

ANNEX C

Technical Specifications

2019-1396-A

Structural Retrofitting and Repair of Building 19

DOH Compound, Rizal Avenue, Sta. Cruz, Manila

TECHNICAL SPECIFICATIONS

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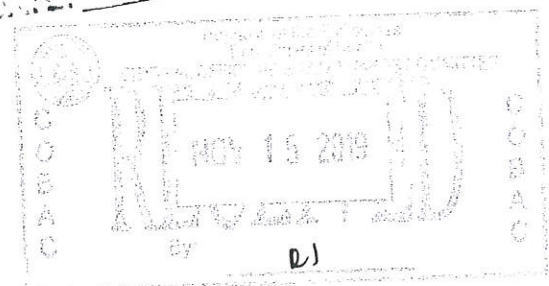


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1.0 GENERAL REQUIREMENTS

1.1 Scope of Work

This section shall include mobilization and demobilization of Contractor's plant, equipment, material and employee to the site; construction of the Contractor's office and facilities; compliance with the contract requirements.

This section shall include the furnishing of labor, materials, transportation, tools, supplies plant, equipment and appurtenance to complete satisfactorily the construction of the proposed subproject.

1.2 Mobilization and Demobilization

The contractor upon receipt of the notice to proceed shall immediately mobilize and transport his plant, equipment, materials and employees to the site and demobilize or remove the same at the completion of subproject.

1.3 Contractors field Office and Facilities

1.3.1 Field Office

During the performance of the contract, the Contractor shall construct and maintain a field office and facilities at the site of the work at which he or his authorized agent shall be holding office and all times, while the work is in progress. The location, dimensions and layout of such field office shall be subject to approval. Construction shanties, sheds and temporary facilities provided as requires for the Contractor's convenience shall be maintain in good condition and neat appearance including finishes as required.

1.3.2 Temporary Light and Power

The Contractor shall provide and maintain temporary electrical service including installation of temporary power and lighting within the construction site. The electrical service shall be adequate in capacity to supply power to construction tools and equipment without over-loading the temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of the local governing cods. At the completion of the construction work, all temporary wiring, lighting, equipment and devices shall be removed.

1.3.3 Temporary Toilet

The Contractor shall provide and maintain its sanitary condition enclosed toilet for the use of all construction personnel located within the contract limits, complete with fixtures, water and sewer connections and all appurtenances. Installation shall be in accordance with all applicable codes and regulations of the local authorities having jurisdiction thereof. Upon completion of the work, temporary toilet and their appurtenances shall be removed.

1.3.4 Temporary Water Service

The Contractor shall provide and maintain temporary water supply services, complete with necessary connections and appurtenances. Installed water supply lines shall be used as a source of water for construction purposes subject to the approval of the Project Manager. The Contractor shall pay the cost of operation, maintenance and restoration of the water system. All temporary water service including equipment and piping shall be removed

upon completion of work and all worn out and damaged parts of the permanent system shall be replaced and restored in first class condition equal to new.

1.3.5 Security

The Contractor shall provide sufficient security in the construction site to prevent illegal entry or work damaged during nights; holidays and other period when work is not executed; and during working hours. The Contractor shall take ample precautions against fire by keeping away flammable materials, and ensure that such materials are properly handled and stored. Fires shall not be built within the area of construction, except when permitted by the Project Manager.

1.4 Compliance with Contract Requirements

1.4.1 Control of on Site Construction

Prior to start of any definable feature of the work, the Contractor must perform the necessary inspection to include as follows:

- (1) Review of Contract Documents to make sure that material, equipment and products have been tested, submitted and approved.
- (2) Physical examination of materials and equipment to assure its conformity to the specification, plans, shop drawing and other data.
- (3) As soon as the work has been started the Contractor shall conduct initial inspection to check and review the workmanship in compliance with the contract requirements for a particular item of work.
- (4) The Contractor shall perform these inspections on a regular basis to assure continuing compliance with the contract requirements until completion of a particular type of work.

1.4.2 Pre-Construction Meetings

Prior to the start of construction, Contractor's material men whose presence is required must attend pre construction meetings as directed for the purpose of discussing the execution of work. In this conference, the contractor determines the necessary precautions in mitigating the effect of construction on environmental aspect and medical services.

1.4.3 Progress Meetings

Progress meetings shall be called upon by the following for the purpose of discussing the implementation of the work:

- (1) When called upon by the Project Manager of DOH or his representative for the purpose of discussing the execution of work, Contractor's material men whose presence is necessary or requested must attend progress meetings. Each of such meeting shall be held at the time and place designated by the Project Manager or his representative. Decisions and instructions agreed in these meetings should be binding and conclusive on the contract. Minutes of these meetings shall be recorded and reasonable number of copies shall be furnished to the Contractor for distribution to various materials men and vendors involved.
- (2) The Contractor may also call for a progress meeting for the purpose of coordinating, expediting and scheduling the work. In such meeting, Contractor's material men or vendors, whose presence is necessary is requested to attend.

1.4.4 Progress Report

The Contractor shall prepare and submit progress reports to the project manager every 30 days after the start of the project up to its completion, showing the work completed, work remaining to be done, status of construction equipment and materials at the site, as stipulated in Section 4 of the General Conditions of Contract.

1.4.5 Survey Data

The Contractor shall layout his work from established base lines and benchmark indicated in the drawing and shall be responsible for all measurement in connection therewith. The Contractor shall furnish, at his own expense, all stakes, templates, platforms, equipments, tools, materials and labor as may be required in laying out any part of the work, out of established base lines and bench mark. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks until he is authorized to remove them. If the Contractor, through his negligence prior to the authorized removal destroys such marks, they shall be replaced at the expense of the Contractor.

1.4.6 Shop Drawing

The Contractor shall submit and furnish shop drawings and samples accompanied with the provision of the Conditions of Contract. The term "Shop Drawing" as used herein shall be understood to include detailed design calculations, construction drawings, lists, graphs supplemental specifications and others.

- (1) Transmittal forms shall be filled out in typewritten or ink with no alterations or inter line actions unless initialized dates before submittal. Shop drawings shall be submitted as the same size as the contract drawing when practicable, but in no case it shall exceed dimension of the contract drawings. The Contractor shall make preliminary check of all shop drawings for compliance with the contract documents and he shall stamp each print with statement of compliance with the requirements. The contractor may authorize his supplier to deal with the Project Manager with regard to the shop drawings, however ultimate responsibility for accuracy and completeness in the submittal shall remain with the Contractor.
- (2) The said shop drawing and transmittal shall be submitted at a time sufficiently early, to allow review of the same by the Project Manager and to accommodate the rate of construction progress required under the contract. The contractor shall submit print copies of shop drawing with transmittal forms, and copies of brochures with transmittal forms as required by the Project Manager.
- (3) Any shop drawing and samples submitted, not accompanied by transmittal forms of all applicable items on the forms or are not completed, would be returned for resubmission. The Project Manager who will check and evaluate mentioned shop drawing would retain print copy for his file and return the rest to the Contractor with notation. Returned shop drawing marked "No Exceptions Taken" or "Make Corrections Noted", means formal revision of said drawings will not be required. If it is remarked "Amend Resubmit" or "Rejected-Resubmit", the Contractor shall revise said drawing and shall submit revised drawing to the Project Manager.
- (4) The Project Manager shall process the submission and indicate the appropriate action on the shop drawing and transmittal forms. Construction of an item shall not commence before the Project Manager has reviewed the pertinent shop drawing and returned it to

the Contractor, marked as mentioned above. Revisions indicated on shop drawing shall be considered as changes necessary to meet the requirements of the contract drawings and specifications, and shall not be taken as the bases of claims of extra work. The Contractor shall have no claim for damages or extension of time due to any delay, resulting from having Contractors make the required revisions, unless review by the Project Manager was delayed beyond reasonable period of time and unless the Contractor can establish that such delay in revision resulted in the delay of the project.

- (5) Resubmitted procedure shall follow the same procedure as the initial submittal.

1.4.7 Construction Photographs

The Contractor shall take photographs during the process of the work once a month, all taken where directed by the Project Manager. At the completion of the project final photographs shall be sent to the DOH or Project Manager. The photographs shall be neatly labeled, dated and identified in a little box in the lower right hand corner, showing the date of exposure, project name, location and direction of view.

All negatives shall be retained by the Contractor until completion of the work at which time they shall become the property of the DOH.

1.4.8 Cleaning-up

The Contractor shall at all times keep the construction area including storage area used by him free from accumulations of waste material or rubbish. Upon completion of construction, the Contractor shall leave the work and premises in clean, neat workmanlike conditions satisfactory to the DOH.

1.4.9 Documents to be submitted

The Contractor shall submit the following documents prior to final payment and before issuance of final certificate of payment in accordance with the provisions of the conditions contract.

- (1) The guarantee required by the Conditions of Contract and any other extended guarantees stated in the technical sections of the specifications.
- (2) A set of As-Built drawing shall be submitted showing accurate record of changes or deviations from the contract documents and the shop drawings indicating the work as actually installed. Records shall be arranged in order, in accordance with various sections of the specifications and properly indexed with certifications of endorsement thereof, that each of the revised print of drawings and specifications are complete and accurate. Prior to the application for final payment, and as a condition to its approval by the Project Manager of DOH, the Contractor shall deliver the records, drawings and specifications arranged in proper order, indexed and endorsed herein specified.

1.5 Method of Measurement and Basis of Payment

Cost incurred in providing and maintaining Contractor's field office, temporary light and power, temporary toilet, water and security services, including cost mobilization and demobilization, and cost incurred in the compliance of contract requirements shall not be measured and paid separately, same shall be deemed to be included in the cost of other items work, as part of the Contractor's construction overheads.

2.0 SITE WORK

2.1 Scope

The section includes site clearing, earthwork and site drainage and utilities construction of septic tank in accordance with the drawing and specification.

2.2 Applicable Documents

The latest edition of the following Standards and Specifications shall form part of these specifications:

ASTM	American Society for Testing and Materials.
C131	Resistance to Abrasion of Small Size Coarse Aggregate by use of the Los Angeles Machine.
D698	Moisture-Density Relations of Soils using 5.5 lb. (2.5 kg) Rammer and 12 in (304.8 mm) Drop
D1556	Density of Soil in place by the Sand Cone Method
D1557	Moisture-Density Relations of Soils using 10 lb. (4.5 kg) Rammer and 18 in (457 mm) Drop.
D2487	Classification of Soils for Engineering Purposes
C-14	Concrete Sewer, Storm Drain and Culvert Pipe.
C-76/C-497	Class II Reinforced Concrete pipes
A-74	Cast Iron Soil Pipes and Fittings
Other pipes shall conform to the latest ASTM requirements.	

2.3 Material Requirements:

2.3.1 Selected Fill Material

Selected fill materials shall consist of pit run gravel, disintegrated rock, sand and or other similar materials. The material shall not contain more than 35% passing the No. 200 sieve; and fraction of the material passing the No. 40 sieve shall have a liquid limit not greater than 35 and plasticity index not greater than 12.

2.3.2 Gravel Fill

Gravel fill shall consist of hard durable particles or fragments of stones or gravel. It shall be clean and free from vegetable matters, lumps or balls of clay and other deleterious material. The proportion of the material passing the 0.075 mm (No. 200) sieve shall not be greater than 0.66 (two thirds) of the fraction passing the 0.425 mm (No. 40) sieve. The fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit of not more than 25 plasticity index of not more than 6 as determined by AASHTO T89 and T90. Gravel bedding 100 mm (4") in depth or as shown on the drawing shall be placed, spread and compacted through tamping and underneath footing, slabs, on fill and slabs on grade.

2.3.3 Base and Sub-base Course

Aggregate sub-base shall consist of pit run gravel, talus rock, disintegrated granite, sand, shale cinders, coral or other similar materials, or additional filler for blending, selected under the direction of the Consultant. The maximum dimension of any particle shall not be greater than two-thirds of the required thickness of the layer in which it is to be placed. Over-sized materials if present shall be removed at the pit by screens, or hand picking. If necessary, to obtain proper uniformity, mixing shall blend additional filler. The fraction to aggregate sub-base materials including any additional filler passing the 0.075 mm (No. 200) sieve shall not be more than two-thirds (2/3) of that passing the

0.425 mm (No. 40) sieve. The fraction passing the 0.425-mm sieve shall have a liquid limit not greater than 25 and plasticity index of not more than 6.

2.3.4 Concrete for Site Work

Concrete materials for the site work shall be in accordance with Section 3, concrete, of these specifications. Cement shall be proportioned as follows:

<u>Description of Structure</u>	<u>Compressive Strength</u>
1.) For sidewalks, walkways, catch basins and man holes	1.72 Mpa (2500 psi) at 28 days
2.) Septic Tank	20.7 Mpa (3000 psi) at 28 days

2.4 Construction Requirements

2.4.1 Earthwork

1. Site Demolition

All superficial obstructions shall be demolished and removed from the site to disposal areas approved by the Consultant.

2. Clearing and grubbing

(a) Clearing

All areas within which the structure or related construction has to be accomplished shall be completely cleared of matted roots, tree brushes, snags, vegetation, rubbish, spoils and other objectionable matters. All combustible materials from clearing operation shall be completely burned or removed from the site of work or otherwise disposal off as directed by the Project Manager. All materials to be burned shall be piled neatly and when in suitable condition shall be burned completely. Piling for burning shall be done in such a manner and location as to cause the least fire risk. All burning shall be thorough that the cleared materials can be reduced to ashes. The Contractor shall at all times take special precautions to prevent fire from spreading and shall have available at all times, suitable equipment and supplies, for use in preventing and fighting fires.

(b) Grubbing

Grubbing shall consist of the removal of tree stumps, brush and rubbish from the work areas to be occupied by permanent structures, from other areas within the indicated clearing limits as directed by the Project Manager. Trees and shrubs to be retained shall be protected properly from damage. Stumps shall be removed entirely. Roots and matted roots shall be grubbed and cut to at least 450 mm below the existing surface.

3. Structural Excavation

All excavation shall be performed by the Contractor to the excavation lines, grades and slopes and profiles shown in the drawings, or as directed by the Project Manager. All excavation shall be performed in the dry condition, unless otherwise approved by the Project Manager.

(a) Excavation for Structure and Trenches

Excavations carried out below the depth indicated on the drawing without the approval of the Project Manager shall be refilled to the proper grade with

thoroughly compacted suitable fill materials to the satisfaction of the Project Manager except for footing excavation where concrete shall be replaced to the bottom of the excavations; additional work of this nature shall be at the Contractor's expense. Where an existing structure lies adjacent to excavation line, adequate shoring and bracing shall be provided to prevent damage to persons and properties. Shoring, bracing and sheeting shall be removed in a manner to prevent caving-in. The grading in the vicinity of excavated areas shall be done to prevent surface water from running into excavation and embankments. Water pumped from excavations shall be diverted to suitable disposal points. Trenches for pipelines shall be excavated along straight lines and provided with minimum of 150-mm space between the outside of the pipe and the side of the trench or bracing. Additional excavation shall be made for each joint to allow for joining.

Trench excavation, other than rock, shall be excavated at least 50 mm above final invert grade; the remainder of the excavation shall be shaped manually, and graded to provide uniform bearing when the pipe is laid. Unless otherwise indicated, backfill cover over water sewer, drainage and electrical conduit pipes shall not be less than 300-mm depth.

(b) Excavation Under Pavement and Concrete Slabs

The entire area of the original ground under pavements and concrete slabs shall be excavated to remove all objectionable matter, sod, muck, rubbish and other unsuitable material to a minimum depth of 300 mm.

4. Filling and Backfilling

Fill and backfill materials shall consist of suitable materials from excavation or from approved borrow areas, and shall be free from roots, wood scraps, vegetations, and other extraneous materials and from large clods of earth or stones greater than 100 mm. No fill material shall be placed until the surface to be filled has been approved.

(a) Filling and Backfilling for Structures and Trenches

Filling around structures shall be placed as the construction work progress, insofar practicable. Backfilling of trenches shall progress as rapidly as construction and testing will permit. In backfilling pipe trenches, approved backfill shall be compacted in 200 mm layers to a depth of 150 mm over the pipe and the remainder of the trench depth shall be backfilled and compacted in 300 mm layers; for trenches under road pavements and concrete floor slabs, the backfill shall be placed and compacted in 200 mm layers to the top of the trench.

(b) Embankment Construction

Before placing fill material, the surface upon which it will be placed shall be scarified to insure good bonding between the existing surface and the fill material. Where embankment is to be constructed on sloping ground with slopes steeper than 1 vertical to 4 horizontals, the new fill shall be cut into or benched as the embankment is brought up in layers in such a manner that the embankment material will bond with the existing surface. The size of each bench shall be subject to approval and shall depend on the equipment to be used.

5. Equipment

Equipment used in the performance of the work shall be subject to approval of the project manager. The quality of compaction equipment shall be adequate to ensure thorough uniform compaction as rapidly as material is

placed. In all areas not accessible to rollers or compactors, the fill shall be compacted with mechanical hand tampers.

6. Compaction

In fill areas, the top 200mm shall be compacted to a density of at least 95 percent of maximum density and the remaining depth of fill to not less than 90 percent of maximum density; except that under ramps pavements and concrete floor slabs, compaction shall not be less than 85 percent of the maximum density for the entire depth of fill. Unless otherwise indicated where the existing sub-grade in cuts have a density of less than 95 percent, all materials to a depth of 150mm or to such greater depth as maybe specified, shall be compacted not less than 95 percent of the maximum density. Soil moisture during compacting shall be controlled between 80 and 110 percent of optimum moisture content determined in accordance with AASHTO Method T99-84.

7. Disposal of Surplus Excavated Materials

Any surplus material from the excavation and grading operations shall be disposed and spread in spoil areas designated by the Project Manager except for the materials classed as rubbish and debris, which shall be deposited in the spoil areas and be graded to a reasonably uniform surface.

2.4.2 Soil Poisoning (NOT APPLICATION)

This item shall consist of furnishing and applying soil treatment for termite control.

At the time soil poisoning is to be applied, the soil to be treated shall be in friable condition with low moisture content so as to allow uniform distribution of the toxicant agents. Toxicant shall be applied at least twelve (12) hours prior to placement of concrete, which shall be in contact with treated materials.

Treatment of the soil on the exterior sides of the foundation walls, grade beams and similar structures shall be done prior to final grading and planting or landscaping work to avoid disturbance of the toxicant barriers by such operations.

Areas to be covered by concrete slab shall be treated before placement of granular fill used as capillary water barrier at a rate of 12 liters per square meter with Type 1 working solution after it has been compacted and set to required elevation.

1. MATERIAL REQUIREMENTS

Termite control chemicals or toxicants shall be able to immediately exterminate termites or create barriers to discourage entry of subterranean termites into the building areas. The toxicants maybe classified into the following types and according to use.

1.1 Type I Liquid Termite Concentrate

This type of toxicant shall be specified for drenching soil beneath foundations of the proposed buildings. The concentrate shall be diluted with water in the proportion of 1 liter of concentrate materials to 65 liters of water or as specified by the manufacturer.

1.2 Type II Liquid Termicide Ready Mixed Solution

This type of toxicants that comes in ready mixed solution shall be used as wood preservative by drenching wood surfaces to the point of run-off.

2. CONSTRUCTION REQUIREMENTS

Before any termite control work is started, the contractor shall undertake thorough examination of the site so that the appropriate method for soil poisoning can be applied. The Contractor shall coordinate with other related trades through the Engineer to avoid delay that may arise during the different phases of application of the termite control chemicals.

2.1 Soil Poisoning Treatment

2.1a. When soil show termite infestation, this method shall be applied. The building area shall be thoroughly drenched with Type 1 working solution at the rate of 24 liters per square meter.

When Powder Termicide is to be applied to eradicate subterranean termites, careful application and precaution shall be given considering that this toxicant is fatal to animal and human lives.

2.1b. At the time soil poisoning is to be applied, the soil to be treated shall be in friable condition with low moisture content so as to allow uniform distribution of the toxicant agents. Toxicant shall be applied at least twelve (12) hours prior to placement of concrete, which shall be in contact with treated materials.

2.1c Treatment of the soil on the exterior sides of the foundation walls, grade beam and similar structures shall be done prior to the final grading and planting or landscaping work to avoid disturbance of the toxicant barriers by such operations.

2.1d Areas to be covered by concrete slab shall be treated before placement of granular fill used as capillary water barrier at a rate of 12 liters per square meter with Type I working solution after it has been compacted and set to required elevation.

2.1e Where the application of wood preservative is necessary, the Contractor shall use Type II working solution as recommended by the manufacturer.

All wood materials not pressure treated shall be treated with Type II ready mixed solution as herein called for or as directed by the supervising Architect or Engineer.

2.1 The Contractor shall give in Service Guarantee covering the treatment of termite infestation or the repetition of the above stated termite control services without extra cost to the Owner if any infestation of recurrence or infestation occurs during the guarantee period of one year.

2.2 Septic Tank

The Contractor shall construct septic tanks in accordance with the size and dimension shown on the detailed plans. Septic tank shall be constructed with two chambers; the primary sedimentation chamber, which serves as a digestion chamber and the final sedimentation chamber which, receives the overflow from the digestion chamber. The effluent from the final sedimentation chamber shall be discharged, whenever practicable, to the surface wastewater infiltration system. In some cases, / or as shown on the drawings, the final sedimentation chamber will be designated as leaching chamber i.e., with open bottoms/flooring with gravel for leaching.

2.5 Method of Measurement and Basis of Payment

Measurement of accomplished quantities shall be of the ff. methods:

- (1) Lump sum payment shall be provided for the following:

- a. Site demolition and clearing shall be deemed to include the cost of salvaging of materials, preservation, storage and disposal.
 - b. Construction of septic tank holding and water storage tank (including reservoir and piping) shall be considered to include the cost of excavation and backfilling, bedding, forms and false work, curing, fasteners and incidentals to complete each item of work.
 - c. Subsurface waste water infiltration system shall be deemed to include the cost of excavation, disposal, gravel filter, silt barrier, overflow and distribution pipes and incidental works to complete this item.
- (2) The volume of structural excavation to be paid for shall be the number of cubic meters measured in original position of material acceptably excavated in conformity with the plans or as directed by the Payment of quantities accomplished shall be deemed to include the cost of disposal of excess and unsuitable materials, shoring, bracing, water control works and other operations necessary to complete this item.
 - (3) The volume of backfill materials from excavation; fill materials from common borrow; top soiling; construction of embankment; sub-base and base course preparations; and compacted gravel fill bedding to be paid for shall be the number of cubic meters measured in the final position of materials actually provided and installed to include where applicable, furnishing, placing, spreading and compaction in accordance with the plans and specifications and disposal of excess and unsuitable materials, if any.
 - (4) The work item for soil treatment is as stipulated in Sub-Section 2. Soil Poisoning, shall be measured and paid for per square meter area of works accomplished and accepted. Payment of work accomplished shall be made based on dimensions shown in the drawings and stipulated in the specifications.

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

3.0 CONCRETE

3.0 Scope of Work

The work includes construction of concrete structures complete in accordance with the standard specifications and conformity with the lines, grades, thickness and typical cross-section shown on the plan.

3.1 Reference Standards

The latest edition of the following standards shall be from apart of this specification:

ACI	American Concrete Institute
211-01	Standard Practice for Selecting Proportions for Normal and Heavyweight Concrete
301	Concrete, Structural for Building
309R	Standard Practice for Consolidation of Concrete
318	Building Code Requirements for Reinforced Concrete
AASHTO	American Association of State Highway and Transport Officials
M173	Concrete Joint Sealer, Hot-Poured Elastic Type Performed Expansion Joint Filler Concrete

ASTM	American Society for Testing Materials
C33	Concrete Aggregates
C31	Standard Practice for Making, Curing Concrete Test Specimen in the Field
C39	Comprehensive Strength of Cylindrical Concrete Specimen
C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C94	Standard Specification for Ready-Mixed Concrete
C143	Standard Test Method for Slump of Portland Cement Concrete
C150	Portland Cement, Specification for
C309	Liquid Membrane-Forming Compounds for Curing Concrete
DPWH Blue Book Vol. III (1995)	

3.2 **Material Requirement**

3.2.1 **General**

Concrete shall be composed of Portland cement; fine and coarse aggregates, water and admixture as specified all thoroughly mixed and brought to proper consistency, uniformity and temperature for final placement.

3.2.2 **Cement**

Concrete shall be Portland cement or a brand approved by the Project Manager and conforming to ASTM Specification C150, Type I of Type II.

3.2.3 **Water**

Water shall be clean and free from injurious amounts of oils, acids, alkalics, salts, organic materials, or other substances that may be deleterious to concrete or steel.

3.2.4 **Admixtures**

Admixtures shall be subject to prior approval by the Project Manager. The admixtures shall be capable of maintaining essentially the same composition and performance throughout the work.

3.2.5 **Fine Aggregates**

Fine aggregates shall consist of natural sand, manufactured sand, or a combination thereof. If the fine aggregate shall be a combination of separately processed sizes, or if batching shall result in a combination of natural and manufactured sand, the different components shall be batched separately. Fine aggregates shall consist of hard, tough, durable, uncoated particles. The specified percentages of fines in the sand may be obtained either by the processing of natural sand or by the production of suitably graded manufactured sand. The shape of particles shall be generally rounded or cubical and reasonably free from flat or elongated pieces. The use of beach sand shall be prohibited. The fine aggregate shall conform to the following specific requirements:

Std	Sieve Designation U.S Std., Square Mesh	Cumulative Percentage by Weight Passing
9.5 mm	3/8	100
4.75 mm	No.4	95-100

2.36 mm	No.8	80-100
1.18 mm	No.16	45-80
300 micron	No. 50	10-30
150 micron	No.100	2-10

In addition to the grading limits shown above, the fine aggregates, as delivered to the mixer, shall have a fineness modulus not less than 2.3 more than 3.0 and during normal operations, the grading of the fine aggregate shall be controlled so that the fineness modulus of at least nine (9) out of ten (10) test samples of fine aggregate as delivered to the mixer shall not vary by more than 0.20 from the average fineness modulus can be determined by dividing 100 the sum of the cumulative percentages retained on U.S. Standard Sieves Nos. 4, 8, 16, 50 and 100.

3.2.6 Coarse Aggregates

Coarse aggregate shall consist of washed gravel, crushed stone or rock, or a combination thereof conforming to ASTM C33. The coarse aggregate, as delivered to the batching plant, shall have uniform and stable moisture content. The approval of deposits shall not be construed as constituting the approval of all materials taken from the deposits, and the Contractor shall be held responsible for the specified quality of all such materials used in the work. Coarse aggregate shall consist of hard, tough, durable, clean and uncoated particles. All foreign materials and dust shall be removed and shall be generally rounded or cubical, and the coarse aggregate shall be reasonably free from flat and elongated particles. A thin, flat and elongated particle can be as defined as a particle having a maximum dimension greater than five times the minimum dimension. The coarse aggregate shall be graded from fine to coarse. It shall be separated into size groups.

The grading of the aggregate within the separated size groups as delivered to the mixer shall be as follows:

Sieve Sizes 1/2	Percent by Weight		Passing Individual 1-
<u>Std (MM)</u>	<u>U.S Std., Sq. Mesh</u>	<u>¾ Size</u>	<u>Size</u>
50	2"		100
37.5	1-1/2"		90-100
25	1"	100	20-55
19	¾"	90-100	0-15
9.5	3/8"	20-55	0-5
4.75	No. 4	0-10	

Use 19-mm (3/4") coarse aggregate for slab on grade, columns, beams, suspended slabs and tie beams.

Use 38 mm (1 ½") coarse for footings

3.3.7 Reinforcing Steel

Reinforcing steel shall be locally manufactured, deformed billet steel bars conforming to Philippine Standard, Grade 275, Intermediate grade (40, 000 psi).

3.3.8 Forms

Concrete form shall be wood, plywood, steel or other suitable materials. Form surfaces requiring standard or special finish shall be plywood or a non-absorptive hand pressed fiberboard or other suitable materials. Plywood shall not be less than 12 mm thick and shall be free from irregularities, dents and sags. Forms shall be coated with non-staining form coating compound such as form oil of the approved make.

3.3.9 Storage of Materials

(1) Cement

Cement in bags shall be stored in a suitable weatherproof structure as airtight as practicable. Floors shall be elevated above the ground, sufficient to prevent the absorption of moisture. Bags shall be stocked close together to reduce circulation of air but shall not be stocked against outside walls. The manner of storage shall permit easy access for inspection and identification of each shipment. Cement that has been stored for so long that there may be doubt of its quality shall be tested by standard mortar tests to determine its suitability for use, and shall not be used without approval of the Project Manager.

(2) Aggregates

Aggregate shall be stored in such a manner as to avoid the inclusion of foreign materials. Aggregates of different sizes shall be stored in separate piles. Stockpiles of coarse aggregate shall be built in horizontal layers not exceeding 1200 mm in depth to avoid segregation. Should the coarse aggregate become segregated, it shall be remixed to conform to the grading requirements here on before. Sufficient stockpiles shall be maintained at all times to permit continuous placement of concrete at the rate specified.

(3) Reinforcing Steel

Reinforcing steel shall be stored in a manner to avoid excessive rusting or being coated with grease, oil, dirt and other objectionable materials.

3.4 Construction Requirements

3.4.1 Concrete Proportion

The proportion of all materials in concrete shall be subject to the approval of the Project Manager. The Contractor shall employ at his own expense an approved testing laboratory, which shall design the mix proportions in accordance with ACI 211.01. Strength requirements shall be 20.7 Mpa (3000 psi) for footing, columns, beams, slabs and stairs, lavatory counter, wash basin; 17.2 Mpa (2500 psi) for ramp, slab on grade, water meter box, grease trap; and 13.8 Mpa (2000 psi) for lean concrete or as required by the Project Manager. The adequacy of this test shall be verified by a test on a minimum of 6 cylinders; 3 tested at 7 days, 3 at 28 days, in accordance with ASTM C39.

If, at any time during construction, the concrete resulting from the approved mix design proves to be unsatisfactory for any reason such as too much water, lack of sufficient plasticity to prevent segregation, honeycomb, etc., or insufficient strength, the Contractor shall notify the testing, laboratory and the Project Manager. The laboratory shall modify the design, subject to the approval of the Project Manager until satisfactory concrete is obtained.

3.4.2 Concrete Samples and Testing

Sampling and testing of concrete shall be done by and at the expense of the Contractor. Throughout the period that the concrete is being poured into cylinder shall be taken from fresh concrete from the forms.

The rests shall be made for each 10 cu. m. of concrete or fraction thereof for each portion of structure as may required by the Project Manager as follows:

1. Compression Tests:

At least two (2) sets of samples consisting of three (3) concrete cylinder specimens per set shall be made. Fresh concrete shall be placed inside standard 150 x 300 mm cylindrical mould in three (3) separate equal layers and rodded separately with 25 strokes with a 16 mm diameter tamping rod. Surface shall be leveled with trowel and samples are to be labeled to identify the class, strength of concrete, date taken and part of structure samples are taken. The samples shall be cured in accordance with ASTM C31.

One set of cylinders shall be tested at the age of seven (7) days, and one set at the age of twenty-eight (28) days, in accordance with ASTM C39. Additional cylinder samples may be molded in reserve for further tests, if the results of the twenty-eight (28)-day-test do not meet the requirements.

2. Slump Tests

Slump tests shall be performed to determine the consistency or workable fluidity of freshly mixed concrete in the field. At least two slump tests shall be made and the sample of concrete from which the test specimens are made shall be representative of the entire batch and shall conform to the procedures are specified in ASTM C143.

Freshly mixed concrete shall be placed in the slump cone 100 x 200 mm x 300 mm in three (3) equal layers. Each layer shall be rodded with 25 strokes of the 16-mm diameter tamping rod with the tamping end rounded to a hemispherical tip of the same diameter. The mould shall be leveled and lifted at once and then measure the slump action immediately by getting the difference in height between the height of the mould and the top of the slumped concrete.

The slump tests shall be performed to determine the consistency or workable fluidity of freshly mixed concrete in the files. At least two slump tests shall be made and the sample of concrete from which test specimens are made shall be representative of the entire batch and shall conform to the procedures as specified in ASTM C143.

The slump for vibrated concrete shall be 50 mm minimum and 100 mm maximum, provided that the required strength of concrete is obtained.

3. Test Reports

The testing laboratory shall submit four (4) copies of its cylinder which are to include as far as applicable, the following items: Location of pour in the structure, concrete design mix number, concrete design strength, type and manufacturer of cement, amount of any admixture used, slump tests, date of sampling, cylinder application number, days cured in the field, days cured in the laboratory, age and time of testing, crushing stress, type of failure, who made the samples, who shipped the samples to the laboratory and whether concrete strength meets the specifications.

4. Additional Tests

If, in the opinion of the Project Manager, based on the cylinder reports, concrete with strengths below specification requirements has been placed, the Project Manager, at the expense of the Contractor shall make additional tests. Additional tests may be compression test on cored cylinder, ASRM C42, and/or load tests as outlined in ACT 318 Sec. 202.

3.4.3 Mixing Concrete

Mixing shall be thoroughly done in a mixer of an approved size and type to insure a uniform distribution of the materials throughout the mass:

1. Site-Mixed Concrete

All structural concrete shall be machine-mixed for at least 1 ½ minutes after all materials including water are in the mixing drum. The time elapsed between the introduction of the mixing of water to the cement and aggregate and placing of the concrete in final position shall not exceed 45 minutes. Placing of the material in the mixer shall be done in such a way that the first batch of concrete materials in the mixer shall contain sufficient excess cement, sand and water to coat the inside of the drum without reducing the cement content of the mix to be discharged. The tempering of concrete, placing additional cement, aggregate or water during mixing period shall not be permitted.

No hand mixing shall be allowed, except in case of emergency of breakdown during pouring operations, subject to the approval of the Project Manager.

2. Ready-Mixed Concrete

Ready-mixed concrete, when shall be batched, mixed and delivered from a plant approved by the Project Manager, and shall be in strict compliance with the requirements set forth in ASTM C94.

The rate of delivery of the mixed concrete shall be such that the interval between placing of successive batches shall not exceed thirty (30) minutes. The elapsed time between the introduction of mixing water to the cement and aggregate, and completion of discharge shall not exceed one (1) hour, or not more than 1 ½ hours if retarder is used. It should be kept constantly agitated during the transit period. Delivery tickets shall contain data on the weight of sand, gravel and amount of cement and water added. The Contractor shall keep legible copies available for examination of the Project Manager.

Tempering of concrete shall not be permitted. The Contractor shall mix only quantities required for immediate use and mixture, which has developed setting, shall not be used. Concrete, which has partially hardened, shall not be tempered.

3.4.4 Concrete Placing

Concrete shall be placed only after all formworks, materials to be embedded, and preparation of surface involved in the placing have been inspected and approved by the Project Manager. The Contractor shall provide equipment and shall employ methods that will minimize separation of aggregates from the concrete mix.

Water shall be removed from excavation before concrete is deposited. Flow of water shall be diverted through proper side drains to a pump, or removed by other approved methods to avoid washing over freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from the interior of forms and from inner surfaces of mixing and conveying equipment. Reinforcements shall be secured in position, inspected and approved before pouring concrete. Runaways shall not be provided for wheeled concrete-handling equipment's, such equipments shall not be wheeled over reinforcement nor shall runaways be supported by reinforcements.

Concrete shall be handled from the mixer to the place of final deposits as rapidly as practicable by methods, which shall prevent segregation or loss of the ingredients. It shall be deposited in the forms in approximately layers and as nearly as practicable in its final position to avoid re-handling.

Conveying or handling of concrete by the use of inclined chutes or pipes of more than three (3) meters shall not be permitted. Dumping of concrete into buggies, buckets or wheelbarrows with a free fall of more than one (1) meter shall not be permitted. When placing operations would involve dropping of concrete more than 1 ½ meters, it shall be deposited through a sheet metal or other approved conveyor. As for practicality, the conveyor shall be kept full of concrete during placing and their lower ends shall be kept buried in the newly placed concrete. After the initial set of concrete, the forms shall not be jarred and no strain shall be placed on the ends of the reinforcing bar, which are being projected.

Concrete in columns shall be placed in one continuous operation. Concrete in girders, beams and slabs in superstructures shall be poured in a monolithic and continuous manner. No construction joint shall be allowed on any part of the structure without the approval of the Project Manager.

Consolidate all concrete in accordance with provisions of ACI 309R. Consolidate each layer of concrete greater than 4 inches in depth with high frequency, interval, mechanical equipment supplemented by hand spading and tamping. Consolidate concrete slab 4 inches or less in depth by wood tampers, spading and settling with a heave leveling straight edge. Operate vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Insert and withdraw vibrators approximately 18 inches apart. Penetrate the previously place lift with the vibrator when more than one lift is required. Place concrete in 180-inch maximum vertical lifts. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation of aggregates. Provide adequate number of units and power source at all times. Maintain spare units on hand to ensure adequacy. If in the opinion of the Project Manager the equipment being used is not adequate to accomplish proper consolidation, the Project Manager may order delay in further placement of concrete until such equipment is available for use at the location of placement of concrete.

3.3.4 Protection and Curing

1. General

Concrete surfaces exposed to conditions causing premature drying shall be protected as soon as possible with canvas, straw, burlap and or other satisfactory material and kept moist; or if the surfaces are not covered they shall be kept moist by flushing or sprinkling, as directed by the Project Manager. All concrete shall be moist cured for a period of not less than seven (7) consecutive days after placing by an approved method or combination of methods applicable to local conditions.

2. Moist Cutting

The surface of the concrete shall be kept continuously wet watered for a period of seven (7) days, by spraying or covering with burlap or other approved material thoroughly saturated with water and keeping the covering wet by spraying or intermittent hosing. Water for curing shall be generally lean and free from any element, which might cause objectionable staining or discoloration of the concrete.

3.4.6 Repairs to the Concrete

All imperfections on concrete surfaces are corrected to produce concrete surfaces that conform to the requirements of this section. Unless otherwise approved by the Project Manager, patching with the cement mortar shall repair imperfections on formed surfaces. Cement mortar for patching shall be the same composition as used in the concrete, except for exposed surfaces; part of the cement shall be white cement to provide a finish color matching the surrounding concrete. Honeycomb or otherwise defective areas shall be cut out from solid concrete to a depth of not less than 25 mm. the edges of the cut shall be perpendicular to the surface of the concrete. The area to be patched, at least 15 mm adjacent thereto shall be saturated with water before placing the mortar. The mortar shall be mixed approximately one (1) hour before placing and shall be remixed occasionally during this period with trowel without adding water. A grout of cement and water, mixed to a consistency of paint, shall then be brushed onto the surface to which the mortar is to be bonded. The mortar shall be compacted into place and screened slightly higher than the surrounding surface. Patches on exposed surfaces shall utilize plywood forms, after the removal of forms, shall not be plastered, unless other wise directed by the Project Manager. All joint marks on the formwork shall be reworked to a smooth surface to match adjacent areas and to present a new appearance.

3.4.7 Forms

(1) General

Forms shall be used whenever necessary to confine the concrete and shape it to the required lines and dimensions, or to protect the concrete from contamination. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in correct position. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Forms for exposed surface shall be lined with form grade plywood. Bolts and rods used for interval ties shall be so arranged that when the forms are removed, they shall not be less than two (2) centimeters from the formed surface.

Removal of forms or shoring is subject to approval by the engineer, and under no circumstances shall bottom form and shoring be removed until after the members have acquired sufficient strength to support their weight and the load thereon. Forms shall remain in place for a minimum time as follows:

Columns, sides of beams, shear and bearing walls	----- 3 days
Beams	----- 14 days

Reshore immediately after stripping beams and girders that support subsequent formwork.

(2) Cleaning and Oiling Forms

Before placing concrete, the contact surface of the forms shall be cleaned of incrustations of mortar, grout or other foreign material. Forms shall be coated with standard form oil that can effectively prevent sticking and will not stain the concrete surfaces.

(3) Removal of Forms

Forms shall be removed in a manner, which shall prevent damage to concrete structures. Forms shall not be removed without prior approval of the Project Manager. Any repairs of the surface imperfections shall be performed at once and curing shall be started as soon as the surface is

Reinforcing steel shall be accurately placed in accordance with approved detailed reinforcement drawings and shall be adequately secured against displacement by using specified tie wires or approved clips at all intersections. After it has been installed, reinforcing steel shall be inspected by the Project Manager for compliance with requirements as to size, shape, length, splicing, position and number. Reinforcing steel shall be supported by concrete or metal supports, spacers or metal hangers, except for surfaces exposed to the ground or to the weather, where supports shall be concrete. Wooden support spreaders shall not be used. At surfaces where attractive appearance is required, the supports shall be of the type, which shall not cause subsequent staining or marring of the exposed surface.

3.4.9 Joints in Concrete

(1) Construction Joints

Construction joints shall be provided where indicated in the drawing or as directed by the Project Manager. Joints not indicated on the drawings shall be constructed and located as not to impair the strength of structures. When a construction joint is to be made, the surface of the hardened concrete shall be thoroughly cleaned and all laitance removed. In addition, the joint shall be thoroughly wetted and sloshed with a coat of neat cement grout immediately, prior to placing of new concrete.

(2) Expansion and Contraction Joints

Expansion and contraction joints shall be provided where indicated and shall be in accordance with details.

(3) Preformed Strips

Preformed strips shall be placed before the adjoining concrete is poured. The joint scalier shall be applied after concrete on both sides of the joint have been poured and after the joint lines have been trued.

3.5 Methods of Measurement and Basis of Payment

The Project Manager shall be in accordance with the dimension in the plan or as otherwise direct the measurement of completed work. The quantities to be paid for under this section shall be measured as follows:

- a. The volume to be paid for under this item shall be the number of cubic meters of concrete placed and accepted. Payment for concrete shall be constructed to include the cost of forms, false works, curing, fasteners and accessories necessary to complete this item of work.
- b. The quantities for reinforcing steel to be paid for shall be the final quantity placed and accepted in the completed structure. No measurement for payment shall be made for splices added by the Contractor for his convenience. Payment for the accepted quantities for reinforcing steel shall be deemed to include the cost tie wires, separators, wire, supports, hangers, chairs and other materials necessary to complete the work.

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

4.0 **MASONRY**

4.1 Scope of Work

The work includes furnishing and placing of concrete masonry units in conformity with the lines, grades and cross-sections shown on the drawings and in accordance with the specifications.

4.2 Applicable Documents

The latest edition of the following specifications and standards shall form part of this specification to the extent required by the references thereto.

ASTM	America Society for Testing Materials
C144	Standard Specification for Aggregate for Masonry Mortar
PSA	Product Standards Agency Publications (Philippines)
PNS 16	Specification of Concrete Hollow Blocks

4.3 Material Requirements

4.3.1 Concrete Hollow Blocks

Concrete hollow blocks shall be a standard product of recognized manufacturer to PNS 16, as indicated on the drawings. Exterior and interior masonry units shall be non-load bearing units. However, load-bearing units may be provided in lieu of non-load bearing units. For non-load bearing units, the required compressive strength shall be 25 kg/cm² or 2.48 Mpa.

4.3.2 Cement, Reinforcing Steel and Water

Cement, reinforcing steel and water shall be as specified in Section 3.0.

4.4 Construction Requirements

4.4.1 Workmanship

Masonry walls shall be placed level and plumb all around. One section of the walls shall not be placed in advance of the others, unless specifically approved. Unfinished work shall be stepped back for joining with the new work; tooting shall not be permitted. Heights of masonry work shall be checked with an instrument at sills and heads of openings, to maintain the level of the walls. Door and window frames, louvered openings, anchors, pipes and conduits shall be installed carefully and neatly as the masonry work progresses. Spaces around door frames shall be filled solidly with mortar. Drilling, cutting, fitting and patching to accommodate the work of others, shall be performed by skilled workers. Bolts, anchors, inserts, plugs, ties and miscellaneous metal work specified elsewhere shall be placed in position as the work progress. Chases of approved dimensions for pipes and other purposes shall be provided, where indicated or necessary. Top of exposed walls and partitions, not being worked on, shall be covered with a waterproof membrane, well secured in place. Wall and partitions shall be structurally bonded or anchored to each and to concrete wall beams, and columns.

4.4.2 Mortar Mixing

Mortar materials shall be measured in approved container to insure that the specified proportions of materials are controlled and accurately maintained during the progress of the work. Unless specified otherwise, mortar shall be mixed in such a manner that the materials will be distributed uniformly throughout the mass. A sufficient amount of water shall be added gradually and the mass further mixed, not less than 3 minutes, until a mortar of the plasticity required for the purpose intended shall be obtained. The mortar shall

be mixed in a manner such that the quality of water can be controlled accurately and uniformly. Mortar boxes, pans of mixing drums shall be kept clean and free of debris or dried mortar. The mortar shall be used before the initial setting of the cement has taken place; tempering of mortar in which cement has started to set shall not be permitted.

4.4.3 Proportion of Mortar Grout

Fine mortar grout shall be mixed in the volumetric proportion of one part Portland cement, $\frac{1}{4}$ part hydrated lime and 3 parts sand. Coarse grout shall be mixed in proportion of one part Portland cement, $\frac{1}{4}$ hydrated lime, 3 parts sand and 3 parts pea gravel passing a $\frac{3}{8}$ -inch sieve.

4.4.4 Use of Fine and Coarse Grout

Fine grout shall be used in grout spaces less than 50 mm in horizontal dimension or when clearance between reinforcement and masonry is more than 17mm.

4.4.5 Mortar Joints

Mortar joint shall be uniform in thickness, and the average thickness of any three consecutive joints shall be 9.50 mm. "Gage rods" shall be made and approved prior to starting the work and shall be used throughout the work. Changes in coursing or bonding after the work has started shall not be permitted. The jointer shall be slightly larger than the width of the joints, so that complete contact is made along the edge of the units, compressing and sealing the surface of the joint. Joints in masonry, which will not be exposed, shall be stuck flush. Joints shall be brushed to remove all loose and excess mortar. All horizontal joint shall be on level and vertical joints shall be plumbed and aligned from the top to the bottom of the wall with a tolerance of plus or minus 12 mm.

4.4.6 Concrete Masonry Unit

The first course of concrete masonry unit shall be laid in full bed of mortar, for the full width of the unit; the succeeding courses shall be laid with broken joints. Concrete masonry units with the cells verticals shall have bed-joints formed by applying the mortar to the entire top of the surface of the inner and outer face shell, and the head joints formed by applying mortar of a width of about 25 mm to the ends of the adjoining units laid previously. The mortar for joints shall be smooth, not furrowed, and shall be of such thickness that it will be forced out of joints as the units are being placed in position. Where anchors, bolts, ties and reinforcing bars occur within the cell of the units, such cells shall be solidly filled with mortar or grout as the work progress.

4.4.7 Reinforcement

Horizontal tie reinforcement shall be provided where indicated. Reinforcement shall be continuous and provided in the longest available lengths. Reinforcement above and below openings shall extend and be embedded into the columns, unless otherwise shown on the drawings. Splices shall overlap not less than 150 mm. Reinforcement shall be embedded in the mortar joints in the manner that all parts shall be protected by mortar. The two top courses of filler block walls shall have their cores filled with grout when placed in position.

Unless otherwise shown on the drawings, the size and spacing of bars shall be as follows:

For Vertical Bars:

150 mm (6") CHB	-	12 mm (1/2") dia. At 600 mm (24") on centers
100 mm (4") CHB	-	10 mm (3/8") dia. At 600 mm
For horizontal bars:	-	12 mm (1/2") dia at 600 mm (24") on center (every third Course) for 150 mm (6") and 100 mm (4") CHBs.

4.4.8 Bounding and Anchoring

Masonry walls and partitions shall be accurately anchored or bonded at points where they intersect, and where they abut or adjoin the concrete frame of the building. All anchors shall be completely embedded in mortar.

4.4.9 Grout Placement

Grout shall be performed on the interior side of wall, except as approved otherwise, sills, ledges, offsets and other surfaces to be left exposed shall be protected from grout falling on such surfaces and be and shall be removed immediately. Grout shall be stirred before placing to avoid segregation of the aggregate and shall be sufficiently fluid to flow into joints and around the reinforcement without leaving any voids. Grout shall be placed by pumping or pouring from buckets equipped with spouts, in lifts not exceeding 1.2 meters high. Grout shall be puddle thoroughly to eliminate voids without displacing the masonry units from its original position. Masonry units displaced by grouting operation shall be removed and re-laid to its proper alignment using fresh mortar grout.

4.4.10 Tests and Test Reports

The testing requirements stated herein or incorporated in referenced contract documents may be waived provided certified copies of report of tests from approved laboratories performed on previously manufactured materials are submitted and approved. Test reports shall be accompanied by notarized copies from the manufacturer certifying that the previously tested material is of the same type, quality manufacturer, and make those

4.5 Method of Measurement and Basis of Payment

In measuring the quantity of masonry units for payment, the dimensions to be used shall be as shown on the plans or as directed by the Project Manager in writing. Projections extended beyond the faces of the wall shall not be included. The area to be paid for in this section shall be the number of square meters of concrete masonry wall and partition placed and accepted in accordance with the plans and specifications. Payment of accomplished work shall be deemed to include the cost of mortar grout, reinforcing steel, tie wires, false work and other necessary works to complete this item.

The quantity of concrete masonry walls and partition shall be paid for at the contract unit price shown in the bid schedule, which payment shall be full compensation for furnishing and placing all materials, labor, equipment, tools and incidentals necessary to complete the work.

5.0 **METALS**

5.1 Scope of Work

The work includes the furnishing, fabrication, erection or installation of structural steel roof framing, Stainless Handrails and miscellaneous metal work in accordance with this specification and as shown in the drawings.

5.2 Applicable Specifications & Standard

The latest edition of the following specifications and standards referred to hereinafter by basic designation only, shall form part of the specification:

ASTM	American Society for Testing and Materials
A36/A36M	Specification for Structural Steel
A53	Steel Pipe Zinc Coated Welded and Seamless Black and Hot-Dip
A307	Bolts and Studs, 60, 000 psi Tensile Strength
A325	Standard Specification, high Strength Bolts for Joints
A570	Hot-rolled Carbon Steel Sheet and Strip, Structural Quality
A611	Steel, Cold-Rolled Steel, Carbon, Structural Quality
AWS	American Welding Society
D1.1	Structural Welding Code, Steel
AISC	American Institute of Steel Construction, Specification for the Design, Fabrication, Erection of Structural Steel for Buildings.
AISI	American Iron Steel Institute, Specification for the Design of Light Gage Cold-Formed Steel Structural Members

5.3 Material Requirement

5.3.1 Structural Steel Shapes Plates and Bars

Unless otherwise shown or specified on the drawing, structural steel shapes plates and bars shall conform to ASTM specification A36/A6M.

5.3.2 Hot-Formed Steel Sheet and Strip

Unless otherwise shown or specified on the drawings, hot-formed steel and strip shall conform steel and strip shall conform to ASTM A570.

5.3.3 Bolts, Nuts and Washer

It shall conform to specification STM A370, with a minimum yield point of 33, 000 psi, unless otherwise shown in the drawings. Heavy hexagonal structural bolts, heavy hexagonal nuts and hardened washers, shall be quenched and tarpapered medium-carbon steel bolts, nuts and washers complying with ASTM A325.

5.3.4 Screw and Expansion Bolts

Screw and Expansion bolts be of standard commercial grade, and of the sizes and types indicated as approved by the

5.3.5 Electrodes

Electrodes for are welding shall be E60, or E70, AWS D1.1

5.3.6 Galvanizing

Unless otherwise specified, galvanizing shall be of standard quality, hot-dipped process of 1.25 ounces per square foot of coating. Galvanized surface that are damaged prior to final acceptance shall be repaired using and approved repair compound to the satisfaction of the Project Manager.

5.3.7 Railings/Handrails

50mm dia stainless steel pipe shall be used for hand rails and vertical railings, properly installed as indicated in the plans. Joints and surfaces that are damaged prior to final acceptance shall be repaired using and approved repair compound to the satisfaction of the Project Manager.

5.3.8 Miscellaneous Metals

Miscellaneous metals including fastenings, anchorage's and incidentals not specifically mentioned herein or in other section of this specifications but are required to complete the work, for which there are no detailed drawings, shall be provided and installed in accordance with standard practice of the trades as approved by the Project Manager.

5.3.9 Delivery, Storage and Handling

Fabricated materials delivered to job site shall be stored in clean and protected dry areas in manufacturer's protective package. Structural steel materials to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. Skids placed near enough together to prevent injury from deflection shall support long members, such as purlins and chords. The Contractor shall check the quantity and quality of materials turned over to him against the delivery list and report promptly in writing any shortage or damage discovered.

5.4 Construction Requirements

5.4.1 General

Fabrication and erection of structural steel shall be in accordance with AISC specification for the design, except as specified herein. The Contractor shall submit to the Project Manager for approval of shop drawings showing the proposed method of fabrication and installation of all metal work. No work shall be started until the shop drawings have been approved. And all work shall conform to the approved shop drawings.

5.4.2 Fabrication of Steel Structure

The work shall be well formed at the shape and size shown and assembled as detailed. Structural members shall be fabricated and assembled in the shop to the greatest extent as possible. Shearing and punching shall be produced in clean, true lines and surfaces with burrs removed. Nuts shall be drawn up tight. Joints, which are to be exposed to the weather, shall be water tight. Hole shall be cut, drilled or punched at right angles to the surface of the metal. Holes in base or bearing plates shall be drilled.

1) Welding

Structural steel shall be welded in accordance with the standard code of Arc and Gas Welding in Building Construction of the American Welding Society. Qualified welders shall perform all welding work only.

2) Shop Painting

Unless otherwise specified or indicated in the drawings, all structural steel work (except galvanized surfaced and surfaces that will be painted with epoxy) shall be given a shop coat of red lead or zinc chromate primer.

5.4.3 Erection

The steel structure shall be erected true to line and grades. Bracings and supports shall be introduced whenever necessary to take care of all the loads to which the structure may be subjected. Such bracings shall be left in place as long as may be required for safety. As erection progress, the work shall be securely bolted to take care of all the dead loads, wind and erection stresses. No reaming of undersize bolt holes shall be permitted, and erection bolts shall not be used for lining up members.

(1) Rift Pins

Drift pins may be used only to bring together several parts; they shall not be used in such a manner as to distort or damage the metal.

(2) Gas Cutting

The use of gas cutting torch in the fields for correcting fabrication errors shall not be permitted on any major member in the structural framing. Its use may be permitted only when the member is not under stress, and subject to the approval of the Project Manager.

(3) Base Plates and Bearing Plates

Base plates and large bearing plates shall be supported in steel wedges or shims until the supported members have been plumbed, following which the entire bearing area shall be grouted with no-shrink cement grout.

(4) Grouting Mortar for Setting Base Plates

Concrete grout shall be a non-shrinking type grouting mortar. The mortar subject to the approval by the Project Manager can either be a mixture of Portland cement, well graded fine aggregate, aluminum powder; and water or an approved commercial grouting mortar containing non-metallic chemical oxidizing agent. If adopted, the approved product shall be delivered to the site of the work in original sealed container bearing the trade name of the manufacturer. Surfaces to receive the mortar shall be clean and shall be moistened thoroughly before placing the mortar. Exposed surfaces of mortar shall be water cured with burlap for at least seven (7) days.

(5) Setting Up

Steel shall be erected plumb, level and properly guyed. In setting or erecting structural steel, the individual piece shall be considered plumb or level where the error does not exceed 1 to 500.

(6) Inspection

The Contractor shall give the Project Manager at least fifteen (15) days notice prior to the start of work at the mill shop, so that the required inspection may be made. The term "mill" means any rolling mill, shop or foundry where material for the work is to be manufactured or fabricated. No materials shall be rolled or fabricated until the said inspection has been provided.

The Contractor shall furnish the Project Manager with copies of the certificate mill reports of the structural steel structure preferably before but not later than the delivery of steel structure to the job site.

The Contractor shall furnish all facilities for inspection and the Project Manager shall be given free access to the mill or shop and premises at all times. The Contractor shall furnish without charge all labor; machinery, materials and tools necessary to prepare test specimens.

Inspection at the mill or shop is intended as a means of facilitating work and avoiding errors. It is expressly understood that it will not relieve the Contractor from any responsibility for imperfect materials or workmanship and the necessity for replacing the same. The acceptance of any material or furnished member at the mill or shop by the Project Manager shall preclude their subsequent rejections if found defective before final acceptance of the work. Inspection of welding works will be in accordance with the provision of Section 5 of the "Standard Code for Arc and Gas Welding in Building Construction" of the American Welding Society.

5.5 Method of Measurement and Basis of Payment

1. The quantity of structural steel roof framing to be paid for shall be the number of kilos completed in place and accepted. Payment for the accepted quantities shall be deemed to include the cost of steel plates, anchor bolts, buckles, sag rods,

work. Nailing shall be done in an approved manner, so as not to split the framing members.

6.3.4 Protection of Work

The Contractor shall protect all finished woodwork and millwork from injury after it has been set in place until completion and final acceptance.

6.3.5 Hardware

Items of hardware to be installed shall be as directed or as shown in the drawings and fitted carefully, attached securely. Care shall be exercised not to mar or injure the work.

7.0 **ROOFING AND MOISTURE & THERMAL PROTECTION**

7.1 Scope of Work

This section includes the furnishing of all plant, tools, equipment, materials and other in the installation of waterproofing and roofing, including miscellaneous sheet metal works as required providing a waterproof installation.

7.2 DESCRIPTION

The work includes installation of GA 24 Pre-finished Rib-type GI sheet and twin wall polycarbonate roofing complete with hardware and accessories.

The work includes furnishing all materials and requirements performing all operations to provide a semi-gloss roof tile roofing and twin wall polycarbonate roofing and miscellaneous roofing work as required to provide an acceptable installation. Surfaces to which metal formed roofing sheets are to be applied shall be thoroughly cleaned and prepared, free from any defects that may affect the application. Details shall be in accordance with manufacturer's recommended installation practice.

Metal formed roofing and sheets and accessories shall be carefully handled at all times to prevent damage to the surfaces, edges and ends and shall be slightly elevated for drainage.

Metal formed roofing and sheets and accessories shall be delivered to the site in the original sealed container or packages bearing the manufacturer's name and brand designated where materials are covered by a reference specification number, type and class as applicable.

7.3 INSTALLATION

Lay and install the first sheet with turned down edge towards the outside of the area to be covered. Overlap the next sheets to the previous sheet in such a manner that the exposed edge is turned down and the covered edge is turned up. Side up fasteners should be done by rivets and washers spaced from 300mm to 450mm on centers.

Care should be exercised in the proper anchorage of all roof frames.

Ridge strips for ridge rolls and ridge flashings are attached to the roofing sheets by means of rivets. Other flashings are to be fabricated from plain sheets of the same materials as the roofing in accordance with the details and/or site requirements. These are also attached to roofing sheets by means of rivet.

7.3.1 TEMPORARY PROTECTION

Except where otherwise specified, lumber shall be sun-dried, or kiln-dried. At time of installation, the maximum moisture content, expressed as a percentage of the oven-dry wood, shall be as follows:

- a. Rough Carpentry and Framing
 - Framing lumber 2 inches and less in thickness: 19 percent
 - Framing lumber over 2 inches thick: 25 percent
 - Boards: 19 percent
- b. Interior millwork, finish and trim: 17 percent,

6.2.2 Plywood/Fiber Cement Board

Ceiling and partition shall be to 6-mm thick marine plywood or 4.5mm fiber cement board as specified in the plans or in the scope of work.

For interior walls or partitions as shown in the plans or as required, fiber cement board shall be installed in accordance with the manufacturers specifications:

Wall Framing (galvanized steel section) Standard materials are C-Stud, U-Track, Rivet or wafer screw, expansion bolt 6mm, drywall screw 25, 38, 40mm, corner metal bead or corner super bead.

6.2.3 Fasteners

Fasteners shall be of the type and size best suited for the purpose as shown in the drawing. Fasteners shall be zinc coated regular commercial size as indicated and shall conform to ASTM specification A307.

6.3 Construction Requirements

6.3.1 Workmanship

Lumber for framing and other carpentry or metal framing shall be fitted closely, set accurately to the required lines and levels, and shall be secured in a place in a rigid and substantial manner. Spiking, nailing and bolting shall be done in an approved manner. Spikes, nails and bolts shall be of the proper size, and care shall be taken so as not to split the members. All frames coming in contact with concrete or masonry shall be anchored by means of nails, metal screws with tox spaced sufficiently apart all around the contact surfaces. Bolt holes shall be drilled accurately and shall have a diameter of 3 mm more than the bolt size. All exposed wood surfaces shall be smoothly dressed and if so required, shall be well sand papered to an even smooth surface ready for finishing.

6.3.2 Finish Framing

Grades and species of wood shall be as specifies. Interior finish shall be set plumb, level, square and in true alignment and joints shall be tight and formed to conceal shrinkage. All finish framing, shall be done as much as possible with carefully fitted mortise and tendon joints as much as possible, if not possible locate them in inconspicuous places where nailing is permitted on wood surfaces. Nailing and blocking shall be provided as necessary.

6.3.3 Rough Framing

Framing and other rough carpentry shall be fitted closely and set accurately to the required line and levels and shall be secured in place in a rigid and substantial manner. Framing members shall not be spliced between bearing points and shall be provided as necessary for the proper completion of the

cross bracing, purlins mounting accessories and other works necessary to complete this work item.

- 2.
2. The quantity to be paid for stair nosing and railing shall be the number of linear meter placed and accepted. Payment shall be construed to include the cost of false work, anchors, and other materials used in mounting this item.

The quantity determined as provided above shall be paid for the contract price for each of the pay item listed in the bid schedule, which price and payment shall be full compensation for furnishing and placing all materials, labor, equipment, tools and incidentals necessary to complete the work.

6.0 CARPENTRY AND JOINERY

6.1 Scope of Work

This section includes all rough and finish carpentry and joinery works, as shown in the drawings and in accordance with this specification.

6.2 Material Requirements

6.2.1 Lumber

All lumber shall be in accordance with the accepted commercial standard and shall be of the approved quality of each kind and shall be of the following species and grades as shown in the drawings.

<u>Use</u>	<u>Species</u>	<u>Grade</u>
Lumber in contact with Concrete, masonry and Cement plasters	Yakal	Good
Jambs, Transoms, mullions Headers, sills, frames and Wood base of detachable Partition	Yakal	Clear
Ceiling joist, studs, roof Framing and nailers	Apitong or Tanguile	Good
Wood trims, wooden Planks and wood vent And frames	Tanguile	Clear

(3) Quality of Lumber

All lumber shall be of the approved quality of each kind required for the various parts of the work, well seasoned, thoroughly dry and free from large, loose or unsound knots, saps, shakes and other imperfections impairing its strength, durability and appearance. Jambs, transoms, mullions, headers, sills, frames and wood base shall be air dried and well seasoned for at least two (2) months before use.

(4) Substitutions

Any lumber equally appropriate for the purpose may be substituted for the kinds specified, provided that the substitution shall be acceptable to the Project manager.

(5) Moisture Content

Metal formed roofing sheets surfaces requiring protection from stains, discoloration, surface abrasion and other construction abuses shall be suitably protected in accordance with the manufacturer's recommendations.

7.3.2 FINAL CLEARING

Upon completion, the Contractor shall clean the metal formed roofing sheets surfaces and drain line of burrs, leaves, stones and other foreign matter that may impair the flow of water. Surface shall be kept clean by periodic inspection.

7.4 RADIANT HEAT BARRIER

7.4.1 SCOPE OF WORK

The Contractor shall furnish and install all labor and material to complete the work.

7.4.3 MATERIAL

Radiant Barrier shall be fire retardant aluminum foil for roof insulation. It shall have 6 layer fire retardant double-sided aluminum foil laminate with superior radiant heat barrier properties. It shall be tear proof, waterproof and possesses the following properties.

Elongation	: 150% ASTM D882
Water Vapor Transmission	: Greater than 5000 Mns/g ASTM E96-E
Water Vapor Permeance	: Less than 0.20 ng/Ns Less than 0.004 (Perms) ASTM E96-E
Tensile Strength	M.D. 6.6 KN/m D.D. 5.0 KN/m C.D. 4.7 KN/m ASTM 828
Puncture Resistance	: 1.0 Joules T.APPA T800
Reflectivity	: 86% ASTM E466-76
Emissivity	: 5%
Roll Size	: 1.25m x 60m = 75.00 sq.m.
Weight	: 200 g/m ²
Thickness	: 0.190mm
Total R-Value (M2K/W)	: 1.72
Fire Retardant BS476	: Part 6 Class 0 Part 7 Class 1

7.4.4 WORKMANSHIP

The product shall be delivered to the site in its original package or container bearing the manufacturer's name and brand designation.

All material shall be installed by skilled and selected workmen familiar with the aforementioned product.

For further information, see manufacturer's specifications.

7.5 ELASTOMERIC WATERPROOFING MEMBRANE (Roof Slab, Shear Wall, Elevator pit, Balcony, Toilet and Other locations where necessary)

7.5.1 SCOPE OF WORK

The Contractor shall furnish and install all materials and labor required to provide waterproofing on designated locations.

7.5.2 Material

Elastomeric water proofing membrane shall be liquid applied single component and made by a reputable manufacturer.

7.5.3 Preparation

All surfaces to be waterproofed should be clean, sound and dry. Concrete surfaces should have a light steel-trowel followed by a fine hair-broom or equivalent finish that is dry and free from dust, oil and other contaminants. Remove all high spots. Moss and lichen must be removed physically followed by treatment with fungal wash down through and allowed to dry. Laitance should be removed from concrete by grit blasting, wire brushing or wet jet blasting and allowing to dry.

7.5.4 Water Testing

All waterproofed surfaces, roof, siding, gutter and downspout system shall be tested for water tightness by flushing or flooding with water as directed by the Consultant. Floodwater shall be kept on gutters, downspouts for a minimum time of twenty-four (24) hours. If any leak occurs, the works shall be repaired or reconstructed. Test shall be repeated until satisfactory result has been attained.

7.4 BASIS OF PAYMENT

The accepted quantities measured as prescribed in the bill of quantities shall be paid for at the appropriate contract unit price for the pay item listed as shown in the bid schedule, which price and payment shall be full compensation for placing all materials, labor, equipment, tools and incidentals to complete the work.

8.0 DOORS AND WINDOWS

8.1 Scope of Work

This section calls for the furnishing, fabrication and installation of doors and windows in accordance with the plans and specifications.

8.2 Material Requirements

8.2.1 Doors

(1) Aluminum Glass Doors

Aluminum frame glass doors shall be provided with 10 mm. thick tempered glass panel; with standard aluminum tubular sections with powder coated finish. Also provide aluminum push bar with powder coated finish and door pivots or thin-slab floor hinges. Also provide integral lock system. Details and sizes shall be in accordance with the plans and supplementary drawings.

(8) Metal Flush Doors (Hollow-core Flush Doors)

Double-swing Metal Flush Doors shall be 44 mm. thick steel door with standard honeycomb insulation, with ga.18 galvanized door skin and ga. 16 galvanized bended plain rabbet jamb for double-swing doors, with paint finish of acrylic spray and provided with 6 mm thick tempered glass flush mounted on panel as indicated in the plans. Also provide heavy duty door pivots or thin-slab floor hinges and other required accessories such as stainless steel door handles, standard duty deadbolt lock, stainless steel kick plate and stainless steel push plate for stretchers. Details and sizes shall be in accordance with the plans and supplementary drawings.

(9) Fire-Rated Exit Doors

Fire-rated exit doors shall be 'UL listed', provided with paint finish of epoxy enamel spray, also provided with mineral rockwool insulation (which has a 1 ½ hours fire rating). In addition, these doors shall also be provided with stainless steel heavy duty ball bearing hinges as well as heavy duty hardware accessories such as panic rim exit device and door closer by leading brands.

8.2.2 Windows

(1) Steel Casement Windows

All steel windows shall be products of reputable and nationally known manufacturers approved by the Construction Officer. Unless otherwise indicated, all window frames shall be constructed to withstand a minimum 1225N/sq.m. wind load with the sashes in closed position. Windows shall be designed for glazing from outside with continuous glazing heads.

The Contractor shall submit to the Officer shop drawings for approval showing design, elevation of window, full sections of sash, frames and mullion, hardware, construction and assembly details. Details of anchorage, erection, proposed location and method of jointing and splicing of the unit to be installed shall be clearly shown. Fabrication shall not commence until these shop drawings have been submitted and approved.

8.2.4 Materials

Window members shall be low-carbon, new hot-rolled steel frame. Vent sections shall be Zee-bars not less than 25mm in depth or 3mm in thickness for light section 32mm depth for heavy sections. All members shall be special sections hot-rolled from new billet steel. Muntins when required, shall be 22mm x 32mm rolled tee sections.

8.2.5 Construction

Corners of the frames and vents shall be mitered and electrically welded, exposed surfaces ground smooth.

Muntins shall be attached to frame or vent members by means of mortise and tenon joints and riveted. Muntin intersections shall be of interlocking design with flush interior surfaces.

Hinges shall have bronze-to-steel contact surfaces throughout. Hinge pins shall be steel, rust proofed.

Double, full contact weathering shall be provided between vents and frames around the entire perimeter of each vent.

Windows shall be designed for glazing from the outside with angle glazing clips and steel sash putty. All units shall be prepared for and supplied with necessary standard hardware.

8.2.6 Hardware

Hardware for doors and windows shall be acceptable foreign and local products of the types, materials, sizes and mechanism as indicated on the drawings, and shall be free from any mark or other defect. Submit samples for Construction Officer's or Architect's approval.

Hinges and door closer shall be the type size and capacity as indicated on the drawings, however, the Contractor shall verify each hardware item as to weight and other load of doors and windows, and minor modifications may be made without change in construction cost.

Each vent shall be a solid bronze, polished, cam locking handle and strike.

8.2.7 Shop Finish

All windows shall be given one shop coat of approved rust inhibitor of the standard type with the steel window manufacturer.

8.2.9 Painting

Refer to the Section entitled PAINTING.

8.2.10 Protection and Cleaning

The Contractor shall be responsible for protecting the windows during construction and for cleaning at the completion of the building.

8.2.11 Samples and Submittals

Submit samples of panel glass not less other than 2" x 3" and glazing materials in lengths not less than 6" for Construction Officer's approval. Submit manufacturer's specifications and recommendations for glazing conditions specified herein. Submit certificate of compliance, certifying conformity with the requirements of this specification.

8.2.12 Delivery

All glass shall carefully packed for transportation, exercising reasonable precaution to insure avoidance of damage during transit. Care shall be insured in unloading, unpacking and storage on arrival at jobsite to avoid damage. Deliver all glazing accessory materials in manufacturer's original unopened containers, clearly marked as to their contents.

8.2.13 Storage

Store all materials at the jobsite, in a manner assuring its safety from all forms of damage. Protect glass from soiling, condensation, etching, etc., Follow manufacturer's recommendations properly.

8.2.14 Glazing

Prevent glass from contact with metal or any hard or sharp materials by use of resilient shims placed at a quarter points. Use resilient sealants. Use stops in sizes permitting a "good grip" onto glass. Install glass only in opening that are rigid, plumb and square. Allow sufficient clearance at edges of glass to compensate for its expansion or for some settlement of the building. Clearance should be ¼ inch from

edge to frame and 1/8 inch for face, markings, banners, posters and other decal should not be spelled directly to glass surface as these could cause thermal stresses. Removal of part of glazing compound smears from glass shall be performed by the glazing contractor during the materials normal work life. Failure to do so may result damage to the glass.

8.2.15 Doors and Window Screen

All windows, main doors and exits shall be provided with aluminum and metal screen of best quality. Materials shall be as approved by the project manager.

8.3 Construction Requirements

8.3.1 Installation of Doors

Doors shall be installed only after the completion of other works, which may affect the moisture content of the door. Doors shall be fitted and trimmed as required by the opening they will cover. Doors shall have a clearance of 3 mm at the side and top and shall have a bottom clearance of 6 mm over thresholds or as shown on details. The lock edge shall be leveled at the rate of 3-mm in 50 mm. Cuts made on the jambs shall be sealed immediately after cutting, using a clear water-resistant varnish or sanding sealer.

Doors with surfaces receive paint finish may be furnished factory primed, and doors with natural finish may be furnished factory pre-finished. Final furnishing shall be done in site in accordance with painting and varnishing specifications.

8.3.2 Installation of Window

Window framing and aluminum and steel frame shall be fitted closely, set accurately to the required lines and levels, and secured and place in a rigid manner with the use of appropriate fasteners. Frame corners shall be mitered and mechanically locked to attain extreme rigidity.

Steel casement and aluminum frames and glass shall be of the design, size and thickness as indicated. Steel casement and aluminum framing and clip shall be shop fabricated and shall be loosely pivoted to allow free movement. The leaves shall be secured. Movable section of the window shall allow easy operation either to close or open operation.

Doors and windows screen shall be installed by well experienced installer and shall be in accordance with the instruction of the project manager.

8.3.3 Installation of Builders Hardware

- (1) Door knobs, lock and larch strikes
All lock and latch strike shall be installed in door frames at the same height from the floor. Door knobs shall be so located that the center of the knob is 0.90 m from the finished floor.
- (2) Butt Hinges
Each panel of hinged door shall be provided with two (2) butts for doors 1.50 m or less in height; three (3) butts, over 1.50 m high and not over 2.10 m in height. Doors of a greater height than 2.10m, unless otherwise specified, shall be provided with an additional one-(1) butt for each 0.65-m or fraction thereof.

Size of the Butt Hinges required as follows:

Thickness of Door	Width of door	Size of Butt Hinges
21 mm or 25 mm (7/8" or 1")		63 mm (2-1/2")
28 mm (1-1/8")		75 mm x 75 mm (3" x 3")
44 mm (1-3/4")		100mm x 100mm (4" x 4")
56 mm x 63 mm (2-1/4" x 2-1/2")		125 mm x 125 mm (5" x 5")

8.4 Method of Measurement and Basis of Payment

- (1) The quantities for doors to be paid for shall be the number of square meter and/or number of units of door panel completed and accepted. Payment of this item shall be deemed to include the cost of jambs, heads, door frames, nailers, glass pane (if any) and finish hardware.
- (2) The quantities accomplished for steel or aluminum casement windows shall be measured in square meters of area and/or number of units completed and accepted. Payment of this item shall be construed to include the cost of window jambs, sill, transom, mullions, aluminum frames and finished hardware.
- (3) The quantities accomplished for each type of steel window shall be paid in square meters of area and/or number of units completed and accepted for each item of work. Payment for these items shall be considered to include the cost of steel frames, glass panels, finished hardware and glazing and incidental works.
- (4) The quantities accomplished for doors/windows screen shall be paid in square meters of area and/or number of units completed and accepted for each item of work. Payment for this item shall include the cost of aluminum frames, screen, accessories and other incidental works necessary to complete the work.

The quantities measured as stipulated above, shall be paid for at the contract unit price for each item, which price and payment shall be fully compensation for furnishing and placing all materials, labor, equipment, tools and incidentals necessary to complete the work described on this section.

9.0 **FINISHES**

9.1 Scope of Work

This section covers all works required in connection with surface finished on wood, metal, masonry and concrete surfaces in accordance with this specification and as shown in the drawings.

9.2 Material Requirement

9.2.1 Plastering Works

- (1) Portland Cement
Cement shall conform to ASTM standard C150, Type 1
- (2) Sand
Fine aggregates for plastering shall be natural sand and shall be retained between No. 50 and No. 100 sieves.
- (3) Lime

It shall be dehydrated lime where the free (un-dehydrated) calcium oxide and magnesium oxide in the hydrated product shall not exceed 8 percent by weight.

(4) Water

Water used in mixing shall be reasonably clean and free of oil, salt, acids, alkali, grass or other substances injurious to the finished product.

9.2.2 Tile Works

Floor Tiles – Tiles shall be standard grade, unglazed vitrified tiles, and 6 mm thick. Color and pattern shall be as specified in the drawing or as approved by the Project Manager.

For all other floor finishes not indicated below, refer to schedule or call-out specifications of finishes indicated in the plan.

Vitrified Unglazed Floor Tile – standard grade unglazed natural clay type dust-pressed or extruded approximately 6 millimeters ($\frac{1}{4}$ inch) thick.

Accessories – soap holders and paper holders shall be recessed type to follow color specified.

Vinyl floor tile wherever indicated in the drawing shall be 2.0mm thick or otherwise specified in the plans. Verify color, design and pattern.

(2) GROUT MATERIALS

As required by the Project Manager or as follows:

Portland Cement Grout:

Scratch Coat: 1 part Portland cement to 5 parts damp sand to 1/5 part hydrated lime.

Mortar Bed: 1 part Portland cement to 5 parts sand to $\frac{1}{2}$ part hydrated lime.

Bond Coat: neat Portland cement paste.

(3) Wall Tiles

It shall be 6-mm thick, standard grade, glazed vitrified tiles. Color and pattern shall be as shown in the drawing or as approved by the Project Manager. Tiles shall be free from lamination, serrated edges, chipped off corners and other imperfections affecting their quality, appearance and strength.

- 200 mm x 300 mm Vitreous Ceramic Wall Tiles (at Utility Room and all Toilets and Baths)

9.2.3 Paints

This item shall consist of furnishing all paints, enamels, varnishes and other products to be used including labor, tools and equipment required as shown on the Plans and in accordance with this Specifications.

1. Material Requirements

1.1 All paint materials shall meet the requirements of the Standard Specifications of the Standardization Committee on supplies.

1.2 All paint materials shall be delivered on the job-site in their original containers with labels and seals unbroken.

- 1.3 Manufacture or brand of painting materials to be used shall be any of the leading brands or approved certified by the design Architect.
- 1.4 Tinting Color, tinting colors shall first be grade pigments ground in alkyd resin, which disperse and mix easily with paint to produce the colors desired.

2. Preparation of Surfaces

- 2.1 Inspect all surfaces in regard to their suitability to receive a finishing. In the event that imperfection due to materials or workmanship appear on any surfaces after the application of the paint, the coat of any correction shall be borne by the contractor. Damage to any painted finish due to carelessness or negligence of other shall be corrected.
- 2.2 Neutralizer shall be quality surface conditioner to be diluted with water, neutralize lime activity in new exterior and interior concrete surfaces to improve paint adhesion and durability.
- 2.3 Touch all knots, pitch streaks and sappy spots with shellac or other approved sealer. Putty nail holes cracks, etc., after the first coat with non-shrinking putty of a color to match that of the finish.
- 2.4 Prepare masonry works surfaces to be painted by removing all dirt, dust, oil and grease stain, sand efflorescence. Masonry surfaces to be painted shall be free from alkali and thoroughly dry before paint is applied.
- 2.5 Before applying succeeding coats, primers and undercoats shall be completely integral and performing the function for which they are specified. Properly prepare and touch up all scratches, abrasions, or any other disfigurement and remove any foreign matter before proceeding with following coat.
- 2.6 Do not apply final coat on interior work until after other trades are finished with their work in any given area in normal sequence and all materials and debris removed and the premises left in satisfactory broom clean condition as approved.
- 2.7 Remove or protect hardware accessories, plates, lighting, fixtures and similar items placed prior top paintings, reposition or remove protection upon completion of each space. Disconnect equipment adjacent to walls, where necessary, move to permit painting wall surfaces and following completion of painting, replace and reconnect.
- 2.8 Except where otherwise noted or specified, all paints shall be applied in three (3) coats (priming body and finish coats). Each coat shall be roller applied (except as otherwise noted) spread evenly and in full covering body.

3. Patching Compound

- 3.1 Patching compound shall be fine powder material that can be mixed into putty consistency with oil base primers and paints to fill minor surface dents and imperfections.

4. Natural Wood Paste Filler

- 4.1 Wood paste filler shall be quality filler ready mixed in can for filling and sealing open grains of interior wood. It shall produce a level finish for succeeding coats of paints, lacquer and other related products.

5. Application

- 5.1 Paints when applied by brush shall be non-fluid, thick enough to lay down an adequate film of wet paint. Brush marks shall be flawed out after the application of paint.
- 5.2 Paints prepared for application by roller must be similar to brushing paint. It must be non sticky when thinned to spraying viscosity to break up easily into droplets.
- 5.3 Paint is atomized by high pressure pumping rather than broken up by the large volume of air mixed with it. This procedure changes the required properties of the paint.

- 5.4 Craftsmen should be experienced and skilled to assure finished work is of first class quality, appearance and durability shall perform all works.
- 5.5 All paints and other coatings shall be mixed and applied strictly in accordance with the manufacturers' printed instructions.

6. Paint Schedule

The types of paint specified are taken from paint catalogue equivalent materials from manufacturers listed herein and are intended to illustrate the expected quality of material. Where the contractor desires to use those other than what has been specified, a formal request in writing for approval of the Architect or Engineer should accompany such proposal. After the award, no substitution of materials for those mentioned in the accepted proposal will be permitted.

6.1 Exterior walls

Cement plaster over concrete use:

1. Preparation of exterior and interior concrete walls
Prepare masonry surface to be painted by removing all dirt, dust, oil and grease stains and efflorescence. Treat with masonry Neutralizers # 44 or approve equivalent. Mix one liter of Masonry neutralizer with 16 liters of water, then apply liberally by brush and let dry overnight before rinsing with water. Let dry.
2. Coat concrete primer and sealer
3. Coats textures paint
4. Coat semi gloss latex paint

6.2 Exterior and interior Work

Frames steel windows and grating use:

1. Wash all metal surfaces with mineral sprints or detergents to remove any dirt or grease before applying materials. Where rust or scale is present, wire brush or sand paper clean before painting. Treat rusty portions with Metal Etching Solution # 71 or approve equivalent. Rinse and let dry.
2. Coat PRIMER paint
3. Coats QD Enamel

6.3 Interior Work

Plywood/gypsum/fiber cement boards Ceiling/walling use: (Roller Painted)

1. 1 priming coat flat washable paint
2. 2 finish coat semi gloss paint.

6.4 Cabinets

Ducco or semi-ducco finish or as specified in the plans.

9.3 Construction Requirements

9.3.1 Cement Finish on Masonry Walls

(1) General

The work consists of furnishing all materials, labor and performing all operations in connection with plastering masonry wall surfaces, complete in every respect as shown in the drawings and as specified herein. Plastering work shall be protected properly from being damaged during plastering operations. Scaffolding shall be amply strong, well braced, tied securely and inspected regularly. Overloading of scaffolding shall not be permitted.

(2) Mixing of Plaster

Except where hand mixing of small patches is approved, mechanical mixer of an approved type shall be used for the mixing of plaster. Materials shall be accurately measured by a device that will maintain the specified proportions within a plus or minus tolerance not in excess of 5% by volume. Plaster materials shall be accurately measured in approved containers to insure the specified proportions. Caked and mixing each batch and kept free of plaster from previous mixes. Plaster materials shall be thoroughly mixed with the proper amount of water until a uniform color and consistency is attained. Tempering shall not be permitted and all plaster that has begun to stiffen shall be discarded.

(3) Proportioning Plaster

Portland Cement plaster shall be a two-coat application, the base and finish coat. Each coat shall be proportioned as follows: One part by volume of Portland, to three parts sand. Hydrated lime may be used as directed by the Consultant.

(4) Application of Plaster

Surface to receive plaster must be free from structural defects and shall be thoroughly dampened prior to application of plaster.

Plaster base coats shall be applied with sufficient pressure and the plaster shall be sufficiently plastic to provide good bond on masonry base. The base coat shall be compacted and straightened to a true surface without the application of water and the entire surface shall be floated to receive the finish coat. The finish coat shall be applied to a thickness approximately 3 mm before the scratch coat has set. Maximum finish free from blemishes or irregularities. Trowling shall be continued until the finish surface sets. Immediately after setting, surfaces shall be sanded vigorously with clean burlap or cement bag paper or brush to remove the sheen finish produced by trowling.

Plaster work shall be finished level, plumb, square and true, within a tolerance of 3mm in meters without waves, blisters, pits, crazing, discoloration, projections or other imperfections. Plaster work shall be formed carefully around angles and contours, and well up to screens. Special care shall be taken to prevent consequent dropping of applications. There must be no visible junction marks where one day's work adjoins another. Finished work shall be protected in an approved manner to prevent damage.

(5) Portland Cement Plaster

Cement plaster shall have a total thickness of not less than 12 mm thick. The base coat shall be applied not less than 9 mm thick and allowed to dry slowly for 24 hours. Then the finish coat shall be applied to a thickness of not less than 3 mm and brushed with 4 applications of fog spray of clean water. The first spray shall be applied 12 hours after the finishing coat has been completed and three subsequent spraying shall be applied at sufficient intervals thereafter as approved by the consultants.

(6) Patching and Pointing

Upon completion of the work all loose, cracked, damaged or defective plastering shall be cut and re-plastered in a satisfactory manner. All pointing and patching of plastered surfaces and where plastering abuts or adjoins any other finished works shall be done in a neat and workmanship manner ready to receive paint or other finish.

(7) Curing and Protection

Damp curing shall begin as soon as the mortar has hardened sufficiently to prevent injury and water applied in a fog spray to keep the plaster damp

throughout without soaking. The period for damp curing shall be specified for each coat. Protect the plaster from uneven and excessive evaporation during hot or drying weather conditions.

(8) Cleaning

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

9.3.2 Cement Finish on Concrete Floor Slabs

(1) General

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

(2) Finishing Requirements

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

(3) Finishing Procedures

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

Finish	Description	Uses
Screened	Rough, free from Ridges and holes	Slab and concrete surfaces under Earth fill
Floated	Medium rough with Texture finished	Light storage areas, base slabs And heavy machine pads
Trowled	Fine and texture To glossy glass Finish depending Upon the number Of passes of	All surfaces: 1) under floor- 1 pass 2) normal wearing surface – 2 passes 3) Dense wearing surfaces-3

(4) Screened Finish

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

(5) Floated Finish

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

(6) Trowled Finish

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

(7) Broomed Finish

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

(8) Mixing of Red Cement

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

(9) Application of Cement Finishes

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

9.3.3 Other Cement Finish

(1) Patching of Surface Defects

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

(2) Repairing of Structural Defects

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

(3) Finishing of Formed Surfaces

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

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

9.3.4 Tile Works

(1) General

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

(2) Mortar for Tiles

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

(3) Floor Tiling

(a) Preparation of Surfaces

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

(b) Application of Floor Tile

All tiles shall be soaked in clean water to a minimum of one (1) hour before they are installed. Placing tile on a wetted cloth in a shallow pan before installing shall damp absorptive mounted tile. Before the initial set has taken place in the setting bed, a skim of Portland cement mortar 75 mm to 1.5 mm thick may be hand dusted uniformly over the setting bed and worked lightly

with a trowel or brush until thoroughly damp. The tiles shall then be pressed firmly upon the setting bed, and carefully tapped into the mortar until true and even with the place of the finished floor base. Tapping and leveling shall be completed within one (1) hour after placing tiles. Borders and defined lines shall be laid before the field or body of the floor. Where floor drain is provided, the floor shall be sloped properly to the drains. Cutting of tiles, where necessary, shall be done along the outer edges of the tile against trim, base, thresholds, pipes, built-in fixtures and similar surfaces and shall be geared and joined carefully. Tiles shall be secured firmly in place, and loose tiles or tiles sounding hollow shall be removed and replaced to the satisfaction of the Project Manager. All lines shall be kept straight, parallel and true all finished surface brought to true and even planes.

(4) Wall Tiling

(a) Preparation of Surfaces

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

(b) Application of Wall Tile

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

(5) Jointing

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

(6) Grouting

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

(7) Cleaning

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

9.3.5 Painting

(1) General

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

(2) Color and Samples

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

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

10.7 Disinfection

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

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

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

10.8 Method of Measurement and Basis of Payment

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

11.0 **ELECTRICAL WORKS**

11.1 Work Included

- a. To secure and pay for the electrical permits, certificates, and other related permits.
- b. To secure and pay for the service charges and other fees required by the local electric utility company for the energization of the proposed transformer bank.
- c. To secure and pay for the service charges and other fees required by the local telephone and MATV companies for the proposed MATV and telephone lines for the project.
- d. To secure and pay for the insurance required for the project.
- e. Roughing-in and wiring for lighting, power, telephone, MATV, fire alarm, nurse call, CCTV and paging system.
- f. Supply, installation, testing, and commissioning of distribution transformer and construction of elevated transformer pad.
- g. Supply, installation, testing and commissioning, of generator sets and grounding system.
- h. Supply and install/cause to install primary metering.
- i. Supply and install/cause to install wood pole and accessories at mid-span of the existing distribution line to be used as tapping point for the proposed transformers.
- j. Supply, installation, and testing of automatic transfer switches, manual transfer switches, panel boards, and disconnect switches.
- k. Supply and installation of underground feeder system included in the plan to powerhouse.
- l. Construction of concrete pedestal and underground service entrance feeder for telephone and TV systems.
- m. Supply and installation of boxes, pull boxes, auxilliary gutters, wire gutters, bus bar gutters, circuit breaker gutters and the like.
- n. Supply and installation of lighting fixtures, switches, ceiling fans, and power outlets.
- o. Supply and installation of complete telephone system including PABX control unit, telephone handsets, and other accessories.
(a) As per regulations of the local telephone company, the electrical contractor shall secure and pay for the required fees for the installation of the service entrance wires and its subsequent connection.
- p. Supply and installation of Master TV system. TV sets and mounting brackets are not included.

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

10.3.5 Bathroom and Toilet Accessories

- a. Shower head (low water consumption) and fittings shall be movable, cone type with escutcheon arm complete with stainless steel; shower valve and control lever (ceramic disk type). All exposed surface to be chromium finish.
- b. Grab bars shall be made of tubular stainless steel pipe provided with safety grip and mounting flange for disabled people.
- c. Concealed floor drains shall be made of steel beehive type, measuring 10cm x 10 cm and provided with detachable stainless strainer, expanded metal lath type.
- d. Toilet paper holder and soap holder shall be vitreous china or approved equal wall mounted. Color shall reconcile with the adjacent fixture and facing tiles.
- e. Faucets shall be made of stainless steel for interior use (gooseneck type). Ceramic disk type.
- f. Hose bibs shall be made of stainless steel finish. Ceramic disk type.
- g. Cleanout shall be made of counter sunk plug brass.

10.4 Drainage System Test

- 10.4.1 The entire drainage and venting system shall have all necessary openings, which can be plugged to permit the entire system to be filled with water to the level of the highest water or a full 30 minutes during which time there shall be no drop greater than 102 mm.
- 10.4.2. Where only a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system except that a vertical stack 3.00 m highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure or water pump may be used to supply required pressure.
- 10.4.3. If and when the Project Manager decides that an additional test is needed, such as an air to smoke test on the drainage system, the Contractor shall perform such test without any designated representative.

10.5 Water Test on System

- 10.5.1. Upon completion of the roughing-in and before connecting fixtures the entire cold water piping system shall be tested at a hydrostatic pressure 1 ½ times the expected working pressure in the system during operation and remain tight and leak-proofed.
- 10.5.2. Where piping system is to be concealed the piping system and in the presence of the Engineer or his duly designated representative.

10.6 Defective Work

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

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

Changes in pipes shall be made with reducing fittings.

- i. Drain Cocks
Pipe drain indicated on the drawing shall consist of 12-mm globe valve with renewable disc and installed at low points on the cold water piping so that all piping shall slope 100mm in 30.5 m.
- j Threaded Pipe Joints
All pipes shall be reamed before threading. All screw joints shall be made with graphite and oil or with an approved granite compound applied to make threads only. Threads shall be cut not more than three threads on the pipe shall remain exposed.
- k Expansion and Contraction of Pipes
Accessible contraction-expansion joints shall be made whenever necessary. Horizontal runs of pipe over 15 m length shall be anchored to the wall to the supporting structure about midway on the run to force expansion and contraction equally toward the ends or as shown on the Plans.

Valves shall be provided on all supplied fixtures as herein specified.
The cold water connection to the return circulation connection shall have a gate valve and a check valve.

All connection to domestic hot water heaters shall be equipped with unions between valve and tanks.

Valve shall not be installed with its stem below the horizontal. All valves shall be gate valves unless otherwise indicated on the Plans.

Valves 50-mm diameter shall be threaded ends; rough bodies and finished trimmings, except those on chromium plated brass pipe.

Valves 63 mm in diameter and larger shall have iron bodies, brass mounted and shall have either screws or flange ends.

Hose bibs shall be made of brass with 12.5-mm inlet threads, hexagon shoulders and 19 mm male.

10.3.3 Fixtures, Equipment and Fastenings

- a. All fixtures and equipment shall be supported and fastened in a safe and satisfactory workmanship as practiced.
- b. All fixtures where required to be wall mounted on concrete or concrete hollow block wall should be fastened with brass and expansion bolts. Expansion bolt shall be 6-mm diameter with 20-mm threads to 25 mm into solid concrete, fitted with loose tubing to sleeves of proper length to acquire extreme rigidity.
- c. Insert shall be securely anchored and properly flushed into the walls. Inserts shall be concealed and rigid.
- d. Bolts and nuts shall be horizontal and exposed. It shall be provided with washers and chromium plate finish.

10.3.4 Plates and Flashing

specification requirements defined in ASTM D-2241 and PNS 65: 1986. Fittings shall be molded type and designed for solvent cement joint connection for water lines and rubber O-ring seal joint for sanitary lines or Fusion weld.

10.3 Construction Requirements

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

10.3.1 Installation of Waste and Vent Pipes

- a. Horizontal lines shall be secured strongly by hooks to the building frame and suitable brackets or chairs shall be provided at the floor which they start.
- b. Vent pipes in roof spaces shall be run as closest possible to under side of roof with horizontal piping pitched down to stacks without forming traps. Vertical vent pipes connected into one main vent riser above the highest vented fixtures.
- c. Where an end circuit vent pipe from any fixtures is connected to a vent line serving other fixtures, the connection shall be at least 1.20 m above the floor on which the fixtures are located.
- d. Horizontal waste line receiving the discharge from two or more fixtures shall be provided with end vents separate venting of fixtures is noted on the plans.
- e. All changes in pipe size on soil and waste lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by appropriate use of 45 degrees, wyes, half wyes, quarter bends or elbows in waste lines where the change in direction of flow is the horizontal to the vertical and on the discharge from waste closets. Where it becomes necessary to use short radius fittings in other location, the approval of the Project Manager shall be obtained prior to installation of the same.
- f. Vent pipe shall be provided with Vent Cap (Studor) and flashed and made watertight at the roof with ferrule lead. Flashing shall be turned down into pipes.

10.3.2 Water Pipes, Fittings and Connections

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

- a. The water piping shall be extended to all fixtures, outlets and equipment from the gate valves installed in the branch near the rise.
- b. The cold water system shall be installed with a fall towards a main shut off valve and drain. Ends of pipes and outlet shall be capped or plugged and left ready for future connections.
- c. Mains and Branches
All pipes shall be cut accurately to measurements and shall be worked into place without springing or forcing. Care shall be taken so as to not to weaken the structural portions of the building.

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

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

10.2.3 Water Closets shall be Tank Type Dual type/Lever Flush, elongated, Free Standing Combination round front bottom outlet siphon vortex or wash-down bowl with jet round front with close coupled tank with cover with complete fittings and mounting accessories.

10.2.4 Toilet lavatories shall be Semi-Pedestal Type, Wall hung lavatory with rear overflow and cast-in soap dishes pocket hanger and integral China Brackets complete with twin faucets, supply pipes, P-trap and mounting accessories.

10.2.5. Installation

- a) Align & mark flange holes for drilling, the top of the flange must be 20" from the floor
- b) Bolt knee control assembly flanges to the wall.
- c) Connect UNION fitting to in house water source pipe.
- d) Bolt in sink brackets 36" from the floor. Keep it centered with the knee controls and drain pipe.
- e) Connect flexible plastic hose to showerhead water supply.
- f) Install Drain and "P" trap.
- g) Install showerhead assembly.

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

10.2.6 Stainless steel working sink shall be used to all working counters, it shall be made of stainless steel self riming, single compartment complete with supply fittings, strainer traps, dual control lever and other accessories, fitted to actual requirement as shown in the plans.

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

10.2.8 Septic Tank

The septic tank shall be provided as shown on the plans including all pipe vents and fittings.

Various construction materials such as concrete masonry work shall conform to the corresponding Items of this specification.

Inlet and outlet pipes shall conform to the latest edition of the National Plumbing Code.

10.2.10 Water Supply Pipes and Fittings

A. Pipes shall be Pn 25 Fusion Weld Polypropylene Pipe conforming to specification requirements including Trims and Fittings.

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

C. Unions in ferrous pipe 50 mm in diameter and smaller shall be malleable iron

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10.2.11 Approved Alternate Pipes and Fittings

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Pipes and fittings for sanitary and potable water lines as approved alternative shall be High Density Polyethylene (HDPE) pipes and fittings, Chlorinated Polyvinyl Chloride Pipes and Fittings (CPVC). and Unplasticized Polyvinyl Chloride Pipes and Fittings (UPVC). Pipes and fittings shall be made of virgin materials conforming to

and then smoothen the surface with sand paper, before applying the final coat.

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

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

(6) Wood Surfaces

(a) Surface Preparations

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

(b) Finishing

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

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

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

9.4 Method of Measurement and Basis of Payment

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

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

10.0 PLUMBING WORKS

10.1 Scope of Work

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

10.2 Material Requirements

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

10.2.1 For cold water lines, Pn 25 Fusion Weld Polypropylene Pipes. Provide coal tar with burlap for embedded pipe.

10.2.2 UPVC Extra Heavy Duty conforming to ASTM D-2729 for all downspouts and sewer, waste & vent lines. Waste pipes for Laboratory shall be HDPE pipes.

The Project Manager shall, in accordance with the color schemes shown in the drawings or as directed, follow all colors. Sample panels of selected colors, as least (1) meter square in area shall be prepared for approval by the Project Manager prior to the application.

(3) Workmanship

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

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

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

Each surface shall be inspected carefully before applying any finish; and if surface is not in proper condition, they shall be notified to that effect in writing, otherwise the Contractor shall be held responsible for any defects in the finishes arising there from. Should a coat of paint be applied to a certain area with defects, it shall be knocked out and re-plastered by the Contractor and repainted to the satisfaction of the Project Manager.

(4) Inspection of Surfaces

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

(5) Concrete Surfaces

(a) Surface Preparation

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

(b) Finishing:

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

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

Intermediate Coat- Repair all minor surface imperfection with paint putty made by mixing paint with patching compound powder. Let it dry for 24 hours,

- q. Supply, installation, termination, testing and commissioning of complete CCTV system, nurse call system, paging system, and fire alarm system.
- r. Supply and installation of hangers and supports of conduits for power, feeder and sub-feeder system and auxiliary system.
- s. Painting of electrical works covering conduits, boxes, hangers, gutters, and the like.
- t. Testing for electrical system:
 - Insulation resistance test
 - Ground resistance test
 - Continuity test
 - Operational test
 - Polarity check
 - Phase balancing check
- u. Anything that has been omitted in any of work or materials usually furnished which are necessary for the completion of the works as outlined herein shall be undertaken or supplied by the contractor included in this division of work and must be included in the bid proposal.

11.2 Code Regulations

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

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

11.2 Drawings and Specifications

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

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

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

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

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

11.4 Permits and Inspections

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

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

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

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

11.5 Materials and Workmanship

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

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

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

11.6 Wiring Method

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

Fire Alarm System Layout – rigid steel conduit concealed in ceiling and double walls and/or embedded in concrete walls/slabs.

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

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

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

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

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

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

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

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

11.7 Feeders

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

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

11.8 Wall Switches and Receptacles

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

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

11.9 Main Switches, Transfer Switches and Panelboards

The cabinets for the above shall be of standard sizes and shall be gauge #16. Circuit breakers shall be 250 Volts, AC, rated 75C, interrupting ratings specified in the plan shall be followed at all times.

11.10 Lighting Fixtures

Install all lighting fixtures and lamps as specified and as shown on plans. Fluorescent lamps shall either be 48 inches/40 watts or 24 inches/20 watts, standard cool white or daylight with the minimum light output of 3,000 lumens. Use high power factor ballast.

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

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

11.11 Water Pump

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

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

11.12 Auxiliary Systems

The Electrical Contractor shall supply, install, test, and commission a complete system for closed circuit TV, nurse call, paging, and fire alarm system as specified in the plan.

The Electrical Contractor shall supply and install a complete system for Master TV, and PABX/Telephone system, and at his expense shall coordinate with the local telephone and cable TV providers to ensure the complete operation and connection of the said systems.

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

11.13 Distribution Transformer

The Electrical Contractor shall supply and install distribution transformers, pole line hardware for the receiving pole and pole at midspan, transformer pads and grounding system as indicated/specified in the plan. He shall also supply service metering instruments and accessories, and at his expense, shall submit these to the local electric utility company for connection.

Materials for the works mentioned above shall be from manufacturers accredited/acknowledged by the local electric utility company.

12.0 MECHANICAL WORKS

12.1 Air Conditioning and Refrigeration System

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

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

12.1.1 Refrigerant Pipes

Refrigerant pipes shall be copper tubing, type L or K black steel pipe, Schedule 40 for size of 100mm diameter and smaller. Pipe over 100mm shall be black steel pipe Schedule 40.

Black steel pipes shall be standard seamless, lap-welded, or electric resistant welded for size of 50mm diameter and larger, screw type for size 38mm diameter and smaller, fittings for copper tubing shall be cast bronze fitting designed expressly for brazing.

12.1.2 Pipes for Cooling Water

Chilled and condenser cooling water pipes shall be black steel pipe, Schedule 40. Pipes and fittings for size 50mm diameter and smaller shall be screwed type. Pipes and fittings for size 62mm diameter and larger shall be welded or flanged type.

12.1.3 Pipe Insulation

Insulation shall be performed fiberglass or its equivalent. The insulating materials shall be covered with 100mm x. 13mm thick polyethylene film, which shall be overlapped not less than 50mm. Pipe insulation shall be adequately protected at point of support by means of suitable metal shield to avoid damage from compression.

Insulated pipes, valves and fittings located outdoors shall be provided with metal jackets.

12.1.4 Ductworks

Ducts shall be galvanized sheet steel of not less than the following gauges:

1. No. 26 for 300mm wide and smaller
2. No. 24 for 350mm to 750mm wide
3. No. 22 for 775mm to 1500mm wide
4. No. 20 for 1525mm to 2250mm wide
5. No. 18 for 2275mm to 2500mm or larger
6. For aluminum sheets use one gage higher.

Joints and stiffeners if ducts using slip joints shall be as follows:

- a. 300 mm wide and smaller, without bracing
- b. 325 mm to 750 mm wide, brace with 25mm x 25mm x 3mm steel angles.
- c. 775 mm to 1500 mm, brace with 31mm x 31mm x 3mm steel angles
- d. 1525 mm up, brace with 38mm x 38mm x 3mm steel angles

Stiffeners shall be located not more than 1200mm from each joint.

12.1.5 Ductwork Insulation

The application insulation materials shall be rigid board made of styropor or equivalent 25mm thick for ground and top floor, 13mm thick for intermediate floor.

Galvanized metal bands for ducts shall be secure and spaced 300mm minimum center to center and corners shall be protected with galvanized metal angles.

12.1.6 Dampers

Dampers shall be of same materials as duct, at least one gauge heavier and shall have accessible location, complete with locking device for adjusting and locking damper in position.

Where necessary, splitters, butterflies and louvers damper deflecting vanes for control of air volume and direction and for balancing the system shall be provided whether or not they are indicated on the Plans.

12.1.7 Fire Damper

Main duct shall be provided with proper fire dampers of the fusible link actuated type.

Access door shall be provided in ductwork for renewal of fusible link and to reset damper.

12.1.8 Equipment Foundation

Foundation shall be provided and shall conform to the recommendation of the manufacturers of the equipment. Equipment shall be leveled on foundation by means

of jacks or steel wedges. All spaces between equipment bases and concrete foundation shall be filled with cement mortar.

12.1.9 Electrical Works

Power supply shall be provided by the Contractor at the pull box installed inside the machine room and shall furnish and install the main circuit breaker and starter with suitable ratings and capacities, conduits, wiring, fittings, devices and all other equipment and electrical connections needed to complete the electrical installation of the system. All electrical works shall comply with the latest edition of the Philippine Electrical Code, with the applicable ordinance of the local government and all the rules and requirements of the local power company.

12.1.10 Construction Requirements

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

12.1.11 Operating Tests

Refrigerating equipment shall be tested for 8-hours per day for three consecutive days or longer when so directed, under the supervision of manufacturers qualified and authorized representative, who will make necessary adjustment and instruct designated plant operating personnel for each operation and maintenance of refrigerating equipment and controls.

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

12.1.12 Miscellaneous

The owner shall be provided with three (3) bound copies "AS BUILT" diagram, shop drawings, parts lists, serial number and inventory of equipment including manufacturers and maintenance manuals.

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

12.1.13 Method of Measurement

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

Compressor, condenser and evaporator shall be measured by set; grilles, diffusers and valve by piece, pipe by length, duct and insulation by square meter.

12.1.14 Basis of Payment

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

12.2 Automatic Water Sprinkler System

12.2.10 Electrical Work

Refer to sub-section 12.1.9 Air Conditioning System

12.2.11 Construction Requirements

Acceptance Tests

System operation and maintenance chart shall be submitted to the Owner upon completion of the Contract. This shall include the locations of control valves and care of the new equipment.

Marked instruction and identification sign boards: These sign boards shall be made of #14 gauge B.I. sheet with baked enamel finish paint and letter instruction are shown on the Plans. Additional signboards as may be required and not specified herewith shall be furnished at no extra cost. Signboards shall be mounted on the equipment or wall nearest the equipment or wall nearest the equipment for easy identification and reading. Paints shall be basically gloss fire red and white.

1. Conduct of Tests - shall be by the Sprinkler System Contractor in the presence of an inspector or Authority having jurisdiction.
2. Flushing if Underground Connections - To remove foreign materials, which may have entered the piping during installation of same as required before, sprinkler piping is connected.
3. Hydrostatic Test
 - 3.1 The Pressure - All systems, including piping shall be tested hydrostatically at not less than 1378 kPa pressure for two (2) hours, or at 344.5 kPa in excess of 1033.5 kPa.
 - 3.2 Operating Test - All control valves shall be fully closed and opened under water pressure to insure proper operation. Use clean, non-corrosive water.
 - 3.3 Fire Department Connection - Piping between the check valve in the fire department inlet pipe and the outside connection shall be tested the same as the balance of the system.
4. Test of Drainage Facilities - Test of drainage facilities shall be made while the control valve is wide open. The main drain valve shall be opened and remain open until the system pressure stabilizes.
5. Test Certificate - Upon completion of work, inspection and test made by the contractor's representative and witnessed by an owner's representative, a test certificate shall be filled out and signed both representative.

12.2.12 Maintenance Service

The contractor shall provide free of charge, maintenance service of the system for a period of at least one (1) year reckoned from the date of acceptance of the work by the Engineer.

Upon completion of the work and all tests, the services of one or more qualified engineers shall be provided by the contractor for period of not less than five (5) working days to instruct and train the representative of the owner in the operation and maintenance of the fire protection system.

- a) The alarm assembly shall be constructed and installed that any flow of water from the sprinkler system equal to or greater than that from the single automatic head shall result in an audible and visual signal in the vicinity of the building.
- b) The alarm apparatus shall be substantially supported and so located and installed that all parts shall be readily accessible for inspection removal and repair.
- c) The actual water flow, through the use of a test connection, shall be employed to test the operation of the sprinkler alarm unit as a whole.
- d) An approved identification sign shall be installed near the outdoor alarm device in conspicuous positions.

"Sprinkler Fire Alarm" when bell rings call Fire Department and Police.

12.2.5 Alarm and Supervisory System

The alarm and supervision system of the automatic water sprinkler shall include the monitoring of the following.

- a) Water flow switch at each floor of the building.
- b) Fire pump and jockey pump running condition and power supplies.
- c) Level of water in the reservoir.
- d) Control Valves.

The water flow switches on each of the building shall be connected to the fire alarm system and annunciator in such a manner that the operation of any sprinkler system will activate the fire alarm system, with the location of the operating water flow switch simultaneously indicated in the annunciator panel.

12.2.6 Pipes and Fittings

Pipes shall be B.I. Schedule 40. Screw fittings shall be used for inside piping. Welding and torch cutting shall not be permitted. Piping shall be painted with red enamel paint.

12.2.7 Siamese Twin

The Siamese twin shall be 64 mm x 64 mm x 102 mm, 90C female coupling national standard thread, swivel type, with protective coupling cap and joint lug.

12.2.8 Pipe Hangers

Pipe hanger shall be a steel bar, 3mm minimum thickness, with corrosion protection.

- a) Anchorage in concrete - expansion shield should preferably be used in a horizontal position in the sides of concrete beams.
- b) Expansion shield in vertical position. When pipes 102mm and larger are supported entirely by expansion shield in the vertical position, the supports shall be spaced not more than 3m apart.
- c) For pipe running through concrete beams use sleeves at least two (2) sizes larger than the piping.

12.2.9 Foundation

Refer to sub-section 12.1.8 Air Conditioning System

This Item shall consist of furnishing and installation of Automatic Water Sprinkler System, inclusive of all piping and pipe fittings connections, valves, controls, electrical wiring connection and all other accessories ready for service in accordance with the Plans and Specifications.

12.2.1 Materials Requirements

The type, size, capacity and quantity and power characteristics shall be specified or as shown on the plans.

The fire pump shall be electric motor driven and capable of delivering a minimum of residual pressure of 103kPa at the top-most and remotest sprinkler. The pump unit shall be supplied with relief valve, gate valve, suction gauge and discharge pressure gauge.

The fire pump shall be designed specifically intended for an automatic water sprinkler protection system. A drop in system pressure due to the operation of one sprinkler pressure shall be triggered a series of automatic operation that will result in instantaneous operation of the motor to drive the fire pump with an automatic controller.

The fire pump shall be UL Listed/FM Approved.

12.2.2 Jockey Pump

Jockey pump shall be electric motor driven, 220V, 3-phase, 60 hertz electric power connection. The capacity to be supplied shall not be less than that indicated on the Plans.

The jockey pump shall be UL Listed/FM Approved.

12.2.3 Sprinkler Head

- a) Type-spray unit, pendant and upright unit
- b) Flow capacity, 83 LPM per head
- c) Pressure rating
- d) Residual pressure - 103 kPa minimum
- e) Maximum pressure - 1035 kPa
- f) Temperature rating - fusing at 57.5 C to 74C
- g) Finish - chrome - pendant - chrome or brass upright
- h) Pipe Thread - 13mm nominal
- i) Stock of extra heads and tools required
 - 1) Pendant and upright - 6 pcs for 300 sprinkler, 12 pcs. for 300 to 1000 sprinkler, 24 pcs. for 1000 sprinkler above.
 - 2) Sprinkler tongs - 2 pcs.
 - 3) Sprinkler wrench - 2 pcs.

12.2.4 Alarm Check Valve and Fire Alarm System

12.2.13 Miscellaneous

Refer to sub-section 12.1.12, Air Conditioning System

12.2.14 Method of Measurement

The work under this Item shall be measured either by set, piece, length actually placed and installed as indicated on the Plans. Fire pump and jockey pump shall be measured by set, sprinkler heads, valves and fittings by piece, pipes by length.

12.2.15 Basis of Payment

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

13.0 GUARANTEE

All equipment, materials and workmanship shall be guaranteed for a period of one (1) year from date of acceptance at any time within the period of guarantee and upon notification, the contractor shall repair and rectify the deficiencies, including replacement of parts or entire units. Under such guarantee, the Contractor shall make good any defect due to faulty materials or workmanship caused by him without any additional cost to the Owner for the period specified.

NOTE: Contractors' proposal covers all items and other incidental works necessary to complete each item of works mentioned above.

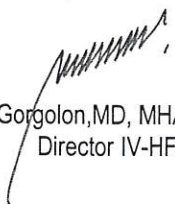
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ANNEX D

Scope of Works

Republic of the Philippines
Department of Health
HEALTH FACILITIES ENHANCEMENT PROGRAM
Building 4, San Lazaro Compound, Rizal Avenue
Sta. Cruz, Manila, 1003 Philippines

2019-1396-A

PROJECT : STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19

LOCATION : DOH COMPOUND, STA. CRUZ, MANILA

OWNER : DEPARTMENT OF HEALTH (DOH)

DATE : As of November 13, 2019

SUBJECT : SCOPE OF WORKS

I. GENERAL REQUIREMENTS

1. Furnish all labor, materials, equipment, tools and other facilities to complete the entire works including water, sanitary, plumbing, electrical, mechanical lines and render ready for use the **Structural Retrofitting and Repair of Building 19** in accordance with the plans and specifications and other contract documents.
2. Contractor is required to have all members of his construction crew to wear uniform long sleeve shirt (one color) bearing the Contractor's name and address or identification.
3. Contractor is required to have all the members of his crew wear hard hats at designated places in the construction site.
4. Cleaning and Hauling Debris.
5. All demolished/removed materials that are still usable will not be allowed to be used and shall be properly stocked, inventoried and turned over to in writing to the owner/end-user.
6. The Contractor shall take due care to protect existing structures which will be affected and unaffected by the work to be implemented.
7. The Contractor shall at all-time keep the premises free from the accumulation of waste or rubbish, caused by his subordinates or work. Upon completion of each item of work, they shall remove all rubbish materials from and within the site including all his tools, scaffoldings and surplus materials. The Contractor shall leave his work "Broom and Cleaned".

II. TEMPORARY FACILITIES

1. Temporary Facilities shall include but not limited to the following items:
 - a. Field Office, Workshops, stockpile areas and storage for materials, equipment, spares, fuel and oil but in no way pose as a hazard to the premises.
 - b. Workforce facilities including probable water supply, electrical power requirements, drainage, sewage disposal, sanitation, first aid, refuse collection, temporary fences and barricades and fire protection facilities.

III. PRE-CONSTRUCTION WORKS

1. Check and review of the result/recommendations of the Structural retrofitting contractor/ consultant for the existing Building No. 19 from Ground to Fourth Floor.
2. Provide retrofitting works from Ground to Fourth Floor, Building 19 as recommended (see attached Structural Investigations and Retrofitting Designs).

3. Second and Third Floor:

- a. Chip-off/ Remove existing floor finish in all areas.
- b. Dismantle doors and jambs that will be affected by the repair/ renovation works.
- c. Chip existing toilet ceramic floor tiles flooring for all areas affected by the Repair/ Renovation works.
- d. Dismantle/ remove existing ceiling for replacement.
- e. Remove existing flooring and frames of the connecting hallway/ bridge of Pantry to HIV Unit,
- f. Remove or demolish existing decorative CHB walls at HIV Unit hallway for replacement of new wall with sliding/ fixed glass windows with powder coated frames.
- g. Check existing electrical loadings for upgrading (panel boards, breakers, conduits, wires, outlets, and switches).
- h. Chip existing ceramic floor and wall tiles at all toilets.
- i. Dismantle the existing ceiling including framing system.
- j. Remove/ Dismantle existing Lower Roof (Third Floor).
- k. Scrape-off existing waterproofing of concrete gutter.
- l. Check all electrical panel boards, breakers, conduits, wires, outlets, and switches.

IV. ARCHITECTURAL WORKS

1. WINDOWS

- a. Replace all the windows from Ground Floor to Fourth Floor. This includes replacement of frames, locks, glass panels and of all components of the windows as indicated in the plans.

1. Front Windows, Left and Right Side, Rear Side Windows

- b. Repair/refurbish existing concrete ledge/ canopy, if necessary.
- c. Provide the necessary additional architectural works to complete this Item of Work.

2. DOORS

- a. Provide new doors, two-leaf panel glass door at the entrance Lobby (Ground and Second Floor).
- b. Provide new door, two-leaf louvered door at the electrical room (Second Floor)
- c. Repair existing doors and replace damaged locksets/ hard
- d. Provide the necessary additional architectural works to complete this Item of Work.

3. FLOOR FINISHES

- a. Provide 190mm x 1210 mm x 2mm Click Lock Vinyl Plank to replace existing floor tiles on the Ground Floor, Second Floor and Third Floor.
- b. Provide nosing at all stairs
- c. Provide 600mm x 600mm ceramic floor tiles for all toilets (Ground, Second, Third and Fourth Floor)
- d. Provide additional works as necessary.
- e. Flooring for all areas should be polished and cleaned before turn-over of project.
- f. Sample and pattern shall be approved by the Architect-in-Charge and the End-user prior to installation.

4. CEILING FINISHES – GROUND FLOOR, SECOND FLOOR, THIRD FLOOR AND FOURTH FLOOR TOILETS

- a. Provide 3.0mm thick fiber cement board in light steel framing system as indicated on the Reflected Ceiling Plans.
- b. Includes application of wood preservatives and painting works.

- c. Provide additional ceiling works, including framing system and other necessary architectural works to complete this item of work.

5. WALL TILE WORKS

- a. Provide 300mm x 600mm ceramic wall tiles at all toilets.
- b. Provide additional works as necessary.
- c. Sample and pattern shall be approved by the Architect-in-Charge and the End-user prior to installation.

6. STEEL LADDER, RAILINGS

- a. Provide new Fire exit steel ladder and Stair Railings.
- b. Gray Alkyd Metal primer for first coat.
- c. Quick Drying Enamel for second to final coat.
- d. Sample and color shall be approved by the Architect-in-Charge and the Owner prior to painting.
- e. Follow manufacturer's instructions for painting process.

7. WATERPROOFING WORKS

- a. Apply three (3) layers of Waterproofing works for all toilet floor slabs, under the counter sink slab, concrete gutter and parapet, including the surface before laying of tiles or finishing materials.
- b. Includes additional works as needed to complete this Item of Work.
- c. Includes leak test.
- d. This item should be done by the waterproofing supplier/ manufacturer including flood test to ensure quality of materials and workmanship. Warranty of five (5) years.

8. ROOFING WORKS

- a. Dismantling and removing of existing roofing (LOWER Roof), make sure to dismantle only the area that can be accommodated for replacing within the day.
- b. Replacing of new roof and other components, includes Pre-Painted rib-type roofing, replacement of hardware, accessories, insulation materials and application of touch-up paint.
- c. Provide additional Roofing works as needed to complete this Item of Work.

V. ELECTRICAL WORKS

- 1. Furnish and Installation of the following:
 - a. Roughing-in
 - b. Wires and Cables
 - c. Wiring Devices
 - d. Lighting System
 - e. Power System
 - f. Auxiliary System
 - g. Panel boards & Circuit Breakers
 - h. Grounding System
 - i. Miscellaneous
- 2. Provide and install main normal electrical system of the proposed repair/renovation as indicated in the electrical plans.
- 3. Provide and install all termination of electrical system.
- 4. Provide and install all roughing-ins and cables of auxiliary system. Provide and install all termination of electrical and auxiliary system at the designated server room and electrical rooms. Provide structured cabling, CCTV system, CATV system, Public Address System and Fire detection system.
- 5. Provide and install grounding system to all panel boards.

6. Provide and install directories to all panel board. Check and balance after all power and lighting loads as to their respective circuit breaker assignments as indicated in the load schedule.
7. All works herein shall be directed and supervised by a duly Registered Electrical Engineer as enforced by the New Electrical Engineering Law or R.A.7920. He shall be on site to overlook the proper implementation of the project.
8. Follow as per plan and specification and scope of works to complete the project and render it to be operational.
9. Provide and install directories to all panel board. Check and balance all power and lighting loads as to their circuit breaker assignments
10. Furnish and install other supporting materials and equipment deem necessary to complete the project.
11. Provide required and necessary documents such as Insulation Test to all new wire and cables installed, as-built electrical plans and other as may be needed prior to testing and commissioning.
12. Testing and commissioning.

VI. SANITARY/PLUMBING WORKS

1. Plumbing Fixtures:

- a. Provide and install new Plumbing Fixtures (BPS Approved) as indicated in the plan complete with trims, fittings and accessories as per manufacturer's standards; (Provide brochures/sample for approval prior to installation)
- b. Provide necessary cleats, brackets and anchors as needed.

2. Water System:

- a. Provide complete water supply to all new fixtures including trims and fittings, as indicated in plans.
- b. Provide Air Cap Chamber for every supply pipe of fixtures
- c. Install control/isolation valves for every group of fixtures as indicated;
- d. Provision Bidet / Spray hose for every water closet
- e. Provision of saddle clamp connection for tapping of water supply pipes to main water line. Verify actual location.
- f. Provision of full brass water meter and main gate valve.

3. Sewer, Storm line and Vent System:

- a. Provide complete sewer and storm line and vent system to all fixtures including trims and fittings, as indicated in plans.
- b. Provide vent cap to all vent stacks installed/recessed at walls or above ceiling, as indicated in plans.
- c. Provide pipe hangers and brackets as needed.
- d. Tap all sewerline including sewerline from building 14 to new septic tank.

4. Others

- a. Provision of beveled face mirror for every lavatory.
- b. Restoration and Repair of affected areas.
- c. Testing and commissioning with the presence of DOH representative and the owner is a must prior to concealing of rough-ins.
- d. All sanitary works shall be performed to the fullest satisfaction of the Sanitary Engineer in-charge and to the owner.
- e. Submit Test Results Certificates, e.g. Leak Test, prior to acceptance of the project.
- f. Submit As-built plans signed and sealed by a duly Registered Sanitary Engineer.

VII. CONSTRUCTION CLEARANCES

1. Secure from Architect/ Engineer-in-Charge the following clearances prior to commencing requisite work:
 - a. Wall layout clearance – verification of measurements and distances.
 - b. Ceiling closure clearance – inspection of electrical, plumbing and mechanical connections, ceiling framing installation and other above ceiling systems.
 - c. Final paint-coat clearance – inspection of surface leveling and absence of surface depressions or bulges prior to final painting.
 - d. Electrical fixture, device, equipment installation clearance – verification of location, adherence to design specifications of electrical roughing-ins.
 - e. Mechanical fixture, device, equipment installation clearance – verification of location, adherence to design specifications of mechanical roughing-ins.
 - f. Certificate from supplier, manufacturer, and dealer indicating specifications of branded material installed in construction.
2. Clearances from the General Services Division.
 - a. Overtime Work.
 - b. Construction of Field Office and Bunk House on Site.

VIII. OTHERS

1. As-built plan and taxes shall be shouldered by the Contractor.
2. Carry all expenditures for temporary water, electrical, telephone connections and field Office/Warehouse.

IX. TIME OF COMPLETION

The Project **Structural Retrofitting and Repair of Building 19** shall be completed on Two-Hundred Forty (240) calendar days.


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ANNEX D

Bill of Quantities

BILL OF QUANTITIES
PRE-CONSTRUCTION WORKS

STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19
DOH COMPOUND, STA. CRUZ, MANILA
Project Name and Location

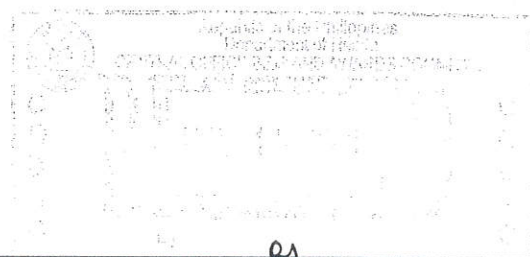
Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
(1)	(2)	(3)	(4)	(5a)	(5b)
B	PRE-CONSTRUCTION WORKS				
B.0	Retroftting Works	1.00	lot		
B.1	Dismantling of existing ceiling finish in all toilets	321.36	sq.m.		
B.2	Dismantling of existing windows	8.00	sets		
B.5	Chipping-off of floor tiles,fixtures and others at all toilets.	88.22	sq.m.		
B.6	Chipping-off of existing wall ceramic/marble tile affected by Repair/Renovation works.	70.25	sq.m.		
B.7	Dismantling of existing ceilings including framing system	402.60	sq.m.		
B.8	Dismantling of existing roof	562.22	sq.m.		
	TOTAL COST FOR PRE-CONSTRUCTION WORKS				
	(Pesos and centavos ----Amount in Words----)				

Name of the Representative of the Bidder :

Date :

Position :

Name of the Bidder :



**BILL OF QUANTITIES
ARCHITECTURAL WORKS**

**STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19
DOH COMPOUND, STA. CRUZ, MANILA
Project Name and Location**

2019-1396-A

Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
(1)	(2)	(3)	(4)	(5a)	(5b)
C.	ARCHITECTURAL WORKS				
C.1	DOORS & WINDOWS INCLUDING ALL REQUIRED HARDWARES & NECESSARY ACCESSORIES				
D-1	1950mm X 2150mm 2-panel double swing 6mm thick Tempered glass door on aluminum frame analok finish	1.00	set		
D-2	1800mm X 2150mm 2-panel double swing 6mm thick Tempered glass door on aluminum frame analok finish	1.00	set		
D-3	1200mm X 2150mm 1-panel swing-in louvered steel door	1.00	set		
W-1	2200mm X 1600mm alum. Powder coated windows	16.00	sets		
W-2	3800mm X 1600mm alum. Powder coated windows	46.00	sets		
W-3	875mm X 1600mm alum. Powder coated windows	2.00	sets		
W-4	835mm X 1000mm alum. Powder coated windows	1.00	set		
W-5	1000mm X 1600mm alum. Powder coated windows	3.00	sets		
W-6	1000mm X 895mm alum. Powder coated windows	2.00	sets		
W-7	720mm x 1200 alum. Powder coated windows	3.00	set		
W-8	1650mm x 1200mm alum. Powder coated windows	2.00	set		
W-9	830mm X 760mm alum. Powder coated windows	1.00	set		
W-10	1180mm x 1600mm alum. Powder coated window	2.00	set		
W-11	1350mm X 1600mm alum. Powder coated windows	1.00	set		
W-12	2250mm X 1700mm alum. Powder coated windows	1.00	set		
W-13	2250mm X 3350mm alum. Powder coated windows	3.00	sets		
W-14	2250mm X 2000mm alum. Powder coated windows	1.00	set		
	Sub-Total for C.1				
C.2	FLOOR FINISHES				
3.1	Ground Floor Finish	674.20			
	2mm - 600mm x 600mm Vinyl floor tiles	1,872.78	sq.m.		
	Self Leveling Compound	674.20	sq.m.		

BILL OF QUANTITIES
ARCHITECTURAL WORKS

STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19
DOH COMPOUND, STA. CRUZ, MANILA
Project Name and Location

Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
(1)	(2)	(3)	(4)	(5a)	(5b)
	Miscellaneous Items	1.00	lot		
3.2	Ground Floor Toilet Tiles	47.30	sq.m.		
	600mm x 600mm Non skid ceramic floor tiles	150.00	pcs.		
	Tile Adhesive 25Kg. (4-5 sq.m./25kg.)	4.42	bags		
	Tile Grout 5Kg. (.48 kg./sq.m.)	23.65	bags		
3.3	Second Floor Finish				
	2mm - 600mm x 600mm Vinyl floor tiles	674.20	sq.m.		
	Self Leveling Compound	674.20	sq.m.		
	Miscellaneous Items	1.00	lot		
3.4	Second Floor Toilet Tiles	17.69	sq.m.		
	600mm x 600mm Non skid ceramic floor tiles	49.14	pcs.		
	Tile Adhesive 25Kg. (4-5 sq.m./25kg.)	3.54	bags		
	Tile Grout 5Kg. (.48 kg./sq.m.)	8.49	bags		
3.5	Third Floor Finish				
	2mm - 600mm x 600mm Vinyl floor tiles	656.00	sq.m.		
	Self Leveling Compound	656.00	sq.m.		
	Miscellaneous Items	1.00	lot		
3.6	Third Floor Toilet Tile Finish	31.06	sq.m.		
	600mm x 600mm Non skid ceramic floor tiles	86.28	pcs.		
	Tile Adhesive 25Kg. (4-5 sq.m./25kg.)	6.21	bags		
	Tile Grout 5Kg. (.48 kg./sq.m.)	14.91	bags		
3.7	Fourth Floor Finish				
	2mm - 600mm x 600mm Vinyl floor tiles	362.52	sq.m.		
	Self Leveling Compound	362.52	sq.m.		
	Miscellaneous Items	1.00	lot		
3.8	Fourth Floor Toilet Tile Finish	30.70	sq.m.		
	600mm x 600mm Non skid ceramic floor tiles	85.28	pcs.		
	Tile Adhesive 25Kg. (4-5 sq.m./25kg.)	6.00	bags		
	Tile Grout 5Kg. (.48 kg./sq.m.)	14.74	bags		
	Sub-Total for C.2				
C.3	CEILING FINISHES				
4.1	Ceiling Finishes for Toilet Rooms Only				
a	CF-1	130.14	sq.m.		
	3.5mm thick fiber cement board	48.00	pcs.		
	light steel framing system	130.14	sq.m.		
	Miscellaneous items	1.00	lot		
	Sub-Total for C.3				
C.4	WALL TILEWORKS				

**BILL OF QUANTITIES
ARCHITECTURAL WORKS**

STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19
DOH COMPOUND, STA. CRUZ, MANILA
Project Name and Location

Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
(1)	(2)	(3)	(4)	(5a)	(5b)
9.1	Toilet Wall Tiles	260.00	sq.m.		
	600mm x 600mm ceramic floor tiles	722.22	pcs.		
	Tile Adhesive 25Kg. (4-5 sq.m./25kg.)	65.00	bags		
	Tile Grout 5Kg. (.48 kg./sq.m.)	124.80	bags		
	Sub-Total for C.4				
C.5	WATERPROOFING WORKS				
	Toilet floor slab, under the counter sink floor slab, concrete gutter and parapet and roof slab, including the surface	240.74	sq.m.		
	Sub-Total for C.5				
C.6	ROOFING WORKS				
12.1	0.50mm thk Pre-Painted Rib-type Long Span Roofing	426.00	lin.m.		
12.2	0.50mm thk x 0.610m x 2.44m Ridge Roll	11.00	pcs.		
12.3	Hardware, accessories, other components including PE Foam Insulation (10mm x 1m x 50m - 2 sided)	1.00	lot		
	Sub-Total for C.6				
C.7	Other Works				
	Other architectural works to complete the architectural works.	1.00	lot		
	Sub-Total for C.7				
	TOTAL COST FOR ARCHITECTURAL WORKS				
	(Pesos and centavos ----Amount in Words----)				

Name of the Representative of the Bidder :

Date :

Position :

Name of the Bidder :

BILL OF QUANTITIES

Electrical Works

STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19

DOH Cmpd., Rizal Avenue, Sta. Cruz, Manila

Project Name and Location

Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
(1)	(2)	(3)	(4)	(5a)	(5b)
I.	ELECTRICAL WORKS				
A.	Wiring Devices				
1	one gang Single Convenience Outlet(ACU)	66	sets	180.00	54.00
2	Two gang Single Convenience Outlet	400	sets	225.00	67.50
B	Roughing-In				
1	20 mmΦ uPVC Pipe	761	length	91.41	18.28
2	20 mmΦ uPVC Adapter	380	pcs.	6.25	1.25
3	20 mmΦ uPVC Coupling	380	pcs.	5.50	1.10
4	20 mmΦ uPVC Elbow	380	pcs.	10.85	2.17
5	20 mmΦ Locknut & Bushing	570	pcs.	10.00	2.00
6	60 mmΦ EMT Pipe	8	length	1,051.70	210.34
7	60 mmΦ EMT Connector	4	pcs.	145.50	29.10
8	60 mmΦ EMT Locknut & Bushing	4	pcs.	145.20	29.04
9	40 mmΦ uPVC Pipe	20	length	213.18	42.64
10	40 mmΦ uPVC Adapter	6	pcs.	10.41	2.08
11	40 mmΦ uPVC Coupling	10	pcs.	7.90	1.58
12	40 mmΦ uPVC Elbow	6	pcs.	7.95	1.59
13	40 mmΦ Locknut & Bushing	6	pcs.	9.51	1.90
14	Utility Box (C.O.)	466	pcs.	26.70	5.34
15	Pullboxes, supports, hangers and gutters	1	lot	40,000.00	8,000.00
D	Wires and Cables				
1	5.5 sq. mm. THWN	30	rolls	4,850.00	1455.00
2	5.5 sq. mm. TW	125	mts.	41.55	12.47
3	14 sq. mm. TW	30	mts.	90.48	27.14
4	30 sq. mm. TW	6	mts.	204.63	61.39
5	22 sq. mm. THWN	44	mts.	140.50	42.15
6	30 sq. mm. THWN	33	mts.	198.60	59.58
7	38 sq. mm. THWN	36	mts.	267.21	80.16
8	125 sq. mm THWN	315	mts.	739.00	221.7
E.	Panelboards and Circuit Breakers				
1	NLP1: 100AT/100AF, 3P	1	set	22,940.00	6882.00
	Branches: 18 - 20AT/2P				
	240VAC, 42KAIC				
	Bolt-On Molded Case CB				
2	NLP2: 150AT/225AF, 3P	1	set	37,015.00	11104.50
	Branches: 24 - 20AT/2P				

BILL OF QUANTITIES

Electrical Works

STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19

DOH Cmpd., Rizal Avenue, Sta. Cruz, Manila

Project Name and Location

Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE	AMOUNT
(1)	(2)	(3)	(4)	(5a)	(5b)
	240VAC, 42KAIC				
	Bolt-On Molded Case CB				
3	NLP3: 100AT/100AF, 3P	1	set	22,940.00	6882.00
	Branches: 18 - 30AT/2P				
	240VAC, 42KAIC				
	Bolt-On Molded Case CB				
4	NLP4: 70AT/100AF, 3P	1	set		
	Branches: 12 - 20AT/2P				
	240VAC, 42KAIC				
	Bolt-On Molded Case CB				
5	MNDP Main: 700AT/800AF, 3P	1	set		
	Branches: 2- 100AT/3P,1-150AT/3P,1-70AT/3P				
	240VAC, 45KAIC				
	Bolt-On Molded Case CB				
6	MCB1 Main: 800AT/800AF,3P	1	set		
	240VAC, 45KAIC				
	Bolt-On Molded Case CB				
G.	Miscellaneous				
1	Electrical PVC Tape	140	rolls		
2	Electrical Rubber Tape	50	rolls		
3	G.I. Wire gauge 16	30	kgs.		
4	Hacksaw Blade	50	pcs.		
5	Assorted Tox, screw, nails, drill bits, etc.	3	lot		
6	PVC Solvent	5	liter		
TOTAL COST FOR ELECTRICAL WORKS					

Name of the Representative of the Bidder :

Date :

Position :

Name of the Bidder :

BILL OF QUANTITIES

Sanitary Works

STRUCTURAL RETROFITTING AND REPAIR OF BUILDING 19

DOH, SAN LAZARO COMPOUND, STA. CRUZ MANILA

Project Name and Location

Item No.	DESCRIPTION	QTY	UNIT	UNIT PRICE (PESOS)	AMOUNT (PESOS)
(1)	(2)	(3)	(4)	(5)	(6)
A	PLUMBING FIXTURES (GROUND FLOOR)				
A.1	Wc- Tank Type Dual Flush w/ complete fittings and accessories	7	sets		
A.2	Lavatory Semi-Pedestal Type w/ spray faucet w/ complete fittings and accessories	7	sets		
A.3	Wash Sink single w/ drain board Heavy Duty S/S C-spout faucet and accessories	1	sets		
A.4	Urinal - Flush valve type w/ complete fittings and accessories	2	sets		
A.5	Bevelled Face Mirror (500mm x 600mmX6mm) complete with studs/brackets and accessories	7	sets		
A.6	Concealed Floor Drains (Stainless steel)	10	pcs		
A.7	Tissue Paper Holder Stainless Steel	7	pcs		
A.8	Hand bidet stainless steel	7	pcs		
A.9	Grease interceptor (large basket) 10gals Stainless Steel	1	pcs		
A.10	Faucet/Hose bibb	1	pcs		
	Sub Total				
B	SEWER SYSTEM (GROUND FLOOR)				
B.1	160mm dia DWV uPVC Extra HD	6	L.m.		
B.2	110mm dia DWV uPVC Extra HD	26	L.m.		
B.3	90mm dia DWV uPVC Extra HD	4.2	L.m.		
B.4	63mm dia DWV uPVC Extra HD	21	L.m.		
B.5	110mm dia uPVC Elbow 45DEG	4	pcs		
B.6	90mm dia uPVC Elbow 45DEG	1	pcs		
B.7	63mm dia uPVC Elbow 45DEG	5	pcs		
B.8	160mm dia uPVC Elbow 90DEG	3	pcs		
B.9	110mm dia uPVC Elbow 90DEG	14	pcs		
B.10	63mm dia uPVC Elbow 90DEG	11	pcs		
B.11	160x110mm Wye	1	pcs		
B.12	110x110mm Wye	12	pcs		
B.13	100x90mm Wye	1	pcs		
B.14	100x63mm Wye	16	pcs		
B.15	90x63mm Wye	2	pcs		
B.16	63x63mm Wye	1	pcs		
B.17	100mm dia Floor Cleanout (S/s)	4	pcs		
B.18	50mm dia Floor Cleanout (S/s)	1	pcs		
B.19	150mm dia Ground Cleanout,concrete encasement	3	pcs		
B.20	50mm dia P-trap	10	pcs		
B.21	uPVC Solvent Cement 400ml	3	can		
	Sub Total				
C	VENT SYSTEM (GROUND FLOOR)				
C.1	63mm dia DWV uPVC Extra HD	104	L.m.		
C.2	63mm dia uPVC Elbow 90DEG	34	pcs		
C.3	110x63mm Tee	7	pcs		
C.4	63x63mm Tee	39	pcs		
C.5	uPVC Solvent Cement 400ml	6	can		
	Sub Total				
D	POTABLE COLD WATER SYSTEM (GROUND FLOOR)				
D.1	63mm dia (PN25) Fusion weld pipe	128	L.m.		

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D.2	50mm dia (PN25) Fusion weld pipe	14	L.m.		
D.3	40mm dia (PN25) Fusion weld pipe	4	L.m.		
D.4	25mm dia (PN25) Fusion weld pipe	29	L.m.		
D.5	20mm dia (PN25) Fusion weld pipe	38	L.m.		
D.6	63x63x63mm dia (PN25) Tee	2	pcs		
D.7	63x50x63mm dia (PN25) Tee	2	pcs		
D.8	50x32x50mm dia (PN25) Tee	1	pcs		
D.9	50x25x50mm dia (PN25) Tee	1	pcs		
D.10	25x25x25mm dia (PN25) Tee	1	pcs		
D.11	25x20x25mm dia (PN25) Tee	8	pcs		
D.12	20x20x20mm dia (PN25) Tee	6	pcs		
D.13	63mm dia (PN25) Elbow 90DEG	5	pcs		
D.14	50mm dia (PN25) Elbow 90DEG	3	pcs		
D.15	32mm dia (PN25) Elbow 90DEG	1	pcs		
D.16	25mm dia (PN25) Elbow 90DEG	8	pcs		
D.17	20mm dia (PN25) Elbow 90DEG	18	pcs		
D.18	63x40mm (PN25)Reducer	1	pcs		
D.19	63x25mm (PN25)Reducer	1	pcs		
D.20	32x25mm (PN25)Reducer	1	pcs		
D.21	25x20mm (PN25)Reducer	4	pcs		
D.22	25mm dia (PN25) End Cap	2	pcs		
D.23	25mm dia (PN25) Tee Adaptor	2	pcs		
D.24	20mm dia (PN25) End Cap	16	pcs		
D.25	20mm dia (PN25) Tee Adaptor	16	pcs		
D.26	Gate valves 63mm (PN25)	1	pcs		
D.27	Gate valves 25mm (PN25)	2	pcs		
D.28	Gate valves 20mm (PN25)	6	pcs		
D.29	Saddle Clamp connection	1	set		
D.29	Water Meter 63mmdia	1	set		
D.30	Teplon Tapes	16	pcs		
	Sub Total				
A	PLUMBING FIXTURES (SECOND FLOOR)				
A.1	Wc- Tank Type Dual Flush w/ complete fittings and accessories	9	sets		
A.2	Lavatory Semi-Pedestal Type w/ spray faucet w/ complete fittings and accessories	9	sets		
A.3	Wash Sink single w/ drain board Heavy Duty S/S C-spout faucet and accessories	1	sets		
A.4	Urinal - Flush valve type w/ complete fittings and accessories	2	sets		
A.5	Bevelled Face Mirror (500mm x 600mmX6mm) complete with studs/brackets and accessories	9	sets		
A.6	Concealed Floor Drains (Stainless steel)	8	pcs		
A.7	Tissue Paper Holder Stainless Steel	9	pcs		
A.8	Hand bidet stainless steel	9	pcs		
A.9	Dual Faucet with Telephone Shower	4	pcs		
A.10	Grease interceptor (large basket) 10gals Stainless Steel	1	pcs		
A.11	Faucet/Hose bibb	1	pcs		
	Sub Total				
B	SEWER SYSTEM (SECOND FLOOR)				
B.1	160mm dia DWV uPVC Extra HD	4	L.m.		
B.2	110mm dia DWV uPVC Extra HD	20	L.m.		
B.3	90mm dia DWV uPVC Extra HD	4.2	L.m.		
B.4	63mm dia DWV uPVC Extra HD	12	L.m.		
B.5	110mm dia uPVC Elbow 45DEG	1	pcs		
B.6	90mm dia uPVC Elbow 45DEG	1	pcs		
B.7	63mm dia uPVC Elbow 45DEG	2	pcs		
B.8	110mm dia uPVC Elbow 90DEG	10	pcs		
B.9	63mm dia uPVC Elbow 90DEG	10	pcs		
B.10	160x110mm Wye	1	pcs		
B.11	110x110mm Wye	6	pcs		
B.12	100x90mm Wye	1	pcs		

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B.13	100x63mm Wye	13	pcs		
B.14	90x63mm Wye	2	pcs		
B.15	63x63mm Wye	1	pcs		
B.16	100mm dia Floor Cleanout (S/s)	3	pcs		
B.17	50mm dia P-trap	8	pcs		
B.18	uPVC Solvent Cement 400ml	3	can		
	Sub Total				
C	VENT SYSTEM (SECOND FLOOR)				
C.1	63mm dia DWV uPVC Extra HD	72	L.m.		
C.2	63mm dia uPVC Elbow 90DEG	33	pcs		
C.3	110x63mm Tee	5	pcs		
C.4	63x63mm Tee	34	pcs		
C.5	uPVC Solvent Cement 400ml	5	can		
	Sub Total				
D	POTABLE COLD WATER SYSTEM (SECOND FLOOR)				
D.1	63mm dia (PN25) Fusion weld pipe	4	L.m.		
D.2	50mm dia (PN25) Fusion weld pipe	5.3	L.m.		
D.3	40mm dia (PN25) Fusion weld pipe	20	L.m.		
D.4	32mm dia (PN25) Fusion weld pipe	3.8	L.m.		
D.5	25mm dia (PN25) Fusion weld pipe	29	L.m.		
D.6	20mm dia (PN25) Fusion weld pipe	57	L.m.		
D.7	63x50x63mm dia (PN25) Tee	1	pcs		
D.8	50x32x50mm dia (PN25) Tee	1	pcs		
D.9	50x25x50mm dia (PN25) Tee	1	pcs		
D.10	40x20x40mm dia (PN25) Tee	3	pcs		
D.11	25x25x25mm dia (PN25) Tee	1	pcs		
D.12	25x20x25mm dia (PN25) Tee	7	pcs		
D.13	20x20x20mm dia (PN25) Tee	7	pcs		
D.14	50mm dia (PN25) Elbow 90DEG	3	pcs		
D.15	40mm dia (PN25) Elbow 90DEG	1	pcs		
D.16	32mm dia (PN25) Elbow 90DEG	1	pcs		
D.17	25mm dia (PN25) Elbow 90DEG	8	pcs		
D.18	20mm dia (PN25) Elbow 90DEG	24	pcs		
D.19	32x25mm (PN25)Reducer	1	pcs		
D.20	25x20mm (PN25)Reducer	3	pcs		
D.21	25mm dia (PN25) End Cap	3	pcs		
D.22	25mm dia (PN25) Tee Adaptor	3	pcs		
D.23	20mm dia (PN25) End Cap	21	pcs		
D.24	20mm dia (PN25) Tee Adaptor	21	pcs		
D.25	Gate valves 25mm (PN25)	1	pcs		
D.26	Gate valves 20mm (PN25)	3	pcs		
D.27	Teplon Tapes	21	pcs		
	Sub Total				
A	PLUMBING FIXTURES (THIRD FLOOR)				
A.1	Wc- Tank Type Dual Flush w/ complete fittings and accessories	4	sets		
A.2	Lavatory Semi-Pedestal Type w/ spray faucet w/ complete fittings and accessories	5	sets		
A.3	Wash Sink single w/ drain board Heavy Duty S/S C-spout faucet and accessories	1	sets		
A.4	Urinal - Flush valve type w/ complete fittings and accessories	1	sets		
A.5	Bevelled Face Mirror (500mm x 600mmX6mm) complete with studs/brackets and accessories	5	sets		
A.6	Concealed Floor Drains (Stainless steel)	8	pcs		
A.7	Tissue Paper Holder Stainless Steel	4	pcs		
A.8	Hand bidet stainless steel	4	pcs		
A.9	Grease interceptor (large basket) 10gals Stainless Steel	1	pcs		
A.10	Faucet/Hose bibb	1	pcs		
	Sub Total				

B	SEWER SYSTEM (THIRD FLOOR)				
B.1	160mm dia DWV uPVC Extra HD	4	L.m.		
B.2	110mm dia DWV uPVC Extra HD	24	L.m.		
B.3	90mm dia DWV uPVC Extra HD	4.2	L.m.		
B.4	63mm dia DWV uPVC Extra HD	12	L.m.		
B.5	110mm dia uPVC Elbow 45DEG	5	pcs		
B.6	63mm dia uPVC Elbow 45DEG	4	pcs		
B.7	110mm dia uPVC Elbow 90DEG	4	pcs		
B.8	90mm dia uPVC Elbow 90DEG	1	pcs		
B.9	63mm dia uPVC Elbow 90DEG	7	pcs		
B.10	160x110mm Wye	1	pcs		
B.11	110x110mm Wye	7	pcs		
B.12	100x90mm Wye	1	pcs		
B.13	100x63mm Wye	10	pcs		
B.14	90x63mm Wye	2	pcs		
B.15	63x63mm Wye	2	pcs		
B.16	100mm dia Floor Cleanout (S/s)	4	pcs		
B.17	75mm dia Floor Cleanout (S/s)	1	pcs		
B.18	50mm dia P-trap	8	pcs		
B.19	uPVC Solvent Cement 400ml	3	can		
	Sub Total				
C	VENT SYSTEM (THIRD FLOOR)				
C.1	63mm dia DWV uPVC Extra HD	84	L.m.		
C.2	63mm dia uPVC Elbow 90DEG	23	pcs		
C.3	110x63mm Tee	4	pcs		
C.4	63x63mm Tee	27	pcs		
C.5	uPVC Solvent Cement 400ml	5	can		
	Sub Total				
D	POTABLE COLD WATER SYSTEM (THIRD FLOOR)				
D.1	63mm dia (PN25) Fusion weld pipe	4	L.m.		
D.2	50mm dia (PN25) Fusion weld pipe	7	L.m.		
D.3	32mm dia (PN25) Fusion weld pipe	9.2	L.m.		
D.4	25mm dia (PN25) Fusion weld pipe	12	L.m.		
D.5	20mm dia (PN25) Fusion weld pipe	21	L.m.		
D.6	63x50x63mm dia (PN25) Tee	1	pcs		
D.7	63x40x63mm dia (PN25) Tee	1	pcs		
D.8	40x40x40mm dia (PN25) Tee	1	pcs		
D.9	40x32x40mm dia (PN25) Tee	1	pcs		
D.10	40x25x40mm dia (PN25) Tee	1	pcs		
D.11	32x20x32mm dia (PN25) Tee	1	pcs		
D.12	25x25x25mm dia (PN25) Tee	1	pcs		
D.13	25x20x25mm dia (PN25) Tee	2	pcs		
D.14	20x20x20mm dia (PN25) Tee	2	pcs		
D.15	40mm dia (PN25) Elbow 90DEG	2	pcs		
D.16	32mm dia (PN25) Elbow 90DEG	3	pcs		
D.17	25mm dia (PN25) Elbow 90DEG	3	pcs		
D.18	20mm dia (PN25) Elbow 90DEG	13	pcs		
D.19	40x20mm (PN25)Reducer	1	pcs		
D.20	32x25mm (PN25)Reducer	1	pcs		
D.21	32x20mm (PN25)Reducer	1	pcs		
D.22	25x20mm (PN25)Reducer	1	pcs		
D.23	25mm dia (PN25) End Cap	1	pcs		
D.24	25mm dia (PN25) Tee Adaptor	1	pcs		
D.25	20mm dia (PN25) End Cap	11	pcs		
D.26	20mm dia (PN25) Tee Adaptor	11	pcs		
D.27	Gate valves 25mm (PN25)	1	pcs		
D.28	Gate valves 20mm (PN25)	3	pcs		
D.29	Teplon Tapes	11	pcs		
	Sub Total				
A	PLUMBING FIXTURES (FOURTH FLOOR)				

A.1	Wc- Tank Type Dual Flush w/ complete fittings and accessories	1	sets		
A.2	Lavatory Semi-Pedestal Type w/ spray faucet w/ complete fittings and accessories	1	sets		
A.3	Wash Sink single w/ drain board Heavy Duty S/S C-spout faucet and accessories	1	sets		
A.4	Bevelled Face Mirror (500mm x 600mmX6mm) complete with studs/brackets and accessories	1	sets		
A.5	Concealed Floor Drains (Stainless steel)	1	pcs		
A.6	Tissue Paper Holder Stainless Steel	1	pcs		
A.7	Hand bidet stainless steel	1	pcs		
A.8	Grease interceptor (large basket) 10gals Stainless Steel	1	pcs		
	Sub Total				
B	SEWER SYSTEM (FOURTH FLOOR)				
B.1	110mm dia DWV uPVC Extra HD	13	L.m.		
B.2	63mm dia DWV uPVC Extra HD	7	L.m.		
B.3	110mm dia uPVC Elbow 45DEG	1	pcs		
B.4	63mm dia uPVC Elbow 45DEG	3	pcs		
B.5	110mm dia uPVC Elbow 90DEG	2	pcs		
B.6	63mm dia uPVC Elbow 90DEG	2	pcs		
B.7	110x110mm Wye	3	pcs		
B.8	100x63mm Wye	3	pcs		
B.9	63x63mm Wye	1	pcs		
B.10	100mm dia Floor Cleanout (S/s)	2	pcs		
B.11	50mm dia Floor Cleanout (S/s)	1	pcs		
B.12	50mm dia P-trap	1	pcs		
B.13	uPVC Solvent Cement 400ml	2	can		
	Sub Total				
C	VENT SYSTEM (FOURTH FLOOR)				
C.1	63mm dia DWV uPVC Extra HD	30	L.m.		
C.2	63mm dia uPVC Elbow 90DEG	7	pcs		
C.3	110x63mm Tee	1	pcs		
C.4	63x63mm Tee	4	pcs		
C.5	uPVC Solvent Cement 400ml	2	can		
	Sub Total				
D	POTABLE COLD WATER SYSTEM (FOURTH FLOOR)				
D.1	63mm dia (PN25) Fusion weld pipe	4	L.m.		
D.2	40mm dia (PN25) Fusion weld pipe	4.6	L.m.		
D.3	25mm dia (PN25) Fusion weld pipe	8.1	L.m.		
D.4	20mm dia (PN25) Fusion weld pipe	12	L.m.		
D.5	25x20x25mm dia (PN25) Tee	1	pcs		
D.6	20x20x20mm dia (PN25) Tee	1	pcs		
D.7	25mm dia (PN25) Elbow 90DEG	2	pcs		
D.8	20mm dia (PN25) Elbow 90DEG	5	pcs		
D.9	63x40mm (PN25)Reducer	1	pcs		
D.10	40x20mm (PN25)Reducer	1	pcs		
D.11	25x20mm (PN25)Reducer	1	pcs		
D.12	20mm dia (PN25) End Cap	3	pcs		
D.13	20mm dia (PN25) Tee Adaptor	3	pcs		
D.14	Gate valves 20mm (PN25)	2	pcs		
D.15	Teplon Tapes	3	pcs		
	Sub Total				
E	STORM DRAINAGE SYSTEM				
E.1	300mm dia Concrete pipe	50	L.m.		
E.2	400mm dia Concrete pipe	30	L.m.		
E.3	160x110mm rectangular upvc tube	242	L.m.		
E.4	160x110mm rectangular upvc elbow	39	L.m.		
E.5	Catch basin	13	pcs		
E.6	Gutter Basket 100mm dia (Stainless)	13	pcs		
E.7	Upvc rectangular Pipe clamp	121	pcs		

E.8	Mortar jointing	1	lot		
E.9	uPVC Solvent Cement	6	can		
	Sub Total				
F	SEPTIC VAULT				
F.1	150mm CHB	406	pc		
F.2	Portland Cement	52	bag		
F.3	12mm dia Rebar	32	pc		
F.4	10mm dia Rebar	41	pc		
F.5	Wash Gravel	2.8	cu.m		
F.6	Wash Sand	3.6	cu.m		
F.7	Formworks	1	lot		
F.8	Hardwares and accessories	1	lot		
	Sub Total				
G	OTHER				
G.1	Excavation	30	cu.m.		
G.2	Backfilling	2	cu.m.		
G.3	Concrete cutting and chipping	1.5	cu.m.		
G.4	Restoration	1	lot		
G.5	Miscellaneous	1	lot		
	Sub Total				
	TOTAL SANITARY WORKS				
	(Pesos and centavos ----Amount in Words----)				

Name of the Representative of the Bidder :

Date :

Position :

Name of the Bidder :

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ELIGIBILITY REQUIREMENTS CHECKLIST

ELIGIBILITY REQUIREMENTS CHECKLIST

Procurement of Structural Retrofitting and Repair of Building 19 IB No. CW-2019-002

ITEM NO.	REQUIREMENTS
A. ELIGIBILITY DOCUMENTS	
1)	<p>Valid and current Certificate of PhilGEPS Registration and Membership – Platinum OR</p> <p>a) Registration certificate from the Securities and Exchange Commission (SEC), Department of Trade and Industry (DTI) for sole proprietorship, or Cooperative Development Authority (CDA) for cooperatives</p> <p>b) Mayor's/Business permit issued by the city or municipality where the principal place of business of the prospective bidder is located <i>or the equivalent document for Exclusive Economic Zones or Areas (2016 Revised IRR of RA 9184) together with corresponding copy of the receipt of payments of the said permit.</i></p> <p><i>Acceptability of the submission of the bidder's recently expired Mayor's Permit or Business Permit and the Official Receipt as proof that the bidder has applied and paid for the renewal of the permit within January 20 or of each subsequent quarter; Provided that, the current and valid Mayor's Permit, as renewed, will be submitted by the bidder with the LCRB as a condition to the award of contract (GPPB CIRCULAR 01-2015, dated 30 January 2015).</i></p> <p>c) Tax clearance per Executive Order No. 398, Series of 2005 issued by BIR main office Accounts Receivable Monitoring Division (ARMD), as finally reviewed and approved by the BIR pursuant to RR 01-2016 of BIR.</p> <p>NOTE: In case of a foreign JV Partner either Delinquency Verification Certification to Non-Resident Foreign Corporations (NRFC) or Non-Resident Aliens Not Engaged in Trade or Business (NRANETB), the Tax Clearance form required under BIR RR 3-2005, the CED of the BIR issues NRFC / NRANETB attesting to the fact that the taxpayer has no outstanding Final Assessment Notice and/or delinquent account or may be substituted by the appropriate equivalent documents, if any, issued by the country of the foreign bidder concerned.</p> <p>d) Audited financial statements, showing, among others, the Total and Current Assets and Liabilities, stamped "received" by the Bureau of Internal Revenue (BIR) or its duly accredited and authorized institutions, for the preceding calendar year, which should not be earlier than two (2) years from the <i>date of bid submission</i></p> <p>NOTE:</p> <ul style="list-style-type: none"> Bidders may still submit the Class "A" Eligibility Documents required to be uploaded and maintained current and updated in the PhilGEPS pursuant to Section 8.5.2 of 2016 Revised IRR of RA 9184; or If already registered in the PhilGEPS under Platinum category, the Certificate of Registration and Membership in lieu of the uploaded file of Class "A" Eligibility Documents; or A combination thereof in case any of the earlier uploaded Class "A" Eligibility Documents has been expired. <p><i>In the event the bidder opted to submit only the Class "A" Eligibility Documents, the Certificate of PhilGEPS Registration (Platinum Membership) shall remain a post-qualification requirement to be submitted in accordance with Section 34.2 of 2016 Revised IRR of RA 9184 (Pursuant to GPPB Circular 07-2017 dated 31 July 2017).</i></p>

2)	<p>Statement of ALL its ongoing government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid; and</p> <p>Statement of the Bidder's SLCC similar to the contract to be bid, in accordance with ITB Clause 5.4, <i>within two (2) years from the Submission and Opening of Bids, must be at least fifty percent (50%) of the ABC.</i></p> <p>The two (2) statements required shall indicate for each contract the following (using the prescribed COBAC Standard Form Nos. 1 and 2, as provided in Section VIII. Bidding Forms):</p>
	<ul style="list-style-type: none"> a. Name of contract; b. Date of the contract; c. Contract duration; d. Owner's name and address; e. Nature of work; f. Contractor's role (whether sole contractor, subcontractor, or partner in a JV) and percentage of participation; g. Total contract value at award; h. Date of completion or estimated completion time; i. Total contract value at completion, if applicable; j. Percentages of planned and actual accomplishments, if applicable; and k. Value of outstanding works, if applicable. <p>NOTE:</p> <ul style="list-style-type: none"> 1. <i>The statement of the Bidder's SLCC shall be supported by the Notice of Award and/or Notice to Proceed, Project Owner's Certificate of Final Acceptance issued by the Owner other than the Contractor or the Constructors Performance Evaluation System (CPES) Final Rating, which must be at least satisfactory. In case of contracts with the private sector, an equivalent document shall be submitted.</i> 2. <i>Failure to include an immaterial ongoing contract or failure to disclose complete information in the statement of contracts shall result in the following (GPPB Resolution No. 29-2012 dated 23 November 2012):</i> <ul style="list-style-type: none"> a. Disqualification of the bidder for non-compliance with the eligibility requirement under Section 23.1 or 24.1 of the revised IRR. b. Blacklisting under Section 65.3 (a) or (b) of the revised IRR.
3)	<p>Valid Philippine Contractors Accreditation Board (PCAB) License for size range or a Special PCAB License in case of a Joint Ventures and registration for the type and cost of the ABC – PCAB License - License Category B, Size Range Medium A per PCAB Categorization (Board Resolution No. 201, Series of 2017)</p>

4)	<p>The Bidder must submit a computation of its Net Financial Contracting Capacity (NFCC), which must be at least equal to the ABC to be bid, calculated as follows using the prescribed COBAC Standard Form No. 3 as provided for in Section VIII. Bidding Forms:</p> <p style="padding-left: 40px;">NFCC = [(Current assets minus current liabilities) (15)] minus the value of all outstanding or uncompleted portions of the projects under ongoing contracts, including awarded contracts yet to be started, coinciding with the contract to be bid.</p> <p style="padding-left: 40px;">The values of the domestic bidder's current assets and current liabilities shall be based on the latest Audited Financial Statements submitted to the BIR.</p>
	<p>NOTE:</p> <p>In case of a Joint Venture Agreement (JVA), the entity using its Audited Financial Statement (AFS) shall submit a statement of its on-going contracts including contracts awarded and not yet started, if any, Provided that, its on-going contracts shall be reflected in the computation of NFCC. Provided further, that the Current Assets and Current Liabilities of foreign bidders shall be based on their AFS accomplished in compliance with International Financial Reporting Standards (Circular 02-2014 dated 20 June 2014 pursuant to GPPB Resolution 14-2014 dated 20 June 2014)</p>
5)	<p>The CPES Rating and/or Certificate of Completion and owner's acceptance of the contract must be at least SATISFACTORY</p>
B. CLASS "B" DOCUMENTS:	
6)	<p>If applicable, Joint Venture Agreement (JVA) in accordance with RA 4566 and its IRR.</p> <p>NOTE:</p> <p>Each partner of the joint venture shall submit the following:</p> <ol style="list-style-type: none"> (1) SEC/DTI <u>or</u> appropriate equivalent documents, if any, issued by the country of the foreign bidder concerned; (2) Mayor's/Business Permit issued by the city or municipality where the principal place of business of the prospective bidder is located, <i>or the equivalent document for Exclusive Economic Zones or Areas together with the corresponding receipt of payments of the said permit;</i> <p><i><u>Acceptability of the submission of the bidder's recently expired Mayor's Permit or Business Permit and the Official Receipt as proof that the bidder has applied and paid for the renewal of the permit within January 20 or of each subsequent quarter; Provided that, the current and valid Mayor's Permit, as renewed, will be submitted by the bidder with the LCRB as a condition to the award of contract (GPPB CIRCULAR 01-2015, dated 30 January 2015).</u></i></p> <ol style="list-style-type: none"> (3) Tax Clearance per Executive Order No. 398, Series of 2005 <i>issued by BIR main office Accounts Receivable Monitoring Division (ARMD), as finally reviewed and approved by the BIR pursuant to RR 01-2016 of BIR or</i> Delinquency Verification Certificate for Non-Resident Foreign Corporations (NRFC) or Non-Resident Aliens Not Engaged in Trade or Business (NRANETB) (GPPB NPM 045-2013, dated 07 June 2013). (4) Audited financial statements, showing among others, the Total and Current Assets and Liabilities, stamped "received" by the Bureau of Internal Revenue (BIR) or its duly accredited and authorized institutions, for the preceding calendar year, which should <i>not be earlier than two (2) years from the date of bid submission;</i> <p>NOTE:</p> <ul style="list-style-type: none"> • <i>Bidders may still submit the Class "A" Eligibility Documents required to be uploaded and maintained current and updated in the PhilGEPS pursuant to Section 8.5.2 of 2016 Revised IRR; or</i> • <i>If already registered in the PhilGEPS under Platinum category, the Certificate of Registration and Membership in lieu of the uploaded file of Class "A" Eligibility Documents; or</i>

	<ul style="list-style-type: none"> • A combination thereof in case any of the earlier uploaded Class "A" Eligibility Documents has been expired. <p><i>In the event the bidder opted to submit only the Class "A" Eligibility Documents, the Certificate of PhilGEPS Registration (Platinum Membership) shall remain a post-qualification requirement to be submitted in accordance with Section 34.2 of 2016 Revised IRR of RA 9184 (Pursuant to GPPB Circular 07-2017 dated 31 July 2017).</i></p>									
7)	<p>Bid Security in accordance with ITB Clause 18. The bidders shall submit a Bid Securing Declaration (BSD) or any form of Bid Security, in an amount <i>not less than the required percentage of the ABC in accordance with the following schedule (2016 Revised IRR of RA 9184):</i></p> <table border="1"> <thead> <tr> <th>Form of Bid Security</th><th>Amount of Bid Security (Not less than the required percentage of the ABC)</th></tr> </thead> <tbody> <tr> <td>(a) Cash, Cashier's/manager's check issued by a Universal or Commercial Bank.</td><td rowspan="2">Two percent (2%)</td></tr> <tr> <td>(b) Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: Provided, however, that it shall be confirmed or authenticated by a Universal or Commercial Bank, if issued by a foreign bank.</td></tr> <tr> <td>(c) Surety bond callable upon demand issued by a surety or insurance company <i>duly certified by the Insurance Commission as authorized to issue such security.</i></td><td>Five percent (5%)</td></tr> <tr> <td>(d) Bid Securing Declaration</td><td>No percentage required</td></tr> </tbody> </table> <p>NOTE: The grounds on which the Bid Security may be forfeited as stated in the ITB Clause 18.5 shall be indicated if the bidder submitted letter (b) and (c) above.</p>	Form of Bid Security	Amount of Bid Security (Not less than the required percentage of the ABC)	(a) Cash, Cashier's/manager's check issued by a Universal or Commercial Bank.	Two percent (2%)	(b) Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: Provided, however, that it shall be confirmed or authenticated by a Universal or Commercial Bank, if issued by a foreign bank.	(c) Surety bond callable upon demand issued by a surety or insurance company <i>duly certified by the Insurance Commission as authorized to issue such security.</i>	Five percent (5%)	(d) Bid Securing Declaration	No percentage required
Form of Bid Security	Amount of Bid Security (Not less than the required percentage of the ABC)									
(a) Cash, Cashier's/manager's check issued by a Universal or Commercial Bank.	Two percent (2%)									
(b) Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: Provided, however, that it shall be confirmed or authenticated by a Universal or Commercial Bank, if issued by a foreign bank.										
(c) Surety bond callable upon demand issued by a surety or insurance company <i>duly certified by the Insurance Commission as authorized to issue such security.</i>	Five percent (5%)									
(d) Bid Securing Declaration	No percentage required									
8)	Duly accomplished and signed Project Requirements, which shall include the following:									
	a) Organizational chart for the contract to be bid;									
	b) Certificate of Site Inspection issued by DOH Administrative Service-General Services Division;									
	c) Duly signed Terms of Reference of the project issued by the DOH;									
	d) Construction methods- to be prepared by the bidder;									
	e) Value engineering analysis of structural retrofitting design and construction method - to be prepared by the bidder;									
	f) List of contractor's personnel to be assigned to the construction, with their complete qualification and experience data, shown in matrix with CV including copy of updated licenses or proof of renewal of their licenses, if expired. The list must contain the name, educational attainment, training, professional license and work experience of personnel;									
	g) List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project									
	h) Construction Schedule and S-Curve									
	i) Manpower Schedule									

	j) Construction Methodology in narrative form
	k) Equipment Utilization Schedule
	l) Construction Safety and Health Program
	m) PERT/CPM
	n) Detailed Architecture and Engineering Plans (Structural, Electrical, and Sanitary/Plumbing), Scope of Works and Technical Specifications issued by the DOH
	o) Planned subcontracted work, if any of not more than 10%
9)	The Omnibus Sworn Statement executed by the Bidder or its duly authorized representative using the prescribed form in Section VIII. Bidding Forms;
10)	Duly notarized authority of the signatory using the applicable COBAC's Standard Form provided in Section VIII. Bidding Forms: <ol style="list-style-type: none"> Secretary's Certificate (i.e. Corporation; Joint Venture Agreement); or Special Power of Attorney (i.e Sole Proprietorship; Partnership)

ELIGIBILITY REQUIREMENTS CHECKLIST

Procurement of Structural Retrofitting and Repair of Building 19 IB No. CW-2019-002

REQUIREMENTS
B. FINANCIAL PROPOSAL
The Bidder shall submit the following <u>Financial Proposal documents arranged, numbered and tabbed</u> as enumerated below: <ol style="list-style-type: none"> Duly accomplished and signed Bid Form; Duly accomplished & signed Bid prices in the Bill of Quantities; Detailed estimates, including a summary sheet indicating the unit prices of construction materials, labor rates, and equipment rentals used in coming up with the Bid; and Cash flow by quarter or payment schedule.