unless steel sleeves are used.

4. Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mounted electrical outlet boxes in wet locations shall be pointed flush with mortar including flush joints above the boxes. Anchors, ties, accessories, flashing, pipe sleeves and other items required to be built-in shall be built-in as the masonry work progresses. Anchors, ties, and joint reinforcement shall be fully embedded in mortar.

5. Unfinished work shall be stepped back for jointing with new work. Toothing may be resorted to only when specifically approved. Before laying new work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

6. Protection

Surfaces of masonry not being worked on shall be properly protected at all times. At the end of each workday period and when rain is imminent, the top of exposed masonry shall be covered with a strong non-staining waterproof membrane well secured in place and in a manner that will prevent moisture. Adequate provisions shall be made during construction to prevent damages by wind.

7. Mortar

Materials shall be accurately measured in laboratory-established proportions and mixed with as much water as may be necessary to produce the wettest workable consistency possible. Mortar shall be placed in final position within one hour after mixing. Mortar not used or that has started to set within this time interval shall be discarded.

8. Jointing

Joints in exposed-to-view except control joints, joints to be pointed or caulked or sealed, and openings around flush-mounted electrical outlet boxes in wet locations shall be tooled slightly concave with the mortar thoroughly compacted and pressed against the edges of the units. Tooling shall be done when the mortar has been thumbprint hard. The tooled joint shall be finished to uniformly straight and true lines and surfaces, smooth and free of tool marks.

9. Placing Reinforcing Steel

Prior to placing grout, all reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout or other coating which might destroy or reduce its bond with grout. Details of reinforcement shall be as indicated in the drawings. Reinforcing shall not be bent or straightened in a manner injurious to the steel. Bars with kinks or bends not shown on the drawings shall not be used. Placement of reinforcement shall be inspected and approved prior to placing grout. One piece vertical bars extending from floor to floor or roof above shall be provided. Vertical bars shall be spliced only where indicated.

a. Positioning Bars

Vertical bars shall be positioned accurately at the centerline of the wall. A minimum clearance between the bars and masonry units of 12mm and between parallel bars of one diameter of the reinforcement shall be maintained. Vertical reinforcing shall be held in place using metal supports, centering clips, spacers, ties or caging devices located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement.

b. Splices

Splices shall be located only as indicated. Splices shall be staggered in adjacent bars at least 600mm. Bars shall be lapped a minimum of 40 diameters of the reinforcement.

PAINTING AND CLEANING

Mortar daubs or splashing, before setting or hardening, shall be completely removed from masonry unit surfaces that will be exposed or painted. Before completion of the work, all defects in joints or masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Masonry surfaces shall not be cleaned, other than removing excess surface mortar until mortar in joints has hardened. Masonry hardened surfaces shall be left clean, free of mortar daubs, dirt, stain and discoloration, including scum from cleaning operations and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

# ITEM 13 : 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 their effluent and discharge pipelines shall be part of other section of these specifications.

## MATERIAL REQUIREMENTS

SUBMITTAL

1. The Contractor shall submit his 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 location of the subject item in the shop drawing which 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 pipings, however, where actual conditions necessitate re-arrangement in opinion of the Contractor and/or the Engineer, the Contractor shall prepare and submit to the Engineer for approval, 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 requirement 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 shall be 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 passes through masonry or concrete. Pipe sleeves shall be uPVC pipe, Schedule 40.

8. Downspout

All downspout 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 downspout emptying at grade which shall be made of pre-cast concrete, with smooth finished counter sunk 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 stainless steel non-tilting grate, perforated or slotted. Urinal drains shall be cast iron dome type drain.

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 which 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 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 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 single hole on center.

c. Urinals

c. 1. Urinals for all comfort buildings shall be built-in urinal trough 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 saving flush system.

d. Service Sinks

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

e. Slope Sinks

Slop sink shall be 24"x20" acid resisting 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 toilet/bath rooms will be provided with soap holder, toilet paper holder and chrome plated towel racks.

g. Faucet for lavatory

Faucet for lavatory shall be in chrome-finish.

h. Bath and shower fitting

Bath and shower fitting 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 bar shall be tubular stainless steel, 25mmØ or as specified in the drawings.

l. Bidet Spray Combination

Installed in every cubicle near on 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 with 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 with 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 with the requirements of non-reinforced concrete pipes AIC latest edition. Concrete shall be with 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 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. Backfilling 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 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 at the pipe.

Cleanouts on floors shall be by uPVC plug adapter fit 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 top of 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 be 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 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 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 covering 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 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 have been installed, the joints 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 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, joint 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. 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. 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 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, capnuts 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 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 which 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 14A: ROOFING AND TINSMITHRY

## TICKETING BOOTH AND COVERED WALKWAY

## SCOPE OF WORK

The work shall include but not limited to all labor, materials, tools, equipment and incidentals necessary to furnish and install the roofing sheets including fittings, flashing caps, ridge rolls, gutters and construction of concrete eaves and canopy excluding waterproofing, to provide completely sound water tight roof for the buildings as shown on the Drawings and specified herein.

## MATERIAL REQUIREMENTS

ROOFING SHEETS

Roof Panel, Long span, pre-painted, pre-insulated roof panel system, composed of an exterior metal skin cladding using "snap on side overlap" fastening system and an interior liner cladding of either metal skin or aluminum kraft vapor barrier sandwiched between is, PIR "Polyisocyanurate" foam to provide a high-level thermal insulation.

| | |
|---|---|
| Base Metal thickness | From 0.40 mm to 0.60mm (standard) a specific tonnage is required for non-standard thickness. |
| Effective Coverage | 1000 mm |
| Rib Height | 33 mm |
| Rib Spacing | 250 mm |
| Length | up to transportable length (long span), minimum chance of leaks |
| Material Finish | Colorlume, Galvalume, PVDF Aluminum and Stainless |
| Insulation Thickness | 25mm thk. (for ticketing booth) |
| Insulation Materials | Polyisocyanurate (PIR) / Polyurethane (PU) (for ticketing booth) |

## EXECUTION

ROOFING SHEETS

1. Roof, Long span

   Spacing of purlins safe at 1.0m to 1.2m.

   At least 28 days before laying of roofing sheet start, the Contractor shall

submit for approval of the Project-In-Charged, shop drawings indicating materials and method of installation. No roofing sheets laying work shall commence without the Project-In-Charged approval of the shop drawings and work method.

Laying shall start from the end opposite the side from where the prevailing monsoon is coming from. The first sheet shall be laid and installed with the turned-down edge towards the outside of the area to be covered. The next sheet shall be overlapped to the previous sheet in such a manner that the exposed edge is turned down and the covered edge is turned up. The overlapped edge in the side shall be with the rib having the anti-capillary groove. End and side laps including flashing shall be as approved by the Project-In-Charged.

The straps shall be fixed and fastened with the fastener and washer as shown on the Drawings.

CONCRETE EAVES AND CANOPY

Construction of concrete eaves and canopy shall be in accordance with Reinforced Concrete as shown on the Drawings and as directed by the Project-In-Charged.

Waterproofing shall be in accordance with "Concrete Waterproofing".

**HANDLING AND STORAGE**

Sheet shall be lifted directly and shall not be dragged over the other sheets or over rough surfaces.

When working on a roof, the workers shall wear flat rubber soled shoes.

Tool shall be handled carefully to prevent them from sliding over the coated surface.

When installation work is completed, all metal off-cuts, used nails and other metallic scrap shall be removed from roof area.

When using drills, hacksaws, or files in the roof area, care shall be taken that metal particles and fillings are swept off the roof immediately.

If not required for immediate use, sheets or bundles shall be staked and clear off the ground. If left in the open, sheets shall be protected by loose tarpaulin or similar covers.

Bundles shall not be left expose to the weather.

CONCRETE EAVES AND CANOPY MATERIALS

Concrete materials shall comply with the requirements in Concrete Works.

Reinforcing Steel bars shall likewise conform with the requirements in Concrete Works.

C CHANNEL

Aluminum C-channel is often referred to as architectural angle and channel. Aluminum C-channel has uses in many industries and is often an ideal choice due to its non-corrosive properties and structural strength. Aluminum C-channel is considerably less expensive than wood, is lighter in weight, insect resistant, and resists warping and cracking from water damage.

C-sections
Height: 100, 120, 150, 200, 250, 300 mm
Thickness: 1.0–3.0 mm
Minimum length 1600 mm
Maximum length 18000 mm

# ITEM 14B : POLYCARBONATE

## TICKETING BOOTH

## GENERAL

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 item shall consist of furnishing all polycarbonate materials, labor, tools and equipment required in undertaking the proper installation as shown on the Plans and in accordance with these specifications.

## MATERIALS

### A. Framing

1. Shall be extruded aluminum of 6063-T5, 6005-T5 or 6105-T5 alloy and temper. All sections shall be formed true to detail and free from defects impairing appearance, strength or durability.

2. Thermally-improved intermediate mullions shall be integrated with non-thermally broken perimeter aluminum framing members.

### B. Glazing Gaskets

1. Shall be elastomeric, having low friction surfaces where they contact the glazing.

2. Shall be tested for chemical compatibility with the glazing, and test reports evidencing same shall be presented to the Architect.

### C. Fasteners

1. Where exposed, shall be stainless steel, 300 Series, with stainless steel backed neoprene washers.

2. Concealed fasteners they may be stainless or zinc-plated steel in accordance with ASTM Specifications A165-55 or A164-55.

3. Bolts, anchors and other fastening devices shall be as required for the strength of the connections and shall be suitable for conditions encountered. Washers shall be of the same metals as fasteners.

## D. Flashing

1. Minimum 0.040 thick Aluminum [painted finish: 3105-H14] [anodized finish: 5005-H34].

2. Factory formed to required profile(s) in 10-ft lengths, whenever practical, to allow for field trimming to suit as-built conditions.

3. The finish on this metal shall match as closely as possible that which is on the extruded aluminum framing members.

## E. Glazing

Polycarbonate

A. Extruded Polycarbonate

a. The extruded panels shall be uniform in color with an integral extruded multi-cell core. The panel's exterior skins shall be interconnected and spaced apart by continuous perpendicular supporting ribs. The space between the two exterior skins, in a cross section, shall be divided by multiple parallel intermediate walls.

b. Extruded panels shall consist of a polycarbonate resin with permanent, co-extruded, ultraviolet (UV) protective layers on both sides of the panels. These protective layers shall be co-extruded by the manufacturer during the original extrusion of the panel and shall be a permanent part of both the interior and exterior of the panels. Post-applied coating or films of dissimilar materials are unacceptable.

c. Panels shall be 6mm thick.

d. Panel width shall vary to suite needs of the project.

B. Monolithic Polycarbonate

a. The solid polycarbonate panels shall be uniform in color.

b. Solid panels shall consist of a polycarbonate resin with a permanent co-formulated ultraviolet (UV) protective additive.

c. Panels shall be 6mm thick.

d. Panel width shall vary to suite needs of the project.

**F. Attachment**

a. System shall be fastened to substrate with fasteners that are designed and installed by the installer.

b. Fasteners to penetrate through one-piece perimeter extrusions, and through base extrusions of intermediate mullions.

c. Any shims or appurtenances required to facilitate system mounting and isolation shall be provided and installed by the installer.

**G. Flammability**

a. The panel shall have a CC1 fire rating classification when tested in accordance with ASTM D-635 or equivalent.

b. The panel shall have a [Class A][Class B] or [Class C] flame spread and smoke development rating when tested in accordance with ASTM E-84.

**FINISHES / SPECIFICATIONS**

- Supply and Install 4 feet X 10 feet X 6.00mm Polycarbonate with complete accessories.

**FABRICATION AND WORKMANSHIP**

A. Construct canopy using extruded aluminum members or any structural design member approved by the structural design.

B. Carefully and accurately design, fabricate and assemble work with proper provision for thermal contraction and expansion. Work shall conform to profiles and sections noted on the shop drawings. Work shall be assembled with joints in a neat and finished manner.

C. All framing members shall be factory fabricated and assembled to the greatest degree possible, including the following:

- Cutting members to length.

- Installation of glazing gaskets, to be glued within extruded gasket tracks.

- Drilling straight and countersunk mounting holes, fastener access holes, and weep holes.

- Fabricating miter joints with concealed joint reinforcements and joint gaskets.
- Installation of non-metallic thermal isolation spacers.
- Removal of extrusion portions to accommodate tight over-lapping joinery and connections, including coped ends, mid-span notches, etc.
- Fabrication and installation of splice plates at jointed connections.

**EXECUTION**

A. EXAMINATION

a. All submitted opening sizes, dimensions and tolerances are to be field verified by the installer unless otherwise stipulated.

b. Installer to examine site conditions to verify readiness. Notify general contractor or owner about any defects requiring correction, including but not limited to improperly sloping sill substrates and uneven planar substrates. Do not work until conditions are satisfactory.

B. INSTALLATION

a. Install components in strict accordance with manufacturer's instructions and approved shop drawings. Use proper fasteners and hardware for material attachments as specified.

b. Use methods of attachment to structure which include provisions for thermal movement.

c. Glazing shall be installed in accordance with panel and system manufacturer's guidelines.

d. Remove all protective coverings on polycarbonate panels during or immediately after installation.

e. Installation shall be performed by a company with ten (10) years continuous experience in commercial construction.

f. Protect contact points between unprotected dissimilar metals (except stainless steel) using continuous separators of FRP, PVC tape (or approved equal)

## C. CLEANING AND PROTECTION

a. During installation, protect exposed surfaces against accumulation of paint, caulking, disfiguration and damage.

b. Interior glazing surfaces shall be cleaned as the panels are being installed. The exterior shall be cleaned as each phase of the work is completed.

c. Follow panel manufacturer instructions when cleaning exposed panel surfaces. Clean polycarbonate and frame at time of installation.

d. Follow panel manufacturer's guidelines when removing foreign substances from panel surfaces. Use only solvents that are deemed acceptable for use.

e. Before final acceptance, repair and/or replace any defective materials or work.

# ITEM 14C: CARPENTRY AND JOINERY WORKS

## SCOPE OF WORK

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

## GENERAL REQUIREMENTS

a. Lumber Grades

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

b. Substitution of Lumber

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

c. Delivery and Storage

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

d. Grading of Plywood

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

## MATERIALS

### a. Lumber

Lumber for various uses shall be one of the species listed for the purpose indicated unless otherwise specified in the drawing. For any use not specified, the lumber shall

be the best commercial grade normally used for the purpose, subject to the approval of the Engineer.

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

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

| SPECIE | U S E |
|---|---|
| Yakal | All door jambs, headers and transom bars, wood plates and all other woodwork in contact with concrete or masonry and where indicated. |
| Apitong (pressure treated) | All truss members and rafters and where indicated; all wood framings and carpentry, except when in contact with concrete. |
| Tanguile (Kiln dried) | All exterior and interior mill work, siding, finish and trim, frame work and all other wood works not specifically mentioned; except when in contact with concrete. |

**b. Plywood**

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

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

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

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

**c. Fastenings**

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

1. Nails

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

2. Wood Screws

Shall be brass or cadmium plated of the best available commercial quality, and of types and sizes suited for the purpose.

## PRESSURE TREATED LUMBER

### a. Preservative Treatment

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

a. Boliden Salts - 45.5 kg. dry chemical per cubic foot of wood
b. Wolman Salts - 0.31 kg. dry chemical per cubic foot of wood
c. Tenalith Salts - 0.34 kg. dry chemical per cubic foot of wood

The Contractor shall submit an affidavit signed by an official of the preservative treatment company to the Engineer. This affidavit shall indicate the net retention of solid preservatives obtained and shall certify that pressure treated lumbers have a moisture content that does not exceed 17 percent upon shipment from the treatment plant.

Where it is necessary to cut or bore pressure-treated lumber on the job, two coats of prepared concentrated preservatives solution shall be applied to the end-cut or bored surfaces.

## ROUGH CARPENTRY

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

### a. Cutting and Fitting

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

### b. Framing and Structural

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

### c. Plates for Walls and Partitions

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

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

Anchors, connectors and fastenings not indicated or specified otherwise shall be of the size and types necessary to suit the conditions encountered. Size, type and spacing of nails, screws or bolts for installation of manufactured building materials shall be as recommended by the product manufacturer unless indicated or specified otherwise.

Rough hardware, exposed to weather or in contact with exterior walls or masonry or slabs shall be zinc-coated except as specified otherwise.

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

## JOINERY WORK

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

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

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

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

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

# ITEM 14D: PAINTING

## GENERAL

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 coatings 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, forms 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 starting of works. This statement shall include 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

2. The Contractor, before placing 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 in 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.

Paints for exterior finish must be with tile like durability and elegance, fast drying, solvent based acrylic, highly suitable for coastal or polluted areas with excellent anti-fungus properties and alkali resistance.

100% Acrylic, water based, quick-drying, easy to clean-up and environmentally friendly, resist dirt, stains, alkali, water, humidity, algae, mold and mildew growth and highly durable paint for interior finish.

An all-purpose synthetic quick dry paint for all types of wood and metal surfaces. It has high gloss, good color retention and outstanding durability.

For pipes, valves and equipment, galvanized and ungalvanized ferrous metal, use a 100% acrylic gloss paint, has excellent resistance to ultraviolet rays and resists chalking, cracking and color fading, dries fast and environmentally friendly.

SCHEDULE OF PAINTING

| | |
|---|---|
| **Architectural Items** | |
| **a. Exterior Finishes** | |
| 1. **On Concrete Walls** | |
| Two Coats, Concrete Masonry Paint | Elastomeric Paint<br>or approved equal |
| 2. **Unprimed Ferrous Metal** | |
| First Coat | Red Oxide Primer,<br>#310 or approved equal |
| Second & Third Coat | Quick Dry Enamel<br>or approved equal |
| 3. **On Concrete Block Wall** | |
| Masonry Neutralizer | Masonry Neutralizer #44<br>or approved equal |
| Two Coats, Concrete Masonry Paint | Elastomeric Paint<br>or approved equal |
| 4. **On Wood** | |
| First Coat ,Exterior Wood Primer | Flat wall Enamel<br>or approved equal |
| Second & Third Coat, Exterior enamel | Quick Drying Enamel<br>or approved equal |
| **b. Interior Finishes**<br>Location of the various finishes are listed in the Finish Schedule on the drawings or else will be confirmed by PPA | |
| 1. On primer and coated metal two coats of interior semi-gloss enamel or as indicated in the Schedule finish | Red Oxide Primer #310,<br>Quick Dry Enamel<br>or approved equal |
| 2. On Plaster | |
| First Coat | Masonry Neutralizer #44<br>or approved equal |
| Three Coats | Elastomeric Paint<br>or approved equal |
| 3. On Wood | |
| First Coat, Enamel under coater | Flat wall Enamel<br>or approved equal |

| | |
|---|---|
| Second & Third Coat, Exterior enamel | Quick Drying Enamel<br>or approved equal |
| 4. Wood Stain Finish | |
| First Coat, Second & Third Coats<br>Fourth & Fifth Coats | Oil Wood Stain,<br>Lacquer Sanding Seale r#1254<br>Clear Gloss Lacquer #1250<br>or approved equal |
| c. Non – Architectural Items<br>(Piping, valves, equipment, etc.) | |
| 1. Piping, valves, equipment etc. in rooms are to be painted | |
| 2. Galvanized pipes and ducts | |
| Primer – one coat<br><br><br>Finish – one coat | Red Oxide Primer,<br>#310<br>or approved equal<br>Quick Dry Enamel<br>or approved equal |
| 3. Black steel pipes | |
| Primer – one coat<br><br><br>Finish – one coat | Red Oxide Primer,<br>#310<br>or approved equal<br>Quick Dry Enamel<br>or approved equal |
| 4. Mechanical Items | |
| a. Ungalvanized ferrous metal<br>Primer – one coat<br><br>Finish – one coat | <br>Red Oxide Primer,<br>#310 or approved equal<br>Quick Dry Enamel<br>or approved equal or approved equal |
| b. Galvanized ferrous metal<br>Primer – one coat<br><br>Finish – one coat | <br>Red Oxide Primer,<br>#310 or approved equal<br>Quick Dry Enamel<br>or approved equal or approved equal |
| c. Submerged galvanized ferrous metal Primer – one coat | Red Oxide Primer,<br>#310 or approved equal |
| d. Buried miscellaneous ferrous surface valves, & flanged joints (excl. pipe) Primer – one coat | Red Oxide Primer,<br>#310 or approved equal |

## 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 2.0mm test sieve, and be substantially retained on a 0.18mm test sieve, with at least 25 percent retained on a 0.355mm 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 points, 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 where 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.

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 end grain. When the priming paint is hard, all cracks, holds, 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 flatted.

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 prime cost.

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 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.

ALUMINUM FRAMES FOR DOORS AND WINDOWS

All metal surfaces shall undergo 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 electro-static 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° C (metal temperature measured on the area with greatest metal thickness). The temperature variation in the oven should not exceed +/- 10° C.

HANDLING

Coated items should be cooled to no less than 40° Centigrade before handling. Precautions should be taken to avoid damages on 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 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 manufacturer's standard method.

## WOOD REPAIR

Badly decayed areas shall be removed and repaired. Areas and pieces decayed beyond repair shall be replaced with new pieces that match 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 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 runs, chop, ridges, waves, laps and unnecessary brush marks. All coats shall be applied in such 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 on 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 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. Finish coat shall be smooth and free from runs, sags, and other defects. Exterior paint shall not be applied during rainy days.

All paint when applied shall provide a satisfactory film and 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.

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 application of water-emulsions shall be soaked in water for a period of 2 hours prior to use.

All cloths and cotton waste which 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 which will minimize damage to sound paint. Rust spots shall be thoroughly cleaned and 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 which will cause cracking, wrinkling, blistering, formation of pores which would detrimentally affect the condition of the paint.

2. No drier 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.

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 14E: CONCRETE WATERPROOFING

TICKETING BOOTH AND PUMP HOUSE

## GENERAL

General Requirements contain provisions and requirements essential to these specifications and apply to this Section, whether or not referred to herein.

## SCOPE OF WORK

The work shall cover the waterproofing requirements for building as shown on the drawings.

The work shall consist of furnishing all labor, materials, equipment and other incidentals necessary for the integral waterproofing works where required as shown on the drawings and in accordance with the requirements of these specifications as directed by the Project - In -Charged.

SUBMITTAL

1. Material description and physical properties, application details, and recommendations regarding shelf life, application procedures, and precautions on flammability and toxicity.

2. Samples for each waterproofing type.

## DELIVERY AND STORAGE

Deliver manufactured waterproofing materials in manufacturer's original, unopened containers, with labels intact and legible. Containers of materials covered by referenced specification number shall bear the specification number, type, and class of the contents.

Store and protect materials in accordance with the manufacturer's instructions, and use within their indicated shelf life. Promptly remove from the site materials or incomplete work adversely affected by exposure to moisture. Use pallets and canvas tarpaulins to cover stored materials top to bottom.

## PRODUCTS

### I. DEEP PENETRATING SEALER

Deep Penetrating Sealer (DPS) is an environmentally friendly, non-toxic, odorless, clear, water-soluble liquid compound, which is safe and easy to use.

Deep Penetrating Sealer (DPS) penetrates below the surface and chemically reacts with the alkali and lime found in concrete. This reaction creates a silica gel membrane within the pores and capillaries of the concrete, permanently sealing it against the ingress of moisture yet allowing the concrete to breathe. Over a period of time, the silica gel membrane hydrates and solidifies into a crystalline structure, increasing the hardness and strength of both new and old concrete while reducing moisture vapor emissions and permanently stopping the penetration and flow of water and water-borne contaminants such as chlorides and acids, both on the positive or negative side forging a waterproofed and preserved concrete structure.

**EXECUTION**

- All existing dirt and other surface contaminants adhering on the surface must be thoroughly removed. Apply Concrete Neutralizer using sufficient coats to completely neutralize the surface. Do not wash off. When sufficiently dry, dust lightly to remove crystalline deposits.

- Mix thoroughly the product mixture as per manufacturer's instruction. Any change from the recommended proportion will affect its quality. Scrape the bottoms, sides and corners of the container to ensure complete and full blending. Prepare only enough quantities that can be used within the pot-life period. Do not delay application. Apply DPS by brush or roller or by using an airless spray.

- Allow to cure overnight prior to application of topcoat.

**II. FLEXIBLE MODIFIED CEMENTITIOUS**

Flexible Modified Cementitious (FMC) is a two-component latex modified cementitious coating. It can be simply achieved by mixing the pre-packed dry-mixing powder with the formulated flexible latex admixture, and subsequent brushing the slurry on various substrates. It protects a wide range of buildings and structural concrete components with excellent resistance to water, aggressive chemicals, long-term weathering, and scratching. It is applicable for those structures subjected to long-term water immersion.

1. Free surfaces from dirt or foreign materials. For the waterproofing to work best, manufacturers recommend the surfaces be sand blasted, bush-hammered or acid-etched.

2. Apply 2 coats of the cementitious waterproofing. The first coat could include the manufacturer's materials only. The second coating will include a cement-sand mixture and also have chemical and metallic elements too. If supplementary waterproofing is required, then a third coat may be required. This typically includes sand and cement for

that extra protection.

## METHODS OF APPLICATION

### Trowel

Application of the coating is done using the handheld trowel, by simply applying and spreading the coating using the trowel.

### Spray

This method uses spraying equipment like the ones used in painting vehicles. It is preferred due to its precise finish and efficiency. It is also faster to use the spray than the trowel method.

### Brush

Use a typical brush similar to roll brushes that are used in painting houses. It also has a uniform finish and is faster to use compared to the trowel.

It is good to note that different surfaces will dictate the method of application.

# ITEM 14F: ALUMINUM COMPOSITE PANEL

## INTRODUCTION

### A. MATERIAL COMPOSITION

Aluminum Composite Panel (ACP) is a lightweight durable panel made of laminated aluminum and polyethylene core compound, coated with an advanced fluorocarbon paint Polyvinylidene Fluoride (PVDF) to ensure the excellent durability of the surface finish. It is an excellent material for exterior and Interior cladding of new building construction as well as retro fit applications. It also has a high degree of levelness top reserve the fine architectural design and can be roller bended to suit various design shapes. The laminated structure of ACP ensures exceptional strength of the panel.

THICKNESSES: 3mm (Polyester) 4 to 6mmPVDF/+Nano

### B. CHARACTERISTICS

1. Flatness–as the composite material is rigid, the flat surface can be preserved. This is considered a major advantage of ACP.

2. Fire Resistance–ACP are laminated at Temperatures from 200° to 250° to bond aluminum sheets to the polyethylene core. The non-flammable aluminum cover sheets protect the plastic core.

3. Light Weight–as the weight is less than ½ to ⅓ of the weight of porcelain enamel, iron, copper, stainless and other metal panels, consequently it can reduce the weight of the building.

4. Durability–ACP is highly resistant to chemical corrosion due to the PVDF coating. The composite material is rigid, resistant to blows, breakage, and pressure and has high bending and breaking strength.

## SPECIFICATION

I. Aluminum Composite Panel (ACP) must be composed of density polyethylene core sandwiched between two sheets of aluminum,

II. It must be strong, lightweight approximately 5.5kg/sqm. But must be exceptionally flat.

III. The ACP composition

- Two sheets of aluminum
- Front side aluminum roll coated with polyvinylidene fluoride PVDF according to AAMA605.2 requirements.

IV. PVDF coating finish adhere to the following standards.

| Testing Item | Standard | Result |
|---|---|---|
| Finished coat thickness | ISO 2360 (CNS 8406) | 27.6m |
| Gloss | ASTM D532-89 | 20 ~ 45 % |
| Pencil hardness | ASTM D3363-00 | 2H |
| Toughness | ASTM D4145-83 | 2T no rift |
| Adhesive force | ASTM 3359-97 | 4B |
| Impact resistance | ASTM D2794-93 | >100 kg. cm. |
| Abrasion resistance | ASTM D968-93 | 64.6 L/mil |
| Mortar resistance | ASTM 605.2-90 | 24 Hrs. pat test exceed |
| Himidity resistance | ASTM D714-97 | 3000 hr no blister |
| | ASTM D2247-02 | |
| Boiling- water resistance | ASTM D3359-B | Passed |
| Salt-spray resistance | ASTM D117-03 | 3000 hr no blister |
| Acid resistance | ASTM D1308-87 | No effect |
| | AAMA 605.2-91, TEST #7, 7.31 | |
| Alkali resistance | ASTM D1308-87 | Passed |
| Solvent resistance | ASTM D2248-73 | Passed |
| | ECCAT T5 & NCCA No. 11-18 | |
| Color retention | ASTM D2244-93 | ΔE = 0.34 |
| Chalk resistance | ASTM D4214-98 | No chalking |
| Gloss retantion | ASTM D2244-93 | 84.2 % |

V. Total thickness must be 4.0mm minimum (standard)

VI. Framing must also be made of aluminum to prevent corrosion of the panels.

VII. Aluminum Composite panel supplier must be the same company that will install the framing and will fabricate and install all panels. This is to insure optimum workmanship. All labor and installation must have a warranty of not less than one year.

**PATTERN / FINISH / COLOR**

A. Panel Color: Black Galaxy or any approved equivalent by the designing Architect.

B. Solid Aluminum Composite Panel: Honeycomb / Circle holes design or any approved equivalent by the designing Architect.

C. Wooden Finish or any approved equivalent by the designing Architect.

## SUBMITTALS

### A. PRODUCT DATA

Manufacturer's printed product literature, specifications, and data sheets

### B. SHOP DRAWINGS

1.Indicate project layout and elevations; dimensions and thickness of panels; connections; details and locations of joints and sealant; methods of anchorage; number of anchors; supports; reinforcement; flashings; accessories; materials; and finishes.

2. Indicate proposed joints details providing watertight and structurally sound panel system that allows no uncontrolled water penetration on inside face of panel system as determined by ASTME331.

### C. SAMPLES

1. Sample of panel system materials for selection and verification of finishes, colors, and sealant colors.

2. Sample of panel assembly.

### D. TEST REPORTS (as requested)

Certified test reports for ACP from approved independent testing laboratories indicating compliance with specifications for specified performance, characteristics, and physical properties.

## QUALITY ASSURANCE

A. Fabricator / installer to be accepted by the manufacturer.

B. Fabricator / installer to have work similar in scope and size to this project.

C. Take field measurements prior to completion of shop fabrication. Coordinate fabrication schedule with construction progress to avoid delay of work. Field fabrication should be allowed to ensure proper fit and keep it to minimum with majority of fabrication being done under controlled shop conditions.

D. Maximum deviation from vertical and horizontal alignment of erected panels should be made.

E. Assume responsibility for components of exterior panel system including, but not limited to, attachment to sub-construction, panel-to-panel joinery, panel-to-dissimilar-material joinery, and joint seal associated with panel system.

**DELIVERY, STORAGE, and HANDLING**

A. Cover exposed surfaces with pressure-sensitive heavy protection paper or apply strippable plastic coating, before shipping to the job site.

B. Leave protective covering in place until final cleaning of building.

C. Deliver materials in (manufacturer's) original sealed packaging.

D. Store panels and accessories in a dry, secure location and protect from weather.

E. Protect finish and edges of panel.

**LOADING AND UNLOADING**

A. Panels must be handled carefully to prevent damage
B. Panels may buckle if they are not properly supported.
C. A forklift may be used for panels up to 10 feet (3 meters) long. However, some means of supporting the panel load over a longer distance from the forks may be used.

**PREPARATION**

Ensure surfaces to receive panels are structurally sound, even, smooth, clean, dry, and free from defects detrimental to work. Notify consultant thru writing of conditions unfavorable to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

**ACCESSORIES**

A. Extrusions, formed members, sheet, and plate are in accordance with ASTMB209 and recommendations of Manufacturer's

B. Panel stiffeners are structurally fastened or restrained at ends and secured to rear face of ACP with double-sided tape of sufficient size and strength to maintain panel flatness.

C. Sealant within panel system to conform with Manufacturer's standards to meet performance requirements.

D. Fasteners are not exposed except where unavoidable.

# ITEM 14G: FINISHES

## GENERAL

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

## SCOPE OF WORK

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

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

TICKETING BOOTH AND PUMP HOUSE

**Walls**

Exterior

a. Plain cement finished painted with elastomeric paint.
Location as shown in the plans and elevations.

Interior

a. Plain cement finished painted with elastomeric paint.

b. 300mm x 600mm Wall Tiles

c. 12mm thick Fiber cement board on light steel frame. (For drywall works)
Locations are shown in the plans and elevations.

Stud: 75 mm (3 inches)
3.0 meter length

Track: 75 mm (3 inches)
3.00 meter length

Board: 1.20 x 2.40 x 12mm fiber cement

## Fiber Cement Surfaces

Submittals

a. Manufacturer's product data for each type of product specified.

b. Samples

(1) 300 mm x 300 mm 2 sets of required mock up.

(2) Miscellaneous product samples such as joint tapes and compounds.

Application and Finishing

a. Apply and finish fiber cement panels as per specifications by manufacturer for flush-jointed.

b. Install fiber cement panels in manner which minimizes the number of end-butt joints or to avoid where possible.

c. Install exposed fiber cement panel with face side out. Do not install imperfect, damages or damp boards. Bat boards together for slight contact at edges and ends with not more than 1.5 mm open space between boards. Do not force into place.

d. Locate either edge or end joints over supports, except in horizontal applications where intermediate support is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered ends. Do no place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

e. Attach fiber cement panel for supplementary framing and blocking provided for additional support at openings and cutouts.

f. Space fasteners in fiber cement boards in accordance with referenced application and finishing standard and manufacturer specifications.

Methods Panel Application

a. Follow specifications by manufacturer.

b. Install fiber cement panel as follows, and as indicated on the drawings.

c. Apply fiber cement panels to supports as follows:

Fasten to steel framing with adhesive and supplementary screws as per recommendation by manufacturer.

Finishing of Fiber Cement Boards

a. Apply to joint treatment at fiber cement panels joints (both directions); penetrations; fasteners head, surface defects and elsewhere as required to prepare works for decoration.

b. Finish fiber cement panels as per recommendation by manufacturer.

Protection

a. Provide final protection and maintain conditions, in a manner suitable to installer that ensures, fiber cement panel construction being without damage or deterioration at time of substantial completion.

**Plain Cement Finish**

a. Surface Preparation

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

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

All surfaces shall be thoroughly wetted before plastering.

b. Trial Mix

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

The proportion of cement-sand and water necessary to produce the cement plaster of the required consistency shall be subject to the approval of the Engineer. Such approval may be withdrawn at any time and a change in

proportions may be required. Based on the approved mix proportions, the Contractor shall prepare a list showing the number of kilograms of the various materials to be used in the cement plaster finish mix.

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

c. Cement Finish Application

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

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

Final plaster finishes shall be rubber sponged.

d. Tolerance

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

e. Patching and Cleaning

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

**Painting Works**

a. Surface Preparation

Allow new masonry to dry for 14 days (for exterior surfaces) to 28 days (for interior surfaces) under normal conditions before painting. Surface to be painted should be clean and dry, free from oil, grease, dirt, dust, contaminants, and all loose grit and mortar.

**Without mesh:**

1st Coat: Elastomeric Wall Covering Sealer
2nd and 3rd Coat: Elastomeric Wall Covering Basecoat

4th Coat: Elastomeric Wall Covering Topcoat

**With mesh:**

1st Coat: Elastomeric Wall Covering Sealer
2nd Coat: Elastomeric Wall Covering Basecoat
Reinforcing Membrane: Fiberglass Matting
3rd and 4th Coat: Elastomeric Wall Covering Basecoat
5th Coat: Elastomeric Wall Covering Topcoat

**Wall Ceramic Tiles**

a. Wall tiles shall be glazed ceramic tiles color as per Architect's approval.

b. Trimmers and moulding shall be lustrous, glazed with size and color corresponding to wall tiles.

c. Portland cement, sand, bonding compound, lime and water shall conform with the requirements.

**Floors**

F1 600mm x 600mm Floor Tiles (Porcelain); Viento Nero Finish or equivalent

a. Exterior Floor

Locations are shown in the plan.

F2 600mm x 600mm Floor Tile; Lighter Beige (Rustic) or equivalent

a. Ticketing Area
b. Waiting Area
c. Commercial Space
d. Malasakit Help Desk Area

Locations are shown in the plan.

F3 600mm x 600mm Floor Tile; Madison White (Matte)

a. Shipping Lines Booth
b. Terminal Fee Booth
c. Electrical Room
d. Control Room
e. Janitor's Room / Storage

Locations are shown in the plan.

F4 600mm x 600mm Floor Tile; Fiorello Beige (Matte)

a. Female Toilet
b. Male Toilet
c. PWD Toilet
d. All-Gender Toilet
e. Nursing Mother / Diaper Changing Room

Locations are shown in the plan.

Ramp and Stairs

Installation of 50mm thk. Rigid type stair nosing.
300mm x 300mm Tactile Blocks

**Waterproof finish for all toilets and pump house**

a. Floor tiles shall be color varies and as shown on the drawings or to be designated by the Architect.

b. Portland Cement, sand, water and adhesive shall conform with the requirements.

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

**Execution**

**Floor Tiles**

a. Mortar Preparation

Mortar mix proportion and preparation shall be in accordance with the requirements.

b. Surface Preparation

Surfaces to receive the tiles shall be clean, free of dust, dirt, oil, grease, and other deleterious substances. Floor tile operations in spaces receiving wall tile shall not be started until wall tile installation has been completed. Before tile is applied with a dryset mortar bed, the structural floor shall be tested for

levelness or uniformity of slope by flooding it with water. Areas where the water ponds shall be filled and leveled with mortar and shall be retested before the setting bed is applied.

c. Placing of Setting Beds and Floor Tile

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

A skim coat of neat Portland cement mortar shall then be applied not more than 4mm thick. The mortar shall be spread until its surface is true and even and thoroughly compacted, either level or sloped uniformly for drainage, as the case requires. A setting bed, as large as can be covered with tile before the mortar has reached its initial set, shall be placed on one operation; but in the event that more setting mortar has been placed than can be covered, the unfinished portion shall be removed and cut back to a clean beveled edge.

All mounted tiles shall be soaked in clean water a minimum of one hour before they are set. Absorptive mounted tile shall be dampened by placing sheets on a wetted cloth in a shallow pan before setting. No free water shall remain on the tiles at the time of setting. Before the initial set has taken place in the setting bed, a skim coat of neat Portland cement mortar, 0.7mm to 1.6mm thick, shall be trowelled or brushed over the setting bed and/or the back of the tile, or a thin layer of Portland cement, 0.79mm to 2mm thick, may be hand-dusted uniformly over the setting bed and worked lightly with a trowel or brush until thoroughly damp.

The tiles shall then be pressed firmly upon the setting bed, and beaten into the mortar until true and even with the plane of the finished floor line. Beating and leveling shall be completed within one hour after placing tiles or sheets. Borders and defined lines shall be laid before the field or body of the floor. Where floor drains are provided, the floors shall be sloped to drain properly to the drains. Intersections and returns shall be formed accurately.

Cutting of tile, where necessary, shall be done along the outer edges of the floor. As far as practicable, no tiles of less than half size shall be used. Cutting and drilling of tiles shall be done neatly without marring the tile surfaces. The cut edges of tile against trim, bases, thresholds, pipes, built-in fixtures, and similar surfaces shall be ground and jointed carefully. Tile shall fit closely

and neatly at all plumbing fixtures and around electrical outlets, pipes and fittings so that cover plates or escutcheons will overlap the tiles properly. Tiles shall be secured firmly in place and loose tiles or tiles sounding hollow shall be removed and replaced. All lines shall be kept straight, parallel, and true, and all finished surfaces brought to true and even planes. The inner edges of borders shall be kept straight and, where practicable, shall form right angles at all returns. The paper and glue shall be removed from mounted tile, without using excess water, within one hour after installing the tiles.

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

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

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

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

d. Cleaning and Curing

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

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

After acid cleaning, the tile shall be flushed with clean water, and the grease coating on metal shall be removed.

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

**Ceiling**

1. C1 - 600mm x 1200mm x 0.70mm Aluminum Clipped-In Perforated Panels in Bone White or Equivalent

    a. Ticketing Area
    b. Waiting Area
    c. Malasakit Helpdesk Area

    Locations are shown in the plan.

2. C2 - 600mm x 600mm x 0.70mm Aluminum Clipped-In Perforated Panel, Bone White or Equivalent

    a. Commercial Space

    Locations are shown in the plan.

3. C3 - 12mm thk. Gypsum Board w/ Paint Finish on 0.40mm thk. Galvanized Steel Ceiling Suspension System @0.40m O.C. (Furring), 0.60m O.C. (Carrying Channel) and 1.20m O.C. B.W. (Suspension Rod)

    a. Shipping Lines Booth
    b. Terminal Fee Booth
    c. Electrical Room
    d. Control Room
    e. Janitor's Room / Storage

    Locations are shown in the plan.

4. C4 - 0.40mm thk. Pre-Formed/Pre-Painted Ribbed Type Spandrel Metal Ceiling

    a. Concrete Eaves

    Locations are shown in the plan.

5. C5 - 12mm thk. Gypsum Board (MR) w/ Paint Finish on 0.40mm thk. Galvanized Steel Ceiling Suspension System @0.40m O.C. (Furring),

0.60m O.C. (Carrying Channel) and 1.20m O.C. B.W. (Suspension Rod)

a. Female Toilet
b. Male Toilet
c. All-Gender Toilet
d. PWD Toilet
e. Nursing Mother / Diaper Changing Room

Locations are shown in the plan.

SUBMITTAL

1. Shop drawings for all finishing and painting works for the building shall be submitted in advance to allow twenty-eight days for review and approval. Shop drawings shall indicate materials and details of finishing works. The Contractor shall be responsible for all errors of detailing and fabrication, and for the correct finishing work items shown on the shop drawings.

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

3. Samples of all finishes, measuring not less than 1000mm x 1000mm shall be submitted to the Engineer for approval as to its finish texture and workmanship.

**Granite Tiles**

a. Black granite slabs for toilet countertops, fascia and splashboard. Dimensions as shown on the drawings.

b. Shall be sound material with uniform and favorable working qualities and with very limited natural faults.

c. Color, veining and quality shall be approved by Engineer.

d. Veining shall run vertically on all vertical surfaces and direction of veining shall continue in same directions over horizontal surfaces except as directed by the Engineer.

e. Sealer

e. 1. Shall be a commercial penetrating type free from harmful alkali or acid content specially prepared for marble work
e. 2. Shall have a Ph factor between 7 and 9

e. 3. Shall not discolor
e. 4. Shall produce a slip resistant surface
e. 5. Shall have a flash point not less than 35 °C

f. cleaning fluid

f. 1. Shall be commercial neutral liquid type especially prepared for marble work
f. 2. Shall have a Ph factor between 7 and 9
f. 3. Shall be free from crystallizing salts or water-soluble alkaline salts
f. 4. Shall be biodegradable and phosphate free

**TICKETING BOOTH AND COVERED WALKWAY**

**Long Span Pre – Painted Roofing**

Pre-insulated Panels Pre-painted Hi-Rib Main Roofing Single Metal (Rib-type) (0.60 PPGL) with UPI Board 25mm thk.

**Installation of Doors / Glass Panels**

1. Surface Preparation

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

**Doors (Ticketing Booth)**

D-1 - 1.5mm thk. Aluminum Powder-coated Framed Door with 12mm thk. Reflective Tempered Glass (2000mm x 2150mm)

D-2 - Marine Plywood Flush Door including Door Jamb in Quick-Drying Enamel Paint Finish with Hinges, lockset and 8mm thk. glass (900mm x 2150mm)

D-3 - Marine Plywood Flush Door including Door Jamb in Quick-Drying Enamel Paint Finish with Hinges, Lockset and Louver (800mm x 2150mm)

D-4 - Marine Plywood Flush Door with Louver including Door Jamb in Paint Finish with Hinges, Lockset, Louver and 7.50mm thk. PWD Signage thk. PWD Signage (1100mm x2500mm)

D-5 - Marine Plywood Flush Door including Door Jamb in Quick-Drying Enamel Paint Finish with Hinges and Lockset (900mm x 2150mm)

D-6 - 1.5mm thk. Aluminum Powder-coated Framed Door with 12mm thk. Frosted Tempered Glass (800mm x 2100mm)

D-7 - Cold-rolled Steel Emergency Exit Door in Quick-drying Enamel with Panic Push Bar Lock including Jamb and Accessories (1200mm x2150mm)

D-8 - Powder-coated Aluminum Door (750mm x 1900mm)

D-9 - 12mm thk. Frameless Clear Tempered Glass Door (1800mm x 2400mm)

D-7 - Marine Plywood Flush Door with Louver including Door Jamb in Paint Finish with Hinges, Lockset, Louver and 7.50mm thk. All-gender Signage (900mm x 2150mm)

**Doors (Pump House)**

D-1 - Marine Plywood Flush Door including Door Jamb in Quick-Drying Enamel Paint Finish with Hinges and lockset (1500mm x 2150mm)

**Glass Panels (Ticketing Booth)**
(Including Door Schedules in Dimension)

W–6 - 12mm thk. Reflective Tempered Clear Glass Frameless Window (4700mm x 3200mm)

W–7 - 12mm thk. Reflective Tempered Clear Glass Frameless Window (11350mm x 3200mm)

W–12 - 12mm thk. Reflective Tempered Clear Glass Frameless Window (1800mm x 800mm)

**Installation of Windows (Ticketing Booth and Pump House)**

1. Surface Preparation

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

TICKETING BOOTH

W–1 - 12mm thk. Reflective Tempered Clear Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Frame (3600mm x 2300mm)

W-2 - 12mm thk. Reflective Tempered Clear Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Frame (1500mm x 2350mm)

W-3 - 10mm thk. Reflective Tempered Clear Glass Window with cut-outs in 1.5mm thk. Powder-coated Aluminum Frame (1200mm x1200mm)

W-4 - 12mm thk. Reflective Tempered Clear Glass Awning Window with 1.5mm thk. Powder-coated Aluminum Frame (2400mm x 600mm)

W-5 - 12mm thk. Reflective Tempered Clear Glass Awning Window with 1.5mm thk. Powder-coated Aluminum Frame (1200mm x 600mm)

W-8 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (5400mm x 3200mm)

W-9 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (4400mm x 3300mm)

W-10 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (4900mm x 3300mm)

W-11 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (5500mm x 3300mm)

PUMP HOUSE

W-1 - 8mm thk. Reflective Tempered Clear Glass Awning Window with 1.5mm thk. Powder-coated Aluminum Frame (1300mm x 600mm)

**Glazing Materials**

All glazing materials shall be delivered at jobsite with labels affixed indicating quality, make, type and thickness.

**Materials**

Use 6.3mm plate glass mirror on 6mm marine plywood backing with aluminum frame. Refer to plans for the required dimension of various glass mirror and location.

## Installation

1. All comfort rooms whether shown or not, the Contractor shall provide and fit securely in place at the most convenient height above each lavatory.

2. Setting and edge blocks shall be made of neoprene, chemically compatible with sealant.

3. All glass mirror shall be bedded, back puttied, secured in place and face puttied. Secure glass in aluminum frame with non-corrosive clips.

# ITEM 14H: ALUMINUM CEILING PANEL

## GENERAL

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

## SCOPE OF WORKS

This Item covers the use of aluminum panel as perforated ceiling panel and shall consist of furnishing and installing materials, tools, labor and equipment necessary for aesthetic purposes as indicated on the Plans and in accordance with this Specifications.

## MATERIAL REQUIREMENTS

### Aluminum

The aluminum shall be high strength, heat-treatable alloy which provides good formability and weldability and good corrosion resistance. It shall be suitable for a wide variety of architectural applications and of commercial quality unless specified in the Plans. It shall conform to the applicable requirements of ASTM B 209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

### Thickness

Thinner material perforates easier and faster. It shall have a gauge thickness tolerance of + 0.2 mm.

### Panel Shape and Size

Panel shape and sizes shall be as indicated in the Plans or as approved by the Engineer.

Aluminum panels shall be equipped with perimeter welded metal frames, return edges, borders mounting holes attachment brackets and clips. It shall be dimensioned as indicated on the Plans and as approved by the Engineer with a width and length tolerances of + 2.0mm and + 4.0 mm respectively.

### Perforations

#### Shape and Size

The shape of perforations shall be as indicated on the Plans using the standard shapes.

**Size:** 1200mm X 600mm, T = 0.70mm
600mm X 600mm, T = 0.70mm
**Hole Diameter:** 2.0mm
**Weight:** 1.94 kg/ sqm
**Powder Coated Finish:** Bone White Color with Black tissue felt in- fill to prevent penetration of dust.

In any cases that a custom shape perforation is needed for functional requirement spacing and size of perforation shall be provided.

The hole diameter should not be less than the thickness of the aluminum panel.

**Pattern**

Staggered pattern perforations shall have an unfinished end pattern that appears incomplete at both ends of the sheet.

For staggered perforations both Round and Square the pattern stagger shall be in the short dimension of the sheet. Holes in a straight row pattern shall be parallel to long dimension of sheet.

Slotted Perforation - Slots shall be identified if to be furnished parallel with either the length or width of the sheet.

**Margin**

The "margin" on a perforated sheet or plate refers to the distance from the edge of the sheet to the first perforation along the same dimension. "No margin" refers to the last row or set of perforations extending off the sheet or plate.

The long side of a sheet shall be supplied with minimum margins. The short side of a sheet will have either minimum margins or no margins.

**CONSTRUCTION REQUIREMENTS**

**Installation**

Install in accordance with manufacturer's installation instructions and approved shop drawings.

1. Level the ceiling height by the use of water level or laser beam.
2. Perimeter trims shall be installed using screw, nails or other applicable fasteners depending on wall type.
3. The ceiling shall be set out from the center to the perimeter wall. The center to

center spacing for Triangle Keel shall be 600mm.

4. The maximum distance from the wall to first suspension part shall be 600mm.
5. The Suspension Part Twin Clamps (together with drop –in anchor installed at the concrete slab) shall be spaced 600mm on center

   Note:
   The end of the threaded bolt shall be spaced on the drop – in anchor and the other end shall be attached to the suspension Party Twin Clamps using nuts.

6. Tringle Keel shall be attached to the Suspension Part Twin Clamps.
7. When the accessories have been installed, adjustment shall be made to ensure that the whole suspension ceiling is leveled.
8. Slightly push the Aluminum Ceiling Panel upward the ends of the panel until it rests with the triangle keel.

**Inspection**

When items not meeting specification requirements are discovered, their existence shall be called to the attention of the manufacturer prior to installation. Possible use of such items may be adjudicated among the responsible parties involved, based on the nature of the deficiency and the effect on the performance of the ceiling.

When rejection occurs, the manufacturer shall have the right to examine the rejected material. After removal of the portion not conforming to the specification, resubmission of the lot shall be permitted.

The inspection of specific ceiling areas for acceptability shall be made with lighting conditions corresponding to that of final building occupancy. If temporary lighting must be used, care shall be taken to position lights such that temporary conditions will approximate the final lighting condition.

# ITEM 14I: HANDRAILS, RAILINGS AND GUARDRAILS

## GENERAL

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

## SCOPE OF WORK

The work covered by this section consist of furnishing all labor, materials, equipment, tools and incidentals necessary to undertake, complete the installation of handrails, railings and guardrails as indicated on the drawings and as specified herein.

## SUBMITTAL

1. Manufacturer's technical data for products and processed used in handrails, railing, guardrails system including finishes and grout.

2. Shop Drawings showing details of fabrication and installation for each type and of handrail, railing and guardrails required including plans, elevations, sections, profiles of rails, fittings, connections, and anchors.

3. Prepare samples of each type of metal handrails & railings stainless steel hairline finish. Where finish involves normal color and texture variations, include sample sets composed of two or more units showing limits of such variations expected in completed works.

- Include 6" long samples of each distinctly different railing member including guardrails, handrails, top rails, posts, and balusters. Include samples of fittings and brackets if requested by Architect.

- Include sample of typical welded connection.

## QUALITY ASSURANCE

Single Source Responsibility

Obtain handrails, guardrail and railing systems of each type and material from a single manufacturer.

## STORAGE

Store handrails, guardrail and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

## FABRICATION

### General

Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets or size and spacing shown, but not less than required to comply with requirements indicated for structural performance.

### Shop Assembly

Pre-assembled items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

### Welded Connections

Fabricate handrails, guardrail and railing systems of materials for interconnections of members of welding. Use welding method, which is appropriate for metal and finish, indicated and develops strength required to comply with structural performance criteria. Finish exposed welds and surfaces smooth, flush, and blended to match adjoining surfaces.

Form changes in direction of railing members by bending members by metering, or as indicated on the drawing, as approved by the Architect.

Furnish inserts and other anchorage devices for connecting handrails, guardrail and railing systems to concrete or masonry work. Fabricate anchorage devices, which are capable of withstanding loading imposed by handrails, guardrails and railing systems.

Coordinate anchorage devices with supporting structure.

a. For railing, and guardrail posts set in concrete provide pre-chiseled openings and insert posts as indicated on drawings. Fill opening with non-shrink, non-metallic grout.

## MATERIALS

General

Comply with standards indicated for forms and types of metals indicated or required for handrail and railing system components.

a. Stair Railings
   As indicated on plans.

b. Stair Handrail
As indicated on plans.

c. Guardrail
As indicated on plans.

Refer to plans for the required dimension of various types of stainless-steel railings and location.

Fastenings: commercial types, except where special types are shown or required.

Fastenings for all exterior work shall be non-ferrous, unless otherwise shown. Fastenings for steel and aluminum and for all other interior work, where exposed, shall match the fastened metal.

Miscellaneous materials or accessories not listed above shall be provided as specified hereinafter the various items of work and/or indicated on the drawings, or in accordance with manufacturer's specifications.

**EXECUTION**

**PREPARATION**

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

**METAL FINISHES**

Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

**EXECUTION**

**PREPARATION**

a. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete and masonry construction. Coordinate delivery of such items to project site.

b. Field Measurements
Take field measurements prior to fabrication.

## INSTALLATION

GENERAL

a. Fit exposed connections accurately together to form tight, hairline joints.

b. Perform cutting, drilling, and fitting required for installation of handrails, guardrail and railing systems. Set work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels.

c. Field Welding

Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.

d. Prior to anchoring, adjust handrails and railing systems to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loading.

## ANCHORING POSTS

a. Concrete-Anchored Posts: Provide chiseled opening on concrete base as indicated on the drawings to receive railing posts and required anchoring system. holes of all loose material, insert posts, and fill annular space between post and concrete with non-shrink, non-metallic epoxy grout, mixed and placed to comply with grout manufacturer's directions.

## RAILING CONNECTIONS

a. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

## ANCHORING RAILING ENDS

a. Anchor railing ends to metal surfaces with manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.

b. Anchor Railing Ends to Concrete or Masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.

## PROTECTION

a. Protect finishes of railing, handrails and guardrails system from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

b. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

# ITEM 14J: LOW-E GLASS

## INTRODUCTION

Low-e glass stands for low emissivity glass. One side of the glass has a special metal coating, known as low emissivity coating. Low-e glass is a type of insulating glass which increases the energy efficiency of the windows by reducing the transfer of heat or cold through the glass.

This means that during cold season, the house stays warmer, and in summer it stays cooler.

## SCOPE OF WORK

This item shall consist of furnishing all low-e glass and glass wall materials, labor, tools and equipment required in undertaking the proper installation as shown on the Plans and in accordance with these specifications.

## MATERIAL REQUIREMENTS

### A. Aluminum

1. Frames and panel members shall be fabricated from extruded aluminum sections true to details with clean, straight, sharply defined profiles and free from defects impairing strength, durability and appearance.

2. Extruded aluminum sections shall conform to the specification requirements of ASTM B-211.

3. Screws, nuts, washers, bolts, rivets, spider connector and other miscellaneous fastening devices shall be made of non-corrosive materials such as aluminum and stainless steel.

4. Hardware for fixing and locking devices shall be closely matched to aluminum section and adaptable to the type and method of opening.

### B. Glass and Glazing

1. All glass and glazing materials shall be delivered at jobsite with labels affixed indicating quality, make, type and thickness. Each glass in glazed position shall resist a design pressure of 244 kilograms per square meter.

2. Glazing materials for glass installation may be:

    a. Bulk compound such as mastic that are elastic and non-skinning

compound.

b. Putties – wood sash putty or metal sash quality.
c. Sealant – shall be chemically compatible with setting blocks, edge blocks and sealing tapes.

3. Setting and Edge Blocks shall be made of lead or neo-prene, chemically compatible with sealant.

4. Accessories like glazing clips, shims, spacer strips etc. shall be made from non-corroding metal accessories.

**SPECIFICATIONS**

LOW-E GLASS

W-8 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (5400mm x 3200mm)

W-9 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (4400mm x 3300mm)

W-10 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (4900mm x 3300mm)

W-11 - 12mm thk. Double-glazed Low-e Glass Fixed Window with 1.5mm thk. Powder-coated Aluminum Side Frame (5500mm x 3300mm)

**CONSTRUCTION REQUIREMENTS**

1. Safety precautions and procedure shall be observed in determining the sizes and in providing the required clearances by measuring the actual opening to receive the glass.

2. Movable items or parts shall be kept in a closed and locked position until after the glazing compound has thoroughly set.

3. All glass sheets shall be bedded, back puttied, secured in place and face puttied. Secure glass in aluminum frame with non-corrosive clips except where glazing beads are required.

4. Apply putty in a uniformly straight lines, with accurately formed bevels and clean-cut corners, then remove excess putty from glass and frames.

5. Set glass in hollow metal doors and in metal frames of interior partitions in felt channels insets or bedded in putty to prevent any rattle.

a. Secure glass in wood doors and wooden frames with glazing stops.

b. Secure stops on doors with screws.

6. Glass breakage caused in executing the work or by faulty installation shall be replaced by the Contractor without extra cost.

7. Improperly installed glass which does not fully meet the requirements of its grade, will not be accepted and shall be replaced without extra cost.

**A. Workmanship**

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

2. Putty shall be neatly run in straight lines parallel with inside of glazing rebate.

3. Corners shall be carefully made. All excess putty shall be removed and surfaces left clean.

4. Apply a thin layer of putty to rebate and set glass. Apply putty by pressing into an even bed secured.

5. Place spring wire or angle glazing clips and run face putty. Remove excess putty from other side flush with edge of rebate.

**B. Cleaning**

Clean all glass on both sides after putty has been applied completely. Do not disturb edge of putty with scraper. At completion of work leave glass and glazing works free from cracks and rattles and clean on both sides.

# ITEM 14K: PHENOLIC TOILET PARTITION

## GENERAL

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

## SCOPE OF WORK

Furnish and install toilet partitions as shown on drawings and as specified herein.

## SUBMITTALS

1. Submit shop drawings indicating elevations of partitions, full scale sections, thickness and gauges of metal, fastenings, proposed method of anchoring, the size and spacing of anchors, details of construction, hardware, fittings, mountings, and other related items and installation details.

2. Submit sample one of each item of hardware, fittings, fastening, and each type of panel. The panel sample shall be cross-sectioned not less than 150 mm by 150 mm in size and shall show finish on base material and core of the panel.

3. Submit manufacturer's data literature for each item of hardware, fitting, fastening and each type of panel, complete with description of materials, finishes, and anchoring devices, and appurtenances.

4. Submit one sample of each color of partition for verification that products match the color indicated. Where colors are not indicated, submit the manufacturer's standard color samples for selection by the Architect.

## DELIVERY AND STORAGE

Deliver materials to the site in original sealed containers or packages, bearing the manufacturer's name, brand designation, specification number, type, style and finish as applicable. Store and handle materials in a manner to protect them from damage.

## MATERIALS

Toilet compartments/cubicles - comprising 12mm thk. intermediate panels, doors, and partitions/compartments (compact laminated phenolic board) including door frame system urinal divider, cubicle divider, hardware and accessories in stainless finish and all other incidentals to complete.

Sizes, dimensions of doors, cubicles and dividers as shown on plans. Color shall be as selected by Architect.

All the accessories shall be of heat chemical and bacteria resistant.

All edges of doors and pilasters are chamfered and finish without any metal trimming.

## EXECUTION

### INSTALLATION

Installation of toilet partitions and urinal screens shall be in accordance with approved shop drawings and manufacturer's installation and directions.

## ITEM 14L: MODULARS, CHAIRS, GANG CHAIRS AND DRINKING FOUNTAIN

### GENERAL

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

### SCOPE OF WORK

The work covered by this section consist of furnishing all labor, materials, equipment, tools and incidentals necessary to undertake, complete supply of tables, chairs of various type including accessories and foldable diaper changing counter for the buildings as indicated on the drawings and as specified herein.

TABLES

| *Tables* | *Unit* | *Quantity* |
|---|---|---|
| Office Desk | set | 11.00 |
| 10-seater, L-Shaped High Table (Charging Station) | set | 1.00 |

CHAIRS

| *Chairs* | *Unit* | *Quantity* |
|---|---|---|
| Breastfeeding chairs | set | 3.00 |
| Office Chairs | set | 12.00 |
| High Chair (Charging Station) | set | 10.00 |

GANG CHAIRS

| *Gang Chairs* | *Unit* | *Quantity* |
|---|---|---|
| 2-seater gang chair | set | 7.00 |
| 3-seater gang chair | set | 107.00 |
| 4-seater gang chair | set | 9.00 |
| 5-seater gang chair | set | 23.00 |

OTHERS

| *Others* | *Unit* | *Quantity* |
|---|---|---|
| Foldable Diaper Changing table | set | 1.00 |
| Drinking Fountain | set | 14.00 |

SUBMITTAL

1. Shop drawings for all gang chair for the building shall be submitted in advance to allow twenty-eight days for review and approval. Shop drawings shall indicate materials and details of finishing works. The Contractor shall be responsible for all errors of detailing and fabrication, and for the correct finishing work items shown on the shop drawings.

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

EXECUTION

All materials will be delivered and installed (if needed to be installed) on site.

# ITEM 14M: SIGNAGES

## SCOPE OF WORK

Furnish materials and perform labor to include miscellaneous works required for the installation of room identification for the toilets and port office.

SAMPLE AND SHOP DRAWINGS

The Contractor shall submit samples for approval by the Architect. Notify the Architect for any changes, clarifications and discrepancies. For the room I.D. full size lettering layout and installation method shall be submitted to the Architect for approval before start of work.

## MATERIAL REQUIREMENTS

1. PPA LOGO

    - Hot dipped cut out 4.5 mm thick Metal sheet screwed at the back.
    - 12.5mm thk. Colored Acrylic Plastic Sheet for PPA Logo
    - 1mm thk. Acrylic Painted G.I. Metal Sheet Free Standing Lettering

2. ROOM MARKERS

    Black acrylic letters, 38mm (1-1/2") high on white acrylic background, 63mm (2-1/2") high, with clear acrylic cover. Lengths shall be as required by the full notation therein.

## EXECUTION

WORKMANSHIP

Workmanship shall be executed in high quality comparable with artworks.

MOUNTING

For all mounted assemblies, appropriate mounting hardware and connectors which are concealed shall be sufficiently used.

Assemblies shall be mounted plumb, straight, level, and at prescribed heights.

INSTALLATION

Installation shall be done in a secure and permanent manner at prescribed heights and/or layout. The backwall shall not be mutilated. After the dowels are positioned, fill with expanding grout, or other approved fillers, and retouch, flashed to the backwall surface.

# ITEM 14N: GREEN WALL SYSTEM

## SCOPE OF WORK

This item shall consist of furnishing all green wall materials, labor, tools and equipment required in undertaking the proper installation as shown on the Plans and in accordance with these specifications.

## MATERIAL REQUIREMENTS

- Supply and installation of green wall system (felt plants included).
- Supply and installation of the flat bars for hanging plant box.
- Supply and installation of the watering/drainage pipe.
- Dimension: 2 - 3.65m X 3.50m

## CONSTRUCTION REQUIREMENTS

Safety precautions and procedure shall be observed in determining the sizes and in providing the required clearances by measuring the actual area to receive the green wall.

## WORKMANSHIP

Workmanship shall be executed in high quality comparable with artworks.

## MOUNTING

For all mounted assemblies, appropriate mounting hardware and connectors which are concealed shall be sufficiently used.

Assemblies shall be mounted plumb, straight, and leveled.

# ITEM 14O: FACILITIES AND DEVICE FOR PERSONS WITH DISABILITY

## SCOPE OF WORK

The work shall consist of furnishing materials, tools, labor and incidentals necessary for the construction/installation of facilities and device for disabled persons as shown on the Drawings and in accordance with the Implementing Rules and Regulations of Batas Pambansa Bilang 344 and this Specification.

## MATERIAL REQUIREMENTS

GRAPHIC SIGNS

Graphic signs like the International Symbol of Access shall be fabricated from plastic materials, white color with either dark blue background. Letters and symbols shall be laminated and raised from the background.

HANDRAILS

Handrail for ramp shall be 45mmØ tubular stainless-steel buff finished. It shall be provided with a small hole as of a Braille system.

GRABRAIL

Grabrail shall be manufactured from gauge 18 tubular stainless steel 50mmØ and provided with safety grip finish.

CONCRETE MATERIALS FOR RAMPS

1. Portland cement shall conform with the requirement of "Reinforced Concrete".

2. Aggregates shall conform with the requirements of "Reinforced Concrete".

## EXECUTION

GRAPHIC SIGNS

1. Directional and information signs, indicating the location of the ramp for physically handicapped persons, shall be installed / placed at the front of the main entrance of the building. The signed board size and dimensions shall be based on DOTr approved Standard Design, schedule 40, sign post and the text and arrow shall be in accordance with the International Symbol of Access "B". Manual (See attached drawings and tabulation).

2. Signs shall be placed at the entrance and exits of the ramps and toilets, installed at conspicuous locations. The signboards shall be based on DOTr approved Standard Design Manual (See attached drawings and tabulation).

RAMP

The ramp shall be constructed as shown on the drawings and with a nonskid surface and tactile strips.