CONSTRUCTION SITE WORK

SECTION 02110 CLEARING OF SITE

PART 1 GENERAL

02110.1 SCOPE

a. Work Included:

1. Labor, materials, equipment, plans and other facilities and the satisfactory performance of all work necessary to the preparation of site excavation, and grading.

02110.2 SITE INSPECTION

a. Visit the site of the work and examine to fully understand all existing conditions relative to the work.

b. No increase in cost or extension of time will be considered for failure to know its conditions.

02110.3 PERMITS

Secure and pay for the necessary permits needed for work.

02110.4 PROTECTION

a. Workmen: Provide adequate measure to protect workmen and passersby in the site.

b. Surrounding Area: Street and adjacent property shall be fully protected throughout the operations.

c. Surface Drainage: Provide in a manner to creating a nuisance to adjacent area during the period of construction.

PART 2 PRODUCTS

02110.5 MATERIALS

Provide necessary tools such as telltale pipes and other instrument to make measurement and clearing.

PART 3 EXECUTION

02110.6 PREPARATION

a. Clearing:

1. Remove all trees that would interfere with the boundaries of the building only.

2. Remove all shrub, bushes, other, debris, existing foundations, pavements, structures, fences and other that would interfere with the construction operations.

3. Protect from damage all trees and shrub are not to be removed. Grab roots out at least 45 centimeter below existing surface.

4. Remove or dispose from the site all items.

b. Base Stakes: Erect base batter boards and base reference mark as indicated at such place where they will not be disturbed.

c. Bench Marks: Construct two benchmarks near the site construction for determining any settlement that may occur during the progress of the work.

SECTION 02200 EARTHWORK

PART 1 GENERAL

02200.1 SCOPE

a. Work Included:

1. Furnishing of all labor equipment and material for excavation and backfilling.

2. Inspection of site to survey necessary labor, equipment and materials.

3. Excavation and hauling of excavated materials.

4. Backfilling and grading up to the property line.

b. Related Work Specified Elsewhere:

1. Preparation of sub-grade for concrete pouring.

2. Trenching and backfilling for storm sewer system.

3. Trenching and backfilling for sanitary sewer system.

4. Trenching and backfilling for underground electrical supply.

02200.2 PROTECTION

a. Provide adequate bracing and shoring to existing construction as may required.

b. Perform all excavation work with a minimum amount of damage to work, which is to remain.

c. Repair any damage caused by negligence of Contractor at his own expense.

d. Provide adequate protection measures for materials, men and adjoining property.

e. Avoid creating nuisance to adjacent areas.

02200.3 MEASUREMENT AND PAYMENT

a. Excavation shall be measured in its original position by cross-sectioning the area excavated. Volume will be computed from the cross-section measurements by the average-end-area method.

b. Accepted quantities will be paid for at the contract price per unit of measurement for excavation, including embankment construction.

PART 2 PRODUCTS

02200.4 MATERIALS

a. Borrow material shall be selected, laboratory approved material obtained from off-site sources and having 3.5 percent liquid limit, and 4 to 12 percent plasticity index.

b. Granular fill to form a capillary water barrier shall be clean, crushed, non-uniformly graded and of a size, which will pass a 25 millimeters mess screen and be retained on a No. 4 mesh screen.

c. Excavated material approved for used as backfill shall be free of fibers, vegetables or organic materials, boulders, large rocks or pockets, lumps or other concentration of silt, debris, or cinders.

d. No fill material shall be placed when free water is standing in the area where fill is to be placed.

PART 3 EXECUTION

02200.5 PREPARATION

a. Stakes and Batter Boards:

1. Stake out the building accurately and establish grades. Secure the approval of the Owner and/or Architect.

2. Erect batter boards and reference mark where they will not be disturbed during construction.

3. Store material and conduct work in such a manner as to preserve all reference marks.

4. Re-establishment of lines and grades where necessary shall be done at the Contractor's expense.

b. Rough Grading

1. Cut and fill machine grade the site area.

2. Deposit materials in horizontal layers not exceeding 20 centimeter (8 inches) in depth and compact to 95% of maximum density. (Modified Proctor Test)

02200.6 EXCAVATION

a. Foundation:

1. Excavate to grade indicated.

2. Excavate trenches to a near size, leveled to line at the bottom ready to receive the foundation.

3. Excavation greater than required by the drawings and specifications and which is within the bearing area of walls,

footings, or floor slabs shall be filled with class “D” concrete at Contractor’s expense.

4. All foundations are designed for an allowable soil bearing capacity computed and the soil boring test results. Contractor shall report to the Engineer actual soil conditions uncovered and confirm soil actual capacity before any concreting is started.

b. Trenching for Utility and Foundation Drawings

1. Excavate to a point 1.0 meter beyond building line of sufficient distance from the walls and footings to allow placement removal of forms.

2. Backfill materials and concrete fill. Where excavation is at lower levels or greater depth than required for foundation, or where unsatisfactory material is removed, the excess material shall be replaced with backfill material, except below grade beams, footings or other structural concrete where fill to depth or level shall be with concrete of the same strength as specified.

02200.7 DEWATERING

a. Water encountered during excavation shall be removed by piling or pumping, care being taken that the surrounding particles of soil are not disturbed or removed.

b. Pump water out of excavated area throughout the construction.

02200.8 SUB-DRAINAGE

a. Excavate trenches for underground utility system and drain lines. Grade and tamp to provide firm bed trenches for drain lines.

b. When rock is encountered, excavate to a depth 15 centimeter below the bottom of the pipe, and before pipe is laid, the space below the pipe shall be filled with sand, gravel or crushed stone.

02200.9 SOIL COMPACTION

All existing earth within building lines that has been disturbed should be placed in 15 centimeter layers and compacted to 95% of maximum density required for fill.

02200.10 DISPOSALOF EXCAVATED MATERIAL

Surplus materials resulting from the site excavation and grading operations shall be removed from the site and disposed off in proper manner at the Contractor's expense.

02200.11 BACKFILLING AND GRADING

a. Backfilling:

1. Commence after approval of construction below finish grade, underground utility system inspected and tested, form removed and the excavation clean of trash and debris.

2. Place in layers not more than 15 centimeter thick and evenly compact and ram by wetting, tamping or rolling until the correct grade is reached.

b. Finish Grading:

1. Place fill materials in horizontal loose layers not exceeding 15 centimeter in thickness and spread, mix and place in such manner as to produce a uniform thickness of material.

2. Start in deepest area and progress approximately parallel to finish grade.

3. Grade finish surface to drain water away from the building.

SECTION 02280 SOIL POISONING

PART 1 GENERAL

02280.1 SCOPE

a. Soil Poisoning shall be executed by a duly licensed and certified termite and pest control company to guarantee the soil poisoning works for five years.

b. Furnish material and equipment and perform labor required to complete soil poisoning work.

02280.2 EXAMINATION OF SITE

Visit the site of the work and examine the premises to fully understand all existing conditions relative to the work.

PART 2 MATERIALS

02280.3 SOIL POISONING

a. Soil poise shall be water-base emulsions. Any of the following may be used:

   1. Benzene Hexachloride - 0.8 percent gamma isomer concentration.

   2. Chloride - 1 percent concentration.

   3. Dieldrin - 0.5 percent concentration.

   4. Aldrin - 0.5 percent concentration.

   5. Heptachlor - 0.5 percent concentration.

PART 3 EXECUTION

02280.4 APPLICATION

a. Soil poisoning work shall not begin until all preparations for footings, CHB under grade and slab on fill have been completed.

b. Soil Poisson shall not be applied when soil is excessively wet.

c. After grading and leveling the soil in the ground and layer of gravel is laid preparatory to the pouring of concrete floor or soap every square meter of floor area with soil Poisoning working solution.

d. Thoroughly drench and saturate every linear meter excavation for footings and other foundation work with soil poison working solution before pouring of concrete.

e. 7.6 liters of soil poison working solution per 1.5 linear meter shall be applied to all area immediately below expansion joints, control joints, and all areas, where slab will be penetrate by pipe duct and other construction features.

f. Hollow masonry walls resting on grades shall have its voids treated with 3.79 liter of soil poison working solution per 1.5 linear meter of wall. Poisons are poured directly into the hollow spaces.

g. Prior to landscaping of the lawn, saturate very linear meter perimeter of the building about 3 meters wide with soil poison working solution.

h. Treat earthfill thoroughly. As soon as fill is packed and levelled, drench every 1 square meter area with soil poison working solution.

02280.5 INSPECTION AND TIME

a. One sample of concentrates toxicant shall be tested.

b. One sample of working solution shall be tested for each 1,000 square meter of treated area. There shall be at least two sample tested.

c. Samples shall be taken and analytical tests performed by approved testing laboratory. Test shall be paid by the Contractor. The result shall be submitted to the Owner.

02280.6 GUARANTEE

Upon completion of the work, and a condition of final acceptance, the Owner shall be furnish with a written guarantee which shall provide that: THE SOIL POISONING TREATMENT SHALL PREVENT SUB-TERRANEAN TERMITES FROM ATTACKING THE BUILDING OR ITS CONTENT FOR A PERIOD OF NOT LESS THAN 5 YEARS.

SECTION 02430 DRAINAGE STRUCTURES- PIPES AND FITTINGS

PART 1 GENERAL

02430.1 SCOPE

Furnish material and equipment and perform labor required to complete the storm drainage system external to the building.

02430.2 PROTECTION

Protect materials from loss, injury or defacement. Loss or damages material shall be replaced by the Contractor at his own expense.

PART 2 PRODUCT

02430.3 MATERIALS

a. Drainage Pipes:

1. Plain concrete drainpipe and fitting 10 to 25 centimeter inside diameter: T & G conforming to ASTM C-14-59.

b. Jointing Material - one part cement to two parts sand in proportion with oakum yawning.

c. Building Storm Drain - connection to main concrete wye branch and clean-out, T & G or use junction boxes.

d. Area Drain Catch Basin - load-bearing concrete hollow block (CHB) or reinforce concrete with reinforce concrete grating covers as show on the drawings.

PART 3 EXECUTION

02430.4 EXCAVATION AND PIPE LAYING

a. Excavate trenches for all underground pipelines to required depth and grades.

b. Sink bell projection so that pipe will rest on well tamped soil bedding for its entire length.

c. Lay pipe in trenches true to line and grade. Properly bed each section of the pipe and shape trench to fit the lowest 90 arch of pipe circumference.

d. Lay water and sewer pipes in separate trenches.

02430.5 BACKFILLING

a. Pipelines shall be tested by Contractor and by Owner's representative prior to backfilling.

b. Clean and free all excavation from trash and debris.

c. Backfill shall consist of same material excavated or other approved materials. Free backfill of debris and big stones. Place backfill in horizontal layers not exceeding these indicated on the drawings.

d. Carefully place and tamp backfill under and around pipe barrel in such manner so as not to disturb pipeline and joints.

e. Properly moist each backfill layer and compact by hand or machine to an optimum density that will prevent excessive settlement and shrinkage.

f. Bring backfill to suitable elevation above grade to provide for anticipated settlement and shrinkage.

DIVISION 3 CONCRETE

SECTION 03100 - CONCRETE FORMWORK

PART 1 GENERAL

03100.1 SCOPE

a. Work Included :

1. All labors, materials, equipment, plant, tools and other facilities necessary to complete all concrete formwork.

2. Refer to General Conditions.

3. Work shall BE DONE IN accordance with the "NATIONAL STRUCTURAL CODE OF THE PHILIPPINES, Volume 1, 3rd Editions and the "ACI BUILDING CODE (ACI 318-latest edition)" and the National Building Code, l988 Edition insofar as they do not conflict with specific provisions.

03100.2 PROTECTION

a. Forms shall be used whenever necessary to confine the concrete and shape it to the required lines, or to insure the concrete of contamination with materials caving or sloughing from adjacent, excavated surfaces.

b. 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.

c. Forms shall be sufficiently tight to prevent loss of mortar from the concrete.

d. Forms for exposed surfaces against which backfill is not to be placed shall be lined with a form grade plywood.

e. Bolts and rods used for internal ties shall be so arranged that when the forms are removed all metal will not be less than two (2) centimeters from the formed surface.

PART 2 PRODUCTS

03100.3 MATERIALS

a. Forms:

1. Plywood, metal, plaster of Paris or plastic materials or surfaced lumber forms shall be used for all cast-in-place concrete works.

2. In no case shall the forms for beams and slabs be less than 12 millimeters (1/2 in) thick plywood for exposed concrete, 20 millimeters (3/4 in") T & G for covered concrete.

b. Quality:

Provide forms that will produce correctly aligned concrete. Plastering in general shall not be allowed so that care shall be exercised in the choice of surface of forms and fittings that will be in contact with concrete.

PART 3 EXECUTION

03100.4 PREPARATION

a. Check all formwork for plumbness and correct alignments.

b. Provide openings for column forms for cleaning and inspection preferably at lowest points of pour lifts.

c. Provide camber as indicated in construction notes.

d. Before placing the concrete, the contact surfaces of the form shall be cleaned of encrustations of mortar, the grout, or other foreign material, and shall be coated with a commercial form oil that will effectively prevent sticking and will not stain the concrete surfaces.

03100.5 FORMS AND SHORING

a. Removal:

1. Forms and shoring shall not be removed until concrete is adequately set and strong enough to withstand anticipated loading and in no case less than what is required in the following tabulations:

PARTS OF STRUCTURE	CLASSIFICATION OF PARTS	TIME REQUIRED
Footing	a. Massive footing b. Cantiliver footing c. Slab Footing	a. 1 day (24 hours) b. 5 days (120 hours) c. 5 days (120 hours)
Walls and Plasters	a. Massive Walls, 30 centimeters b. Thin Walls - less than 150mm c. Cantiliver walls	a. Up to 60 centimeters (2 ft.) - 1 day (24 hours). Add 1 day for additional 90 centimeters (3 ft.) of height or fraction thereof. b. Up to 180 centimeters (6 ft.) high - 2 days (48 hours). Add 1 1/2 days (36 hours)for every additional 90 centimeters of height or fraction thereof but not more than 28 days (672 hours) c. without load same as a and b
Columns	a. ratio of height to least dia. up to 4 b. Ratio of height to least dia. from 4 to 15	a. 2 days (48 hours) b. Add to the above number 1 day(24 hours) for every additional 90 centimeters (3 ft.) of height or fraction thereof but not more than 28 days (672 hours)
Slabs	a. 90 centimeters (3 ft.) to 210 centimeters (7 ft.) span b. over 210 centimeters (7 ft.) span	a. 90 centimeters (3 ft.) span - 5 days (120 hours). Add 1/2 day (12 hours) for every 30 centimeters (1 ft.) span or fraction thereof. b. 210 centimeters (7 ft.) span - 7 days (168

		hours). Add 1/2 day (12 hours) for every 30 centimeters (1 ft.) additional span or fraction thereof but not more than 28 days (672 hours)
beams and Girders	a. sides b. bottoms	a. 3 days (72 hours) b. Up to 425 centimeters (14 ft.) - 15 days (336 hours). Add ½ day (12 hours) for every 30 centimeters (1 ft.) additional span or fraction thereof but not more than 28 days (672 hours).

2. Forms and shoring may be removed earlier than specified above provided that test samples of concrete are taken and are shown to be adequately strong to carry safely, dead and construction loads to the satisfaction of the Project Engineer.

3. Forms shall be removed in a manner, which will prevent damage to the concrete. Forms shall not be removed without approval by the Project Engineer. Any repairs of surface imperfections shall be performed at once and curing shall be started as soon as the surface is sufficiently hard to permit it without further damage.

SECTION 03200 - CONCRETE REINFORCEMENT

PART 1 GENERAL

03200.1 SCOPE

a. Related Work Specified Elsewhere:

1. Concrete Formworks: ITEM 900

2. Masonry: ITEM

3. Thermal and Moisture Protection: ITEM 1016

03200.2 PROTECTION

a. Storage of Materials:

Steel reinforcements shall be stored under cover or otherwise prevented from rusting.

b. Concrete cover shall be determined before concrete pouring is started.

03200.3 DESIGN CONDITION

All Steel reinforcements shall be designed in accordance with the ACI Building Code (ACI 318-latest edition), Uniform Building Code 1988 Edition, and the National Structural Code of the Philippines, Volume 1, 3rd Edition.

03200.4 TESTING

The Owner, his duly authorized representative or the Architect shall have the right to order the test of any steel supplied by the Contractor, Such tests shall conform to the ASTM Designations enumerated below on materials. Samples shall be provided by the Contractor without cost to the Owner and expenses for testing shall be borne by the Contractor and copies of results shall be furnished to the Owner and to the Architect.

PART 2 PRODUCTS

03200.5 MATERIALS

a. Steel Bars:

1. Reinforcing steel bars to be used shall be new and free from rust, oil, grease or kinds.

2. Shall conform to the latest edition of ASTM Designation A615M Specifications.

3. Reinforcing steel for columns shall be intermediate grade. For all other parts of the structure such as beams, girders, slab, footings, walls, etc., reinforcing steel shall be structural grade, unless noted in the plan.

4. Ties and stirrups for beams and column as well as slab reinforcements may be plain bars unless noted in the plan or specified herein.

PART 3 EXECUTION

03200.6 PREPARATION

a. Remove all loose rust or scale, adhering materials and oil or other materials which tend to destroy bond between concrete and reinforcement before steel is placed or before pouring.

b. All bars shall be bend cold, unless otherwise permitted by the Engineer.

03200.7 PLACING REINFORCEMENTS

a. Metal Reinforcements:

1. Placing shall be in accordance with the plans furnished. Refer to the Architect/Engineer in case of doubt or ambiguity in the placing of steel.

2. Reinforcing bars shall be accurately placed and adequately secured by concrete metal wires, or metal chair spaces.

3. Spacing of bars shall be done in accordance with the ACI - Building Code or as follows:

Clear distance between parallel bars shall be one and one half (1/2 times) the diameter for round bars, and twice the side dimension for square bars.

4. Clear distance shall not be less than 2.54 centimeters (1 inch) nor more than 1 1/3 times the minimum size of aggregates.

5. Where bars are used in two or more layers, the bars in the upper layers shall be placed directly above those in the lower layers at a clear distance of not less than 25 mm.

b. Stirrups and Ties:

Bends for stirrups and ties shall be made around a pin having a diameter of not less than 6 times the minimum thickness of the bar, except that for bars larger than 25 mm, the pin shall not be less than 8 times the minimum thickness of the bar.

03200.8 OFFSET AND SPLICES IN REINFORCEMENT

a. Splices

1. In slabs, beams and girders at points of maximum stress shall not be made, and may be allowed only upon written approval of splice details by the Project Engineer.

2. Provide sufficient lap to transfer stress between bars by bonding shear or by welding.

3. Splices in adjacent bars shall be generally staggered.

4. Unless otherwise indicated, the minimum splice length shall be 24 times the bar diameter or 300 mm whichever is greater.

b. Offsets - Where changes in cross section of column occur, longitudinal bars shall be offset in a region where lateral support is afforded. The slope of the inclined portion of an offset bar with axis of column shall not exceed 1 in 6. Portions of the bar above and below an offset shall be parallel to axis of column. Horizontal support at offset bends shall be provided by lateral ties, spirals, or parts of the floor construction. Horizontal support provided shall be designed to resist 1 1/2 times the horizontal component of the computed force in the inclined portion of an offset bar. Lateral ties or spirals, if used, shall be placed not more than 150 mm from points of bend. Offset bars shall be bend before placement in the forms.

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

03300.1 SCOPE

a. Related Works Specified Elsewhere:

1. Concrete Formworks: ITEM 900

2. Concrete Reinforcement: ITEM 901

3. Masonry: ITEM

4. Moisture Control: ITEM 1016

5. General Conditions

b. Foundations and bedded slabs

c. All other structural concrete members except pre-cast concrete.

d. Unless otherwise specified herein, concrete work shall conform to the requirements of the ACI Building Code (ACI 318 latest edition). Full

cooperation shall be given other trades to install embedded items. Provisions shall be made for setting items not placed in the forms. Before concrete is placed, embedded items shall have been inspected and tests for concrete aggregates and other materials shall have been done.

03300.2 STORAGE OF MATERIALS

a. Cement bags shall be stored in a suitable weatherproof structure which shall be as air-tight as practicable; floors shall be elevated above the ground a distance sufficient to prevent the absorption of moisture. Bags shall be stocked against outside walls. The manners of storage shall permit easy access for inspection and identification for each shipment. Cement that has been in storage for a long time, that there is doubt of its quality will be tested by standard mortar tests to determine its suitability for use and such cement shall not be used without approval.

b. Aggregates shall be stored in such a manner as to avoid the inclusion of foreign materials in the concrete. Aggregates of different sizes shall be stored in separate piles. Stock Piles of coarse aggregate shall be build in horizontal layers not exceeding 4 feet in depth to avoid segregation. Should the coarse aggregate become segregated, it shall be remix to conform to the grading requirements given herein. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete at the rate specified.

03300.3 MEASUREMENT AND PAYMENT

Cast-in-place concrete shall be measured in cubic meter and payment shall be based on the actual poured volume using the unit prices on the proposal form.

03300.4 DESIGN CONDITIONS

All strengths of concrete shall be as indicated on the construction notes.

PART 2 PRODUCTS

03300.5 MATERIALS

a. Cement:

Portland cement shall conform to the Standard Specifications for Portland Cement (ASTM Designation C150, latest revision) for type I Portland Cement.

b. Concrete Aggregate:

1. Well graded, clean, hard particles of gravel or crushed rock conforming to the "STANDARD SPECIFICATIONS FOR CONCRETE AGGREGATES (ASTM Designation C33, latest revision).

2. Maximum size of aggregate shall not be longer than 1/5 of the narrowest dimension between sides of the forms nor larger than 3/4 of the minimum clear spacing between reinforcing bars, nor 1/3 the depth of slab and in no case larger than 5 centimeters in diameter.

3. Fine aggregates shall consist of natural Porac sand. Fine aggregates shall consist of hard, tough, durable, uncoated particles. The stipulated percentages of fines in the sand shall be obtained either by the processing of natural sand or by the production of a suitably graded manufactured sand. The shape of the particles shall be generally rounded or cubical and reasonably free from flat or elongated pieces. Rock, which breaks down into thin, flat elongated particles, regardless of the type of processing equipment used will not be approved for use in the production of fine aggregate. Á thin, flat elongated particle is defined as a particle having a maximum dimension in excess of five times the minimum dimensions. The fine aggregate shall conform to the following specific requirements:

Sieve Designation US Standard, Square Mesh	Cumulative Percentage Passing	Weight Retained
3/8”	100	0
No. 4	95-100	0-5
No. 8	-	-
No. 16	45-80	20-55
No. 30	-	-
No. 50	10-30	70-90
No. 100	2-10	90-98

In addition to the grading limits shown above, the fine aggregate as delivered to the mixer, shall have a fineness modules of not less than 2.3 or more than 3.0, and, during normal operations, the

grading of the fine aggregate shall be controlled so that the fineness module of at least nine of ten test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.20 from the average fineness modules of all samples tested during the preceding 30-day period. The fineness modules shall be determined by dividing by 100, the sum of the cumulative percentage retained on US Standard Sieve Nos. 4, 8, 16, 30, 50 and 100. At the option of the Contractor, fine aggregate may be separate into two or more sizes or classifications, but the resulting combined sand shall be of uniform grading within the limits specified above. It may be generally assumed that a fine blending sand will be required to meet the above grading.

4. Coarse aggregate shall consist of gravel, crushed gravel or rock, or a combination of gravel and crushed gravel or rock, approved by the Engineer. 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 will 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 by adequate processing. The particle shape of the smallest size of crushed coarse aggregate shall be generally rounded or cubical, and the coarse aggregate shall be reasonably free from flat and elongated particle in all sizes. A thin, flat and elongated particle is defined as the particle having a maximum dimension greater than five times the minimum dimension. The coarse aggregate shall be well graded from fine to coarse. It shall be separate into the following sizes as delivered to the mixer.

Sieve Size US Standard Square Mesh	Percent by Weight ¾: Size	Passing Individual 1 ½: size
2”	-	-
1 ½”	-	-
1”	100	100
¾”	90-100	90-100
3/8”	20-55	0-10
No. 4	0-10	0.5

The sizes of coarse aggregate to be used in the various parts of the work shall be in accordance with the following or as directed:

General use	Sizes
Footings, piers, columns, walls, slabs on	

fill, catch basins and others not specified	3/4
Beams, pillaters, jambs, pre-cast, catch basin Covers	¾

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

d. Concrete Additives:

1. Calcium Chloride in the amount of not more than 630 grams per 40-kilogram bag of cement may be used as accelerator and curing agent with the previous approval of the Engineer.

03300.6 CONTROLLED STRENGTHS OF CONCRETE

a. Concrete for all columns, beams, girders, walls, framed slabs, stairs, footings, foundations, roof slabs and gutters shall develop a minimum 28-day cylinder strength of 20.7 MPa (3,000 psi). (see Construction Notes).

b. Concrete for bedded floor slabs, walks, manholes, catch basins, curbs and gutters, pavements shall develop a minimum 28-day cylinder strength of 17.24 MPa (2,500 psi).

03300.7 METHOD OF DETERMINING STRENGTH

The Contractor shall submit mix designs obtained from samples made in accordance with "METHOD OF SAMPLING FRESHLY MIXED CONCRETE (ASTM Designation C172 and "TEST METHOD FOR COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS (ASTM Designation C39) for each strength required stating the proposed slump and the proportional weights of cements, saturated surface, dry aggregates, and water. This mixture shall be proved by preliminary tests 30 days before concreting and shall show a 28-day strength of 15 percent higher than the ultimate required. No substitutions shall be made in the materials mix without additional tests to show that the quality of concrete is satisfactory.

03300.8 CONCRETE PROPORTIONS AND CONSISTENCY

a. Cement and Aggregate:

Proportions shall be such as to produce a concrete mixture, which will work readily into the corners and angles of the forms and around

reinforcement with the method of placing materials to segregate, or excess free water to collect on the surface.

b. Measurement:

1. Concrete materials shall be measured preferably by weight such that the proportions can be accurately controlled and easily checked at any time during work.

2. Measurement of materials for ready mixed concrete shall conform to "STANDARD SPECIFICATIONS FOR READY MIXED CONCRETE (ASTM Designation C94), or "SPECIFICATIONS FOR CONCRETE MADE BY VOLUMETRIC BATCHING and "CONTINUOUS MIXING (ASTM C 685), where applicable.

3. The water content shall, in no case, exceed 27 liters per bag of cement for all portions in the structure. Slumps shall be within the following limits:

Portions of Structure	Slumps (Centimeters)
Columns and end supported beams, girders Slabs	7.5 - 15
Foundation elements, bedded slabs and cantilevered beams and slabs	5 - 12.5

c. Job Mix Adjustment of Water Content:

Shall be allowed only on permission of the Project Engineer and provided that cement is also added to keep the original water cement ratio of the design mix. Job-mixed concrete shall conform to Section 5.5.2.3 of NSCP, 3rd edition.

03300.9 MIXING CONCRETE

a. No hand mixing shall be allowed, except in case of emergency such as mixer breakdown during pouring operations and shall stop at the first allowed construction joints. All concrete shall be machine mixed for at least 1 1/2 minutes after all materials including water are in the mixing drum.

b. The mixer shall be of an approved size and type which will ensure a uniform distribution of material throughout the mass, it shall be equipped with a DEVICE FOR ACCURATELY MEASURING AND CONTROLLING THE AMOUNT OF MIXING WATER IN EACH BATCH.

c. Placing of material in mixer shall be done in such a way that the first batch of concrete materials placed in the mixer shall contain sufficient excess of cement, sand and water to coat the inside of the drum without reducing the cement content of the mix to be discharged.

d. Retampering of concrete, or concrete that has been remixed after initial set shall not be used.

PART 3 EXECUTION

03300.10 PREPARATION

a. Forms:

1. Shall be inspected, cleaned and all installations checked before concrete is placed.

2. Surfaces shall be thoroughly wet and grouted before placing concrete.

3. All laitance from previous pouring shall be cleaned and possible exposed aggregates before renewing pouring.

03300.11 DEPOSITING CONCRETE

1. Depositing shall be done without segregation, rehandling or flowing of concrete. It shall be done with the use of buggies, buckets or wheelbarrows. Use of chutes will not be allowed except to transfer concrete from hoppers to buggies, wheelbarrows or buckets in which case shall not exceed 6 meters in aggregate length.

2. Placing of concrete with a free drop or fall of more than 1.5 meters is not allowed.

3. Conveyors when used shall be kept full of concrete and ends shall be kept buried in the newly placed concrete as pouring progresses.

4. Concreting shall be carried out at such a rate that the concrete is at all times plastic and flows readily into spaces between reinforcement.

5. Top surfaces of vertically formed lifts shall be generally level.

6. Approval of the Engineer shall be obtained before starting any concrete pour. Concrete shall be deposited as close as possible to its final position in the forms so that flow within the mass does not exceed two (2) meters and consequent segregation is reduced to a minimum. Near forms or embedded items, or elsewhere as directed, the discharge shall be so controlled that the concrete may be effectively compacted into horizontal layers not exceeding 30 centimeters in depth within the maximum lateral movement specified. Free water shall be collected in depressions away from the forms and removed by pailing prior to placement of additional concrete. All concrete placing equipment and methods shall be subject to approval.

7. Concrete shall be placed before initial set has occurred and before it has contained its water content for more than 45 minutes.

b. Consolidation of Concrete

1. No placing of concrete will be allowed without vibrators.

2. Segregation due to over vibration shall be avoided.

3. Concrete shall be consolidated with the aid of mechanical vibrating equipment and supplemented by hand-spading and tamping. In no case shall vibrators be used to transport concrete inside the form. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and power of each unit to properly consolidate all concrete. Form or surface vibrators shall not be used unless specifically approved.

4. Vibrators shall not be inserted into lower courses that have commenced initial set, and reinforcements embedded in concrete beginning to set or already set shall not be disturbed by vibrators.

c. Construction Joints:

1. If possible, concreting shall be done continuously until section is complete. When stoppage of concrete operations occur, construction joints shall be placed either horizontally or vertically as indicated by the Project Engineer and provided with shear keys or dowels to develop bond.

2. Construction joints shall be as per plan or shall be approved or as directed by the Project Engineer.

03300.12 CURING CONCRETE

a. Finished Surface:

1. Keep concrete continuously wet or moist for at least one week after placing.

2. Floors and vertical surface may be sprayed with an approved retarder.

3. Curing shall begin as soon as concrete has attained initial set.

b. Curing additive may be used. A minimum of 48 hours continuous moist curing after placing of concrete shall be done after which subsequent additional curing can be dispensed with.

c. Water for curing shall be generally clean and free from any elements that may cause objectionable staining or discoloration of the concrete.

03300.13 REPAIR OF CONCRETE

a. Imperfections:

1. Repairs shall be completed within 24 hours after removal of forms.

2. Damaged or honeycombed concrete must be removed to reach sound concrete and should be replaced with drypack, rich mortar or concrete with pea gravel.

b. Large Bulges:

Where present large bulges and abrupt irregularities protrude, it shall be removed by bush hammering and grinding.

c. Drypack Filling:

1. Shall be used for holes having at least one surface dimension less than the depth of the hole.

2. Holes left by the removal of fasteners from the ends of the rods; for grout and pipe recessed; and for narrow slats cut for repair of cracks shall also be filled with dry pack.

3. Drypack shall not be used for filling behind reinforcement and for filling holes that extend completely through the concrete.

d. Mortar filling placed under impact by use of mortar gun shall be used for holes too wide for drypack filling and too shallow for concrete

filling and no deeper than the far side of the reinforcement nearest the surface.

e. Concrete filling shall be used for holes extending entirely through the concrete, for holes which are greater in area than 1,000 square centimeters and deeper than 10 centimeters and for holes in reinforced concrete which are greater in area than 500 square centimeters and which extend beyond reinforcement.

f. All materials, procedures and operations used in the repair of concrete shall be as directed.

g. Fillings shall be bonded tightly to the surface of the holes and shall be sound and free from shrinkage, cracks and dumpy area after the fillings have cured and dried.

h. The cost of all materials, labor and equipment used in the repair of all materials shall be borne by the Contractor.

03300.14 FLOOR FINISHES

a. Shall be noted carefully by the Contractor. Prepare the slabs suitably for the intended surface finish.

1. Where plain cement floor finish is specified, it shall be bonded. The slab shall be brought to a true surface 2.0 centimeters - 1.3 centimeters (3/4" to 1/2") below finished floor elevation and it shall be roughen by being raked as it sets. At a later date, when it is time to apply the finish, the slab shall be thoroughly cleaned by brushes and with a small jet from a high pressure hose.

2. All dirt shall be removed from crevices and depressions. After the surface has been wet, it shall be grouted with 1:1 grout. The 2 centimeters (3/4") sand finish composed of 1 part cement and 2 1/2 parts of sharp clean sand mixed with 7.6 - 11.4 liters (2 to 3 gallons) of water per bag of cement shall be supplied, rammed, and floated. This shall be trowelled sufficiently when dry to a smooth hard finish using a light dusting of cement only.

3. Coloring admixtures shall be as determined by the Architect/Engineer.

03300.15 TEST OF CONCRETE

a. Reasonable number of tests for the concrete may be required by the Owner during the progress of the work. Not less than four (4) cylindrical specimens shall be made for each test of which at least two (2) shall be reserved for the 28 - day test. Not less than one (1) test shall be made in case less than one (1) test for each day's

concreting. Samples shall be secured and molded in accordance with "METHOD OF SAMPLING FRESHLY MIXED CONCRETE (ASTM Designation C172) and METHOD OF MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD (ASTM Designation C31)". The Contractor shall provide the samples to be taken at the place of deposit and as specified by the Project Engineer, without cost to the Owner. The Contractor shall pay for the cost of testing the samples. The Contractor shall take care of transporting the samples to the approved testing laboratory without cost to the Owner.

b. To conform to the requirements of these specifications, the average strength of test samples representing each class of concrete as well as the average of any five consecutive strength tests representing each class concrete, shall be equal to or greater than the specified strength and not more than one strength test in 10 shall have an average value less than 90 percent of the specified strength.

c. Should the tests fail to give the required strength, the Owner shall have the right to order a change in the proportions or in the procedure of curing of the concrete for the rest of the structure.

03300.16 FAILURE TO MEET CONCRETE STRENGTH REQUIREMENTS

For failure to meet the specified strengths of concrete as per designed, prepared and deposited by the Contractor, removal of the concrete so deposited and replacement of the same, following the specified strength of the concrete shall be at the expense of the Contractor.

DIVISION 4 - MASONRY

SECTION 04110 CEMENT AND LIME MORTARS

PART 1 GENERAL

04110.1 SCOPE

a. Work Included:

1. All labor, materials, equipment, plans and other facilities and the satisfactory performance of all work necessary to complete all cement and masonry work shown on the drawings and specifies herein.

2. Refer to the General Conditions accompanying these specifications.

PART 2 PRODUCTS

04110.2 MATERIALS

a. Sand : ASTM C-4

b. Portland Cement : ASTM C150, Type I

c. Water shall be clean and free from deleterious substances.

04110.3 MIXES

a. Cement Mortar for Finish Coat :

1 part - Portland Cement

2 part - Sand but not more than 4 parts

b. Cement Mortar for Plastering:

1 part - Portland Cement

3 part - Sand

PART 3 EXECUTION

04110.4 INSTALLATION

a. Surface to receive plasters shall be cleaned of all projections, dust, loose particles, grease bone breaker an other foreign matter. Plaster shall on be applies directly to concrete on masonry surface that have been coat with bituminous compound, to surface that have been painted on previously plastered. Before the plasterwork is started, masonry surface shall be wetted thoroughly with fog spray of clean water to produce a uniformly moist condition. Metal grounds, corner bend and other accessories shall be check carefully of alignment before work is started.

b. Brown coat shall be applied with sufficient pressure to fill the groove in hollow block on concrete to prevent aid pocket and receive a good bond Brown coat shall be lightly scratch an bromide Each coat of cement plaster shall be keep moist of 48 hour after application and then allowed to dry.

c. Finish coat shall be applied untie after brow coat has seasoned for days Just before application of the finish coat, brown coat shall again be evenly moisten with fog spray finish coat shall be float first to a true an even surface the trowel in a manner that will force the sand particle Dow into the plaster. Plaster surface shall be and free from rough areas, trowel marks, checks and blemishes.

04110.5 PATCHING

a. Patch plaster following work of other trades.

SECTION 04200 UNIT MASONRY

PART 1 GENERAL

04200.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete concrete unit masonry

b. See drawing for sizes, details and location work required.

04200.2 HANDLING AND STORAGE

a. Handle in a manner to prevent undue chipping and breakage.

b. Protect storage piles, stacks on bins from heavy traffic.

c. Provide platforms to protect bottom piles from contact with soil.

PART 2 PRODUCTS

04200.3 MATERIALS

a. Concrete Hollow Block - 100 mm x 200 mm x 400 mm and 150 mm x 200 mm x 400 mm and 200 mm x 200 mm x 800 mm.

b. Mortar - 1 part Portland Cement, 3 parts sand

c. Wire Ties - 16 gauge looped at both ends.

d. Bars and Rods - ASTM Standard of masonry reinforcement and minimum diameter at 10 millimeter (3/8 inch).

PART 3 EXECUTION

04200.4 ERECTION

a. Lay all masonry units plumb, true to line, level and with accurately spaced courses.

b. Bond shall be kept plumb throughout. Corners and reveals shall be plumb and true.

c. Built-in anchors, wall plug and accessories to masonry as erection progresses.

d. Each course shall be solidly bedded in Portland cement mortar. All must be dump when laid.

e. Units terminating against beam or slab soffits shall be wedged tight with mortar and reinforcement properly secured to dowels.

f. Reinforcements shall be as shown in drawings. Minimum reinforcement is 12 millimeters (1/2 inch) round horizontal bars at

every 3 courses and 12 millimeters (1/2 inch) round vertical bars at every 2 blocks.

04200.5 UNFINISHED WORK

a. Unfinished work shall be stepped back for joining with new works.

b. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted not less than one hour before laying new work.

04200.6 PLASTERING

a. Grout wall to be plastered generously and let dry.

b. Apply scratch coat same as specified under Section 04110.4.

c. Final plaster finish shall be 1 part Portland cement and 2part sand, and 1/4 part hydrates lime. Plaster shall conceal all joints and even-out wall surface to a uniform smooth finish using Manila Paper or rubber sponge.

04200.7 CLEANING

Wash finish wall with a solution of 10 percent by volume of muriatic acid applied with stiff fiber brushes.

04200.8 OPENINGS

a. Provide beam blocks over or above openings not exceeding 1.20 meters span with same height and width as unit masonry blocks exceeding at least two masonry block lengths beyond the edge of the opening into the wall.

b. Provide 2-4 longitudinal reinforcing bars each at top and bottom of beam blocks with ties at 25 centimeter (10 inches O.C.).

c. For openings over 1.20 meters (4 ft.) in span, refer to drawing of cast-in-place design of lintel beam.

04200.9 CONSTRUCTION STANDARDS

Provisions of Section 6.10 of the National Structural Code of the Philippines, 3rd Edition, shall strictly be followed.

04200.10 TESTING

Testing of masonry materials shall be done in accordance with ASTM C140-70, METHOD OF TEST FOR CONCRETE MASONRY UNITS.

DIVISION 5 - METALS

SECTION 05120 STRUCTURAL STEEL

PART 1 GENERAL

05120.1 SCOPE

a. Work Includes:

All labor, materials, equipment and transportation required to complete fabrication, delivery and erection of all structural steel as indicated in the drawings and herein specified.

05120.1 The standards and codes applicable to only a portion of the work specified in this section are referred in the relevant parts of clauses. Standards and codes which are generally applicable to the work on this section are listed hereinafter

a. AISC - American Institute of Steel Construction:

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

Code of Standard Practice for Steel Buildings and Bridges.

Specifications for Structural Joint Using ASTM A325 or ASTM A490 Bolts.

Quality Certification Program.

b. ASTM - American Society for Testing and Materials :

A36 Structural Steel

A30 Low - Carbon Steel Externally and Internally Threaded Standard Fasteners.

A325 High Strength Bolts for Structural Steel Joint Including Suitable Nuts and Plain Hardened Washers.

A490 Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.

A449 Quenched and Tempered Steel Bolts and Studs

c. AWC - American Welding Society:

B3. Standard Qualification Procedure

D1.1-77 Structural Welding Code

d. ANSI - American National Standards Institute, Inc. :

B18.2.2.1 Plain Washers

e. NSCP - National Structural Code of the Philippines, 3rd Edition.

05120.3 SUBMITTALS

a. Detail Drawings and/or Shop Drawings

Fabrication, installation and assembly drawings for all parts of the work in sufficient detail to check conformity with the contract requirements.

Drawings shall show the details and dimensions of all component parts including plan and elevation views, cross sections and details.

b. Certificate of Compliance

Certificate of compliance shall include material or product manufacturer statement that the supplied items or systems conform to the specifications. Certificate of codes compliance shall be signed by the code authority verifying conformance to the specified code.

1. Test Reports:

Shop tests shall show the results of required shop tests of materials, equipment or system certified in writing by the manufacturer or its authorized representative.

Field test reports shall show the results of required field tests and compliance with approved procedure, certified by the Contractor.

2. Samples of bolts, welding product

3. Assembly, Erection and Installation Drawings and Manuals:

   Field assembly, erection, installation and checkout drawings, specifications and manuals shall include the following:

   Arrangement Drawings - showing dimensional equipment arrangements and weights including plans, elevations, sections and details.

   Assembly Drawings and Instructions - showing method and detailed instructions for the field assembly of unit deliverer in sections of sub-assemblies.

   Setting Drawings - showing mounting dimensions, anchor bolt and support locations and sizes.

   Erection Drawings and Instructions - showing the construction and installation methods and sequences of erection with the marking and position of each number.

05120.4 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

a. Handling - Do not handle structural steel until paint has thoroughly dried. Exercise care to avoid abrasions and other damage.

b. Protection - Stack material out of mud and dirt and provide for proper drainage. Protect from damage or soiling by adjacent construction operations.

c. Storage - Storage of fabricated steel at the job site shall be the responsibility of the Contractor. Store material at the job site in a manner which does not exceed design loads of existing or newly-constructed structures. Protect materials against corrosion or deterioration.

05120.5 QUALITY CONTROL

Follow AISC "Quality Certification Program

PART 2 PRODUCTS

05120.6 MATERIALS

a. Structural Steel - ASTM A36 unless otherwise shown.

b. High Strength Bolts - ASTM A325 or ASTM A490, heavy hexagon bolts with nuts and hardened washers.

c. Unfinished Bolts - ASTM A30 regular hexagon-bolts with nuts low carbon steel and washers conforming to ANSI B18.2.21, type B.

d. Fillet Metal - Electrodes for Carbon Steel: Conform to AWS D1.1-77. AWS D1.1. "Structural Welding Code".

e. Shop Primed Paints - Inorganic zinc paint manufacturer by Carbonlina or Amerun Incorporated equal.

05120.7 SHOP FABRICATION

a. Requirements - Fabricate structural steel in accordance with references standards.

b. Milling and Planning - Mill column and bearing stiffeners to give full bearing over the cross section.

c. Cleanout without Tort or Ragged Edges - Remove outside burrs resulting from drilling operations.

d. Holes, Slats and Openings - Provide holes, slats and openings required by other work together with necessary reinforcing as shown. Use suitable templates for proper location of these openings. Steel requiring adjustment shall be provided with slatted holes as shown. No change in location of openings will be permitted without prior approval.

05120.8 CONNECTIONS

a. Requirements - Minimum connections shall comply with appropriate tables "Framed Beam Connections“ shown in the ASIC Manual of Steel Construction. Seated connections maybe used only when they do not interfere with architectural features.

b. Beam Connections - Connections used shall be adequate to provide for the reaction due to the maximum uniformly distributed load that the beam is capable of carrying for its span, based on the allowable until stresses, except where higher reactions are shown or specified elsewhere.

c. Bolts and Welds - All connections shall be one of the following unless otherwise specified or shown elsewhere.

    a. Welds

    b. High Strength Bolts

05120.9 BOLTING

a. Requirements - Bolts shall be of a length that will extend not less than 6 mm (1/4 inch) beyond the nuts. Enter bolts into holes without damaging the thread.

b. High Strength Bolts - Use friction type connection unless otherwise shown. Make high-strength bolted joints without the use of erection bolts. Bring members tightly together with sufficient high strength "fitting-up bolts which shall be retighten as all the bolts are finally tightened. Protect bolt heads from damage during placing. Bolts that have been completely tightened shall be marked for identification.

c. High Strength Bolt Connection Contact Surfaces - The contact surfaces in high-strength bolted connections shall be free of oil, paint, lacquer, or other coatings.

d. Tightening - Final tightening of high-strength bolts shall be by calibrated wrenches. Each wrench be checked for accuracy at least once daily.

e. Unfinished Bolts: Use unfinished bolts purlin or girt connections where shown. Draw unfinished bolt heads and nuts against the work with a suitable wrench. Peek bolt threads for unfinished bolts to prevent the nuts from backing off.

05120.10 WELDING

a. Requirements - Do not begin structural welding until joint elements are bolted or tacked in intimate contact and adjusted to dimensions shown with allowance for any well shrinkage that is expected. Well heavy sections and those having a high degree of restraint with low hydrogen electrodes. No members are to be spliced without project manager’s approval.

b. Qualifications of Welders - Welding shall be performed by operators who have been qualified as per AWC B3.0, within the preceding one year period under AWC qualification procedure for the type of work required.

05120.11 SURFACE PREPARATION

a. Cleaning - Clean all surfaces not otherwise specified in accordance with SSPC-SP 2 or the paint manufacturer's instructions is more stringent.

b. Shop Coat - Cleaning shall be done after fabrication and immediately prior to shop painting of shipment. Apply one shop coat of paint within 1 hours after cleaning and before rust-bloom occurs.

05120.12 SHOP PAINTING

a. Requirements - All structural steel shall receive a shop coat of primer paint except as follows:

1. Members encased in concrete.

2. Contact surfaces of welded connections and areas within 50 mm (2 inches) of field welds.

3. Contact surfaces of high-strength bolted connections.

4. Milled surfaces.

b. Primed Applications - Apply specified primed by brush, spray, rolled or other approved means to provide a minimum dry fill thickness of 2.0 mil. No. 1 painting shall be done when the surface temperature of the steel is below the temperature at which condensation will occur. Apply paint thoroughly and evenly to dry surfaces at a rate recommended by the manufacturer.

PART 3 EXECUTION

05120.13 ERECTION

a. Plumbing, Leveling and Aligning - Individual pieces shall be plumbed, leveled and aligned in accordance with the requirements of the AISC Code of Standard Practice.

b. Drift Pine - Drift pine may be used only to bring together the several parts. They shall not be used in such manner as to distort or damage the metal.

c. Temporary Bracing and Guy Lines - Temporary bracing and guy lines shall be provided to ensure proper alignment wherever necessary to

take care of all loads to which the structure may be subjected, including equipment and the operation of the same and to adequately protect all.

d. Persons and property. Such bracing shall be left in place as long as may be required for safety.

05120.14 FIELD PAINTING

Cleaning and Touching Painting - After erection, clean exposed surfaces of field connections, unpainted areas adjacent to field connections, and damaged areas in the shop coat according to the same standards required for the shop coat, and paint with the same primed used in the shop coat.

DIVISION 6 WOOD AND PLASTIC

SECTION 06100 ROUGH CARPENTRY

PART 1 GENERAL

06100.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete framing sheathing and related rough carpentry work as indicated on the drawings and/or specified herein.

b. Include in the work, plates, straps, joints hangers, rods, dowels, rough hardware, fasteners and other miscellaneous iron and steel items pertinent to rough carpentry work.

c. See drawings and details for location of framing, sheathing and related rough carpentry work required.

06100.2 STORAGE AND PROTECTION

a. Stack framing lumber and plywood to insure against deformation and maintain proper ventilation.

b. Protect lumber and plywood from elements.

c. Lumber in contact with concrete or masonry shall be coated with asphalt or any approved preservative.

PART PRODUCTS

06100.3 LUMBER

a. Moisture Content - not to exceed 20 percent.

b. Grade and Trade Mark - required on each piece of lumber.

c. Quality - lumber must be sound, thoroughly seasoned, well cut and free from wrap.

d. Preservative and Pressure Treatment - all lumber shall be pressure impregnated with waterborne preservative like wolman salt, boiled salt and tanalite H.R. Surface, cut after treatment, shall be brush coated with same preservative.

06100.4 PLYWOOD

Unless otherwise specified or indicated in drawings, use the following:

a. For Interior Plywood: Use 6 millimeter (1/4 inch) thick.

b. Pressure Treatment: All plywood shall be pressure treated.

06100.5 ROUGH HARDWARE AND METAL FASTENERS

Plates, straps, nails, spikes, screws, bolts, joists, hangers, rods, dowels, fasteners and miscellaneous iron and steel items shall be of size and types to rigidly secure members in place.

PART 3 EXECUTION

06100.6 INSTALLATION

a. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels and rigidly secured in place. Plans and dress side of frames that will receive wallboards or sidings.

b. Wood Furring and Nailers shall be in accordance with detailed drawings. Where not indicated on the drawings or mentioned herein, furring trips shall be 2.5 centimeter x 5 centimeter (1” x 2") spaced at 40 centimeter (16 inches) on center both ways. Fasten wood furring securely by expansion bolts or other approved device at every 60 centimeter (2 ft.) on center. Wood plugs shall not be used.

06100.7 SCHEDULES

a. Treated Apitong Lumber shall be used for:

1. Vertical and Horizontal Studding of Wood Partitions.

2. Ceiling Nailers and Ceiling Joists

3. Other Related Rough Lumber Works

b. Well-seasoned Yakal shall be used for all plates, plugs and other portions of the work directly in contact with concrete or masonry.

SECTION 06200 FINISH CARPENTRY

PART 1 GENERAL

06200.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete built-in cabinetry and countertops and related finish carpentry work as indicated on the drawings and/or specify herein.

b. See drawings and details for location and quantity of finish carpentry work required.

6200.2 STORAGE AND PROTECTION

a. Protect millwork against dampness during and after delivery.

b. Do not bring in interior finish, including doors, into building until plaster is thoroughly dry.

06200.3 MEASUREMENT AND COORDINATION

a. Check and verify measurement at sits prior to fabrication.

b. Coordinate work with all other related trades.

06200.4 LUMBER

a. Kiln-dried quarter saws containing not more than 14% moisture, free from imperfections impairing its strength and finish.

b. Trademark is required on each piece of lumber.

06200.5 PLYWOOD

For interior plywood, use Class A Plywood the specie and thickness shall conform to Schedule and Drawings.

PART 3 EXECUTION

06200.6 WORKMANSHIP

a. All wood finish, millwork and built-in cabinet work shall be true to details, clean and sharply defined.

b. Panels must be set to allow for free movement in case of swelling or shrinkage.

c. Means of fastening various parts together shall be concealed.

06200.7 FINISH

a. Mill, fabricate and erect interior finish as indicated on the drawings. Machine-sand at the mill and hand-sand smooth at the job.

b. Interior trim set against concrete, masonry or wood shall be separated with 6 millimeter (1/4 inch) stone cut joints.

c. Intersecting plywood veneers or plywood panels shall be finished with a corner trim of wood with same specie and finish as the plywood.

d. Make joints tight and in a manner to conceal shrinkage. Secure trim with fine finishing nails, screws or glue where required.

e. Set nails for putty stopping

f. Window and door trim shall be single length.

g. Mites molding at corner, cope at angles.

06200.8 WOOD DOOR, JAMBS AND HEAD

a. Set door frames plumb and level and brace until built-in.

b. Anchor wood frames to masonry with approved metal anchors on each side of jamb. Place to and bottom anchors 20 centimeter (8 inches) from head and floor.

06200.9 WOOD SHELVING

a. Each shell shall be supported on a continuous wood cleat at walls.

b. Secure cleats to masonry walls by expansion bolt or approved fastening device.

06200.10 BUILT-IN CABINETS AND COUNTERTOPS (MILL MADE)

a. Fabricate counter and cabinets in accordance with details.

b. Only sound kiln-dried lumber or plywood shall be used.

c. Erect cabinet straight, level and plumb and securely anchor in place. Scribe and closely fit cabinets to adjacent work. Provide necessary grounds and anchors for securing cabinet work in place.

06200.11 FIXED GLASS ON WOOD FRAMES

Where fixed glass is set on wood frames, thoroughly prime rabbets and wood stops. Fit screw and secure in place loosely with chrome oval-head screws.

06200.12 HARDWARE INSTALLATION

a. Accurately fit and install all finish hardware items required.

b. In surface-applied hardware is fitted and applied before painting, remove all such items, except butts, and reinstall after painting is completed.

06200.13 SCHEDULES

a. Kiln-Dried Tanguile Lumber shall be used for:

1. Exposed woodwork as ceiling including wood slats.

2. Other finish carpentry work as shown on the drawings unless indicated or specified otherwise.

3. Cabinets and Shelving

b. Well-seasoned Yakal Lumber shall be used for:

1. Door jambs and heads

DIVISION 7 THERMAL & MOISTURE PROTECTION

SECTION 07100 WATERPROOFING

PART 1 GENERAL

07100.1 SCOPE

Furnish materials and equipment and perform labor required to complete:

a. membrane waterproofing

b. hydrolithic waterproofing

c. liquid waterproofing

d. metallic oxide waterproofing

07100.2 SUBMITTALS

Manufacturer's Literature: submit two copies.

07100.3 GUARANTEE

MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED FOR AT LEAST FIVE (5) YEARS

PART 2 PRODUCTS

07100.4 MEMBRANE WATERPROOFING

a. Primer: Asphalt free from water and other foreign materials. Conform to ASTM D41.

b. Membrane: Smooth, evenly wooven, open mesh glass fibers impervious to acid, heat, dampness and rot. It must permit complete penetration of asphaltic compound on bituminous coating.

c. Mopping Material:

1. Below Ground Level - Type A. A soft, adhesive "Self-Healing" asphalt

2. Above Ground Level - Type B, where asphalt is not exposed to temperature exceeding 51.7 degrees Celsius (125 degrees Fahrenheit).

3. Above Ground Level - Type C, where asphalt is exposed on vertical surfaces in direct sunlight of above temperature of 51.7 degrees Celsius (125 degrees Fahrenheit).

07100.5 HYDROLYTIC WATERPROOFING

a. Heavy cement-based coating compatible to reinforced concrete wall. It must prevent built-up of water vapor causes blistering, flaking and peeling of paint films.

b. Material must thoroughly fill and seal pores and voids that can be used against water pressure on the interior surface of walls below grade.

07100.6 LIQUID WATERPROOFING

Waterproofing compound of elastomeric or other substances applied in liquid form and cures to an impervious membrane.

07100.7 METALLIC OXIDE

Finely pulverized powder made from gray cast iron that has been treated chemically and physically to produce waterproofing qualities through oxidation of iron particles.

PART 3 EXECUTION

07100.8 MEMBRANE WATERPROOFING

a. Preparation of Surface:

1. Thoroughly clean concrete surfaces of all dirt, dust, or patches and other foreign matters.

2. Check slope of concrete gutter and correct slope when necessary.

3. Insure that area to be waterproofed is completely dry, and holes, cracks and crevice repaired.

4. When there is reasonable doubt as to the presence of moisture in the area to be waterproofed, expose it to direct sunlight for another 24 hours or heat all suspected spots with use of blowtorch.

b. Application:

1. Apply asphalt primer at the rate of 4 liters (1 gallon) per 10 square meters (100 square feet evenly by brushing or spraying.

2. Application shall be done in one direction strip by strip and overlapping each other to assure uniform thickness.

3. Let dry prime coat until it is ready to receive next coat or layer as specified.

4. As soon as prime coat is workable, lay a single layer of fiberglass cloth smoothly and free from irregularities and folds.

5. Lay cloth without disturbing the fabric and conforming to the size and shape of the area to be covered.

6. Lay carefully and or side laps in order to assure an even thickness throughout the whole area.

7. Apply a single coat of asphalt materials (mastic black at the rate of 12 to 16 liters per 10 square meters (3 to 4 gallons per 100 square feet).

8. Meshed of treated fabric shall not be completely closed or sealed by the bituminous material, but shall sufficiently open to allow successive mopping of the plying material to seep through.

9. Cover ply more than minimum amount of surfacing necessary to prevent sticking in plies.

10. After application surfaces shall be uniformly smooth, free from irregularities, folds or knots.

11. Repeat the procedure in as many layers required or specified in the schedule or drawings.

12. In case of interruption of work or sudden exposure to moisture, remove layer exposed to moisture, and repeat procedure until completion of the process.

c. Protective Coatings:

1. Sand Mastic - one part "Flintkote" and 4 parts washed and screened sand by volume. Lay mixture by trowel at an average of 3 millimeter (1/8 inch) thick over surface.

2. Aluminum Heat Reflecting Finish - apply at the rate of 4 liters per 10 square meters (1 gallon per 100 square feet) over thoroughly dried "Sand Mastic" coating.

d. Metal Cap Flashing :

1. Provide cap flashing of 24 gauge GI sheet in 2.43 meters (8 foot) lengths except where shorter pieces are required. Lay end joints 30 centimeters (12 inches) and solder. Fold exposed bottom edge of flashing 6 millimeter (1/4 inch) of underside for stiffness.

2. Where cap flashing is terminated in raked joints or in prepared masonry or stone reglets, fasten flashing with wedges every 30 centimeter (12 inches) and fill reglet of vertical surfaces continuous with plastic cement and of horizontal surfaces, continuous with molten lead.

3. Where cap flashing is connected to performed lock in through-wall flashing, form upper edge of cap flashing to engage in preformed lock. Mallet lock down tight to provide a spring action against ease flashing.

07100.9 HYDROLITHIC WATERPROOFING

a. For Walls Above Grade:

Coatings shall adequately cover holes, voids, pitmarks, honeycomb and form marks.

b. For Walls Below Grade:

1. Clean concrete surface free of all laitance, dirt, grease, form oil, efflorescence, paint and other foreign materials.

2. Apply a trowel coat as per manufacturer's specifications.

07100.10 METALLIC OXIDE

Mix to consistency of thick grout and apply as per manufacturer's specifications.

07100.11 LIQUID WATERPROOFING

a. Surface Preparation:

1. All floor surfaces to which flooring is to be applied shall be dry, clean, smooth and free from oil or grease and from projections that might puncture the coatings.

2. Final cleaning method shall be treating the concrete surfaces with 10% to 15% solution of muriatic acid to remove laitance and impurities.

3. After acid has stopped foaming or boiling immediately rinse thoroughly with water.

b. Application:

1. Apply a primer coat of elastomeric coating standard of the manufacturer at the rate of 1.3 liters per 10 square meters (1/3 gallon per 100 square meter) over surfaces.

2. After the primed surfaces has dried, apply 35 dry mills of coating at the rate of 10 square meter per 3.79 liters for three (3) coatings to all surfaces by brush or roller.

3. Allow three (3) hours or longer between coatings if relative humidity is above 70%.

4. When using roller application method, the material shall not be rolled excessively.

5. Right quantity of material and proper application strokes shall be made to produce a uniform firm thickness and to prevent undue sagging.

6. The coat must flow into all cracks, control joints and pores. For clean-up purposes, use water.

PART 4 SCHEDULE OF WATERPROOFING

07100.12 MEMBRANE WATERPROOFING

For canopy concrete roof gutters - 2 layers membrane

07100.13 HYDROLYTIC WATERPROOFING

For inside surface of concrete gutter outside	- apply one coat. For porous areas apply as many necessary coats

building line

07100.14 METALLIC OXIDE

For all vertical and horizontal construction joints below grade.

07100.15 LIQUID WATERPROOFING

For canopy of concrete roof gutters	-	20 mils

SECTION 07610 SHEET METAL ROOFING

PART 1 GENERAL

07610.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete:

1. sheet metal roofing
2. metal roof flashing and trim

b. See drawings and details for sizes and location of work required.

07610.2 SAMPLES

Submit samples of sheet metal flashing and trim, grilled and louvers.

07610.3 GUARANTEE

THE CONTRACTOR SHALL ISSUE A WRITTEN GUARANTEE TO THE OWNER TO MAINTAIN ENTIRE ROOF FLASHING AND COUNTER FLASHINGS IN A WATERTIGHT CONDITION FOR A PERIOD OF FIVE (5) YEARS.

PART 2 PRODUCTS

07610.4 MATERIALS

a. Corrugated Sheets - Gauge 26 galvanized iron zinc coated by hot dip process.

b. Plain Sheets - Gauge 26 galvanized iron sheet zinc coated by hot dip process.

c. Solder - Standard solder for galvanized iron sheets.

PART 3 EXECUTION

07610.5 INSTALLATION OF SHEET METAL ROOFING

a. Space purlins to fit sizes of the sheets so that center line of purlins will come of line 15 centimeters (6 inches) from bottom line of end laps.

b. Space intermediate purlins equidistant from purlins at end laps.

c. Minimum end lap shall be 25 centimeters (10 inches). Minimum side lay shall be 2-1/2 corrugations.

d. Lay sheets in a manner such that vertical joints are broken. Lay top sheets with side corrugation down. Nail upper end of each sheet securely to purlins with 8-d G.I. pail in the valley of every second corrugation. The upper end of each sheet shall be covered by other sheets or by ridge and hip rolls.

e. Secure lower end of first sheet laid at gutter line by straps to the purlins after gutter hangers are in place. Use No. 24 gauge strap one inch wide with corners clipped of at riveting ends. Bend strap around purlins and rivet to the sheets.

f. Place first row of straps at gutter line. Then rivet the lower end of every sheet to the sheet beneath at the top of every fourth corrugation. Such rivets to alternate with rivets engaging top line of straps.

g. Rivet side laps with two lines of rivets staggered and spaced not to exceed 23 centimeters (9 inches) on centers.

h. Rivets must be anchored on top of corrugations.

07610.6 RIDGE ROLLS, HIP ROLLS AND VALLEY

a. Use Gauge 24 ridge roll. Minimum lay of ridge roll shall be 30 centimeters (12 inches) over roofing sheets. Rivet ridge to roofing sheets at top of every fourth corrugation in addition to rivets engaging top line of straps

b. Use Gauge 24 hip roll. Minimum lay of hip roll shall be 30 centimeters (12 inches) over roofing sheets. Rivet hip roll at every second corrugation.

c. Use Gauge 24 valley. Project 45 centimeters (18 inches) away and under roofing sheet edge each way and secure to framework with G.I nails spaced not to exceed 30 centimeters (12 inches) on center.

07610.7 FLASHING AND COUNTER FLASHING

a. Use Gauge 24 plain G.I. sheet for flashings at intersection of roof and parapet walls. Raise one wing of flashing not less 20 centimeters (8 inches) high terminated at horizontal reglet.

b. Where corrugation run parallel to the walls, corrugate one wing of the flashing sheet to match corrugation of G.I. sheets which other wing shall go up against the walls and counterflashed.

DIVISION 8 - DOORS AND WINDOWS

SECTION 08100 METAL DOORS AND FRAMES

PART 1 GENERAL

08100.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete aluminum doors and frames

b. See drawings and details for sizes, location, extend and other requirements.

08100.2 SHOP DRAWINGS

Submit shop drawings of fabricated items showing sizes of all members and method of joining and anchoring.

08100.3 SAMPLES

Submit sample corner sections of metal doors and metal buck or jambs.

08100.4 PROTECTION

a. Before shipment from factory, cover aluminum work with heavy building paper or other adequate covering to protect finish surface from mortar, plaster, finger prints, scratches or stains.

b. Aluminum surfaces in contact with concrete, plaster, steel or other dissimilar metal parts shall be given a coat of suitable alkali-resistant bituminous paint.

c. Aluminum shall have a hard, smooth satin finish and shall receive a coating of methacrylite lacquer as an additional protection.

d. Shop paint with two coats of air dried zinc chromate rust inhibitive primed all metal items except aluminum brass or stainless steel.

PART 2 PRODUCTS

08100.5 MATERIALS

Aluminum:

1. Extruded sections - alloy 6063-T5
2. Fastening device - cadmium plated

3. Anchor bolts - pressed or rolled and galvanized

4. Shimming material - chemically treated wood

08100.6 FABRICATION

Aluminum Works:

1. Wall Panel Assembly - Accurately mate vertical and horizontal pieces flush at intersections. Assembled dimensions shall conform to the drawings.

2. Door Assembly - Door stiles and top rails for swing doors shall be from solid extrusions. Fit members of hairline joints.

PART 3 EXECUTION

08100.7 INSTALLATION

a. All frames shall be erected plumb, square, and true to line and level, with secure fastening to structures and anchors. Formed steel stiffeners and reinforcement shall be installed within frames at all points where tap screw fastenings are used in connection with embedded strap anchorage.

b. Doors shall be installed by authorized representative of the manufacturer, but not before all plastering is completed.

c. All glazing beads and bars shall be tap screw set and let loose. All items of hardware shall be adjusted for proper functioning.

08100.8 HARDWARE

All metal doors and frames shall be mortised, reinforced, drilled and tapped for mortise hardware in accordance with templates or hardware finished under "Finish Hardware".

08100.9 INSPECTION

Carefully examine and clear all aluminum surfaces and test all framing and hardware. Make all repairs and adjustment to the work, leaving it in a satisfactory condition.

08100.10 SCHEDULE

Refer to Schedule of Doors.

SECTION 08210 WOOD DOORS

PART 1 GENERAL

08210.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete flush doors and other wood doors

b. See drawings and details for sizes, location, extent and other requirements.

08210.2 SAMPLES

Submit sample corner sections of wood doors and jambs.

08210.3 PROTECTION

Adequately protect doors from scratches, and other stains with heavy building paper.

PART 2 PRODUCTS

08210.4 MATERIALS

a. Plywood: First quality plywood grain and color suitable for painted finish.

b. Framing: Kiln-dried tanguile treated lumber for interior framing.

08210.5 FABRICATION

a. Assemble joints in doors with water-resistant glue keep doors under pressure until glue has thoroughly set.

b. Sand smooth finished door. Door must have tiger joints and clear-cut mouldings.

c. Faces shall be free from defects or machine marks that will show through the finish.

d. Wood flush doors hollow core:

1. Size, design and thickness shall be as indicated on the drawings.

2. Doors shall have cross banding, and faces of two or more plies with a combined minimum thickness of 2.5 millimeters (1/10 inch) after sanding. Face veneer shall be first class quality selected plywood either rotary-cut or sliced-cut.

Provide lock blocks of size required for hardware use. Rails and side edge bands shall be of hardwood same as face veneer.

3. Doors shall be rimmed square and factory pre-fit to standard sizes.

PART 3 EXECUTION

08210.6 INSTALLATION

a. Each door shall be accurately cut, trimmed and fitted to its frame and hardware.

b. Give allowance for painter's finish and possible swelling or shrinkage.

c. Clearance at lock and hanging stiles and at top shall not exceed 3 millimeters (1.8 inch). At bottom, not bigger than 6 millimeters (1/4 inch).

d. All corners shall be rounded to 1.5 millimeters (1/16 inch radius). Lock and rail edges shall be slightly leveled.

e. The screws for hardware shall not be driven, but merely started by driving and then screwed home.

f. All doors shall operate freely and with all hardware properly adjusted and functioning.

08210.7 SCHEDULE

Refer to Schedule of Drawings.

SECTION 08500 METAL WINDOWS

PART 1 GENERAL

08500.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete all metal windows shown on the drawings.

b. See drawings and schedules for size, type and details of metal windows required.

08500.2 SHOP DRAWINGS AND SAMPLES

a. Submit shop drawings.

b. Submit sample corner sections, hinges, handles and other accessories.

08500.3 PROTECTION

After fabrication and before delivery to job site shop paint steel windows with two coats of air-dried zinc chromate rust inhibitive primer.

PART 2 PRODUCTS

08500.4 MATERIALS

a. Sections of steel windows shall be solid hot-rolled shaped made from new billed steel and be straight and smooth on exposed surfaces.

b. For light casement: Frame and ventilator members shall be set-shaped and have a combined weight of not less than 2.95 kilogram per linear meter (2 pounds per linear foot).

Frame, meeting rail and ventilator for members shall not be less than 25 millimeters (1 inch) in depth front to back and not less than 3 millimeters in thickness.

c. For intermediate casements: Frame sections shall have two equal length outstanding legs not less than 10 millimeters (3/8 inch) high or be of modified channel shape with unequal than 12 millimeters (1/2 inch) against the masonry, concrete or metal work of openings.

   Frame, meeting rails and ventilator members shall not be less than 32 millimeters (1-1/4 inch) depth front to back and not less than 3 millimeters (1/8 inch) in thickness. Combined weight of outside frame and ventilator sections shall be 4.1 kilogram per linear meter (2.75 pounds per linear feet).

d. For heavy casements: Frame sections shall have two equal length outstanding legs not less than 10 millimeters (3/8 inch) high or be a modified channel shape with unequal length legs to provide a continuous flat bearing of not less than 12 millimeters (1/2 inch) against the masonry, concrete or metal work of opening.

   Outside frame, meeting rail and ventilator members shall not be less than 38 millimeters (1-1/2 inch) deep front to back and not less 3 millimeters (1/8 inch) thick.

   Combined weight of frames and ventilator shall be 5.6 kilogram per linear meter (3.80 pounds per linear foot).

08500.5 FABRICATION

a. Fabrication corners, joints and intersection of members by mitering or coping and welding. Make all welds solid. Remove excess metal exposed and contact surfaces and dress smooth.

b. Ventilator for all windows shall form continuous two point flat weathering contact with frames. For intermediate and heavy casements, metal to metal contact between ventilator and frame shall be such that when ventilator is locked, it will not be possible to insert without forcing a metal fooler gauge 25 millimeters (1 inch) wide 0.8 millimeter (1/32 inch) thick at any point in the perimeter.

c. Provide continuous drip mould on transom bars immediately above ventilators and at heads where ventilators are at full height of opening.

   For continuous combinations of fixed and ventilator sections, extend drip across entire window head.

Drips may be integral with frames or applied.

Applied drips shall not be less than gauge 16 cold rolled steel for light and intermediate type and gauge 14 for heavy type.

08500.6 HARDWARE

a. Hinges - Friction type extension steel hinges with bronze pins.

b. Handles - Solid bronze can type locking handle.

PART 3 EXECUTION

08500.7 INSTALLATION

a. Set and anchor windows as shown on details and approved shop drawings.

b. Set windows plumb and square and brace where necessary to prevent distortion.

c. Window set in prepared openings shall be wedged clean of masonry 4.8 millimeters (3/16 inch) to 6 millimeters (1/4 inch(c) to allow for caulking.

08500.8 ADJUSTMENTS

a. Adjust windows and attach hardware before glazing.

b. Leave windows in water-tight conditions with movable ventilators and hardware operating free and easy.

c. Adjust friction hinges to proper tension.

SECTION 08800 GLASS

PART 1 GENERAL

08800.1 SCOPE

a. Furnish glass free from imperfections and watermarks and other materials and equipment and perform labor required to complete all glass and glazing work.

b. See drawings for size, location and details.

08800.2 SAMPLES

Submit samples of glass panel.

08800.3 PROTECTION

Protect materials from loss, injury, staining, and breakage. Lost and damaged materials shall be replaced by the Contractor at his own expense.

PART 2 PRODUCTS

08800.4 MATERIALS

a. Plate Glass - mechanically round and polished after rolling resulting in parallel, distortion free surfaces. Use where good vision is required.

b. Float Glass - manufactured by "floating continuous ribbon of molten glass unto a bath of molten tin where it is reheated to obtain a flat, fire-polished finish. It is then allowed to cool to a degree permitting it to be drawn on rollers in a long oven and then annealed.

Commonly used in windows, sliding doors, and window walls.

Grade AA - intended for use where superior quality is required.

Grade A - intended for selected glazing.

Grade B - intended for general glazing.

Greenhouse quality - intended for Greenhouse glazing or similar application where quality is unimportant.

08800.5 GLAZING

Glazing materials for glass installation may be:

a. Bull compounds such as:

Mastics - elastic compounds and non-skinning compound.

Puttied - wood sash putty, metal sash putty.

Sealant - one component, two components.

b. Performed sealant such as:

Synthetic polymer - bass sealant - resilient or non-resilient type.

Performed gaskets - compression type, structural type.

PART 3 EXECUTION

08800.6 GLAZING

a. Prevent glass from all contact with metal or any hard or sharp materials by use of resilient shims placed at quarter points.

b. Use resilient sealant.

c. Use stops in sizes permitting a "good grip" of the glass.

d. Install glass only in openings that are rigid, plumb and square.

e. Allow sufficient clearance at edges of glass to compensate for its expansion or for some settlement of the building. Clearance should be 6 millimeters (1/4 inch) from edge to frame and 3 millimeters (1/8 inch) for face.

f. Markings, banners, posters, and other decay shall not be applied directly to glass surface as these could cause thermal stress.

g. Removal of putty or glazing compound smears from glass shall be performed by the glazing contractor during the materials normal work life. Failure to do so may result in damage to the glass.

08800.7 HEAT ABSORBING GLASS

a. Special attention must be given to the installation of all types of heat absorbing glass, because of its ability to absorb heat. Partial shading, painted signs, large interior labels, tight draperies or blinds, heavy masonry structure, and heating-cooling outlets directing aid against the glass may increase edge tension stresses.

b. The ability of heat absorbing glass to resist solar energy breakage is primarily related to its edge strength. Therefore:

1. Clean out all edges.

2. Do not install glass with flared edges at bottom.

3. Do not seal edges.

4. Do not nib edges nor scarf corners.

5. Do not bump nor brush edges against metal or other hard objects.

6. Do not use pocket flush glazing.

7. Radius cutting should be reviewed by manufacturer.

DIVISION 9 FINISHES

SECTION 09310 TILE WORK

PART 1 GENERAL

09310.1 SCOPE

Furnish materials and equipment and perform labor required to complete ceramic glazed and vitrified ceramic tile work.

See drawings and details for location and extent of work required.

09310.2 SAMPLES

Submit sample of floor and wall tiles including all required beads and moldings.

09310.3 DELIVERY OF MATERIALS

Deliver all materials in original cartons and container with labels intact and seals unbroken.

09310.4 PROTECTION OF FINISHED WORK

a. Cover floor with heavy building paper before foot traffic is permitted over finished tile floors.

b. Lay board walkways on floors to be used as passageways.

PART 2 PRODUCTS

09310.5 CERAMIC TILES

a. Ceramic Glazed Wall Tiles - standard grade bright or matte glaze. Square edge or cushion edge with integral spacer approximately 8 millimeter (5/16 inch.) thick.

b. Vitrified Ceramic Floor Tile - standard grade vitrified unglazed natural clay type dust-pressed or extrudes approximately 6 millimeter (1/4 inch) thick.

c. Trim - compatible with type, color, thickness, face size and finish as specified wall tiles.

d. Accessories - soap holders and paper holders shall be recessed type to follow color of specified wall files.

09310.6 GROUT MATERIALS

Portland Cement Grout:

1. Scratch Coat: 1 part portland cement to 5 part damp sand to 1/5 part hydrate lime.

2. Mortar Bed: 1 part Portland cement to 5 parts dam sand to 1/2 part hydrate lime.

3. Bond Coat: Neat Portland cement paste.

PART 3 EXECUTION

09310.7 APPLICATION OF SCRATCH COAT

a. Thoroughly dampen, but do not saturate surface on masonry or concrete walls before applying the scratch coat. Surface area shall appear slightly damp. Allow no free water on the surface.

b. On masonry, first apply a thin coat with great pressure, then bring it out sufficiently to compensate for the major irregularities of the masonry surfaces to thickness of not less than 6 millimeter (1/4 inch.) at any point.

c. On surfaces not sufficiently rough to provide good mechanical key, dash on the first coat with a whist broom or fiber brush using a strong whipping motion. Do not trowel or otherwise disturb mortar applied by dashing unto it has hardened.

d. Evenly rake scratch coats, but not dash coats, to provide good mechanical key for the subsequent coat before the mortar has fully hardened.

09310.8 FLOOR TILE INSTALLATION ON MORTAR BED

a. Before spreading the setting bed, establish line on borders and canter the fieldwork in both directions to permit the pattern to be laid with a minimum on cut tiles.

b. Clean concrete sub-floor then moisten but not soak. Afterwards sprinkle dry cement over the surface and spread the mortar on the setting bed.

c. Mix mortar 1 part Portland cement to 3 part sand. Tamp to assure good bond over the entire area and screw to provide a smooth and level bed at proper height and slope.

d. Pitch floor to drain as required.

e. After setting bed has set sufficiently to be worked over, sprinkle dry cement over surface and lay tile.

f. Keep tile joints parallel and straight over the entire area by using straight edges.

g. Tamp the tile solidly unto the bed, using wood block on size to ensure solid bedding free from depressions.

h. Lay tiles from centerlines outward and make adjustment at walls.

09310.9 WALLTILE INSTALLATION ON MORTAR BED

a. Before application of mortar bed, dampen the surface on scratch coat evenly to obtain uniform suction.

b. Use temporary or spot ground to control the thickness on the mortar bed. Fill out the mortar bed even with the grounds and rob it to a true plane.

c. Apply the mortar bed over an area no greater than can be covered with tiles while the coat is still plastic.

d. Allow no single application of mortar to be 19 millimeter (3/4 inch.) thick.

e. Completely immerse glazed wall tile in clean water and soak it at least 1/2 hour. After removal, stack tile on edge long enough to drain off excess water. Resoak and drain individual tiles that dry along edges.

i. Allow no free moisture to remain on the back of the tile during setting.

f. Apply a bond coat 0.8 millimeter to 1.6 millimeter (1/32 to 1/16 inch) thick to the plastic setting bed or to the back of each shell of tile.

g. Press tile firmly into the bed and beat into peace within 1 hour.

h. Lay tile fields in rectangular block area not exceeding 60 centimeter x 60centimeter (24 by 24 inches). Cut the setting bed through its entire depth along the edge on each block area after placement and before subsequent block are installed.

i. Within 1 hour after installation on tile, remove strings from string-set tile and wet the face on face-mouthed tile and remove the paper and glue. Avoid using excess water. Adjust any tile that is out of alignment.

09310.10 SETTING TILE ON ADHESIVE TWO METHODS

Note:

There are two methods of setting tiles with adhesive:

1. Spreading it on the back of each tile at set is called the "Buttering" method.

2. Combine adhesive over the entire foundation surface is called the "Floating method.

   The "Floating method is generally preferred because it is faster, gives a more uniform appearance, used less adhesive and gives better waterproofing treatment to the wall.

   The "Buttering" method is recommended where tile must be cut and fitted around plumbing and electrical fixtures.

a. Floating Method:

1. Apply gobs on adhesive to wall and comb out adhesive with a trowel or scraped having notched and flats as recommended by manufacturer.

2. Hold trowel at 30 - 45 angle to the wall surface for easy spreading and maximum coverage.

3. Set tile using a slight twisting motion and press down to give a final adhesive thickness on 1.5 millimeter (1/16 inch).

4. Do not allow spread adhesive to stand over 45 minute before setting tile.

b. Buttering Method:

1. Apply sufficient adhesive to the back on each tile to produce a spot of approximately 75 centimeter (3 inches) in diameter, when bonded.

2. Press down adhesive thickness to 1.5 millimeter (1/16 inch) using a slight twisting motion.

09310.11 GROUTING

a. After tile has sufficiently set, force a maximum of grout into joints by trowel, squeeze, brush on finger application.

b. Before grout sets, strike on tool the joints of cushion-edges tile to the depth of the cushion.

c. Fill all joints of square edges tile flush with the surface of the tile. Fill all gaps of skips.

d. During grouting clean all excess grout of with clean burlap, other clothes or sponges.

09310.12 CLEANING

Sponge and wash tile thoroughly with clean water after the grout has stiffened. Then clean by rubbing with damp clothes on sponge and polish clean with dry cloth.

SECTION 09390 VINYL TILES

PART 1 GENERAL

09390.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete vinyl floor tiles work.

b. See drawings and details for location and extent of work required.

09390.2 SAMPLES

Submit samples for color and pattern.

09390.3 INSPECTION

The concrete floor to be finished with vinyl tiles shall be trowel finished leaving a smooth, even finish, free of visible joints on marks and other imperfections.

PART 2 PREPARATION OF SURFACE

09390.4

Where possible, concrete should be permitted to dry for several months by providing it with good ventilation. Clean the floor thoroughly of all dirt, grease, paint drops, etc., leaving a surface suitable for the installation of the vinyl tiles. The resulting concrete surface, therefore, shall be smooth, even, thoroughly dry and clean, before a layer of the contact cement of approved adhesive is laid to receive the tile in accordance with the manufacturer's instructions.

09390.5

If the Engineer so requires, because of concrete surface conditions, the concrete surface shall be primed with the manufacturer's Primer.

PART 3 WORKMANSHIP

09390.6

"GERFLOR" vinyl floor tiles or roll form or approved equivalent, locally available, shall be 2.5 mm gauge and shall be of the dimensions and color approved by the Architect. The vinyl tile shall be laid according to details approved by the Architect and shall be carefully matched and the same cut. All seams and edges shall be cemented carefully snug fit with adhesive for this purpose. The surface of the finished floor shall be left smooth, clean and in first class condition.

09390.7

Do not begin work until work of other trades, including painting, has been completed.

09390.8 CLEANING, WAXING, POLISHING

a. At completion of the work, the Contractor shall clean all vinyl tile work; and remove all cement, dirt or other foreign substances.

b. Apply two coat of "Liquid Complete Wax" or approved equivalent; and polish each coat to produce a well-polished finish.

c. Do not permit traffic on finished floor unless they are protected with heavy papers.

09390.9 ADJUSTMENTS

a. The installation shall be thoroughly inspected and all necessary adjustments shall be made within one month of time.

b. Tiles showing broken corners or fracture lines entirely across their surface shall be removed. Substitute new tile of same color and thickness.

SECTION 09900 PAINTING

PART 1 GENERAL

09900.1 SCOPE

a. Furnish materials and equipment and perform labor required to complete painting and varnishing works

b. See Drawings for location, quantity and extent of surfaces to receive paints.

09900.2 DELIVERY OF MATERIALS

a. Deliver at jobsite in original container with labels intact and seals unbroken.

b. Submit to Owner the manufacturer's certificate of origin and quality of paints including quantity purchased.

09900.3 QUALIFICATION OF PAINTING CONTRACTOR

a. Painting contractor shall be approved by the Owner

09900.4 TEST PANELS

a. Sample panels of selected color or shade shall be prepared on 60 centimeters (2 feet) plywood panel for approval by the Architect.

09900.5 PROTECTION

a. Provide all drop cloth and other coverings requisite to protection of floors, walls, aluminum, glass, finishes and other works.

PART 2: PRODUCTS

09900.6 PAINT MATERIALS

a. Tinting colors and thinning materials must be the same brand as the paint specified

09900.7 SCHEDULE

EXTERIOR

a.	Exterior concrete painted surface	3 coats Acrylic base masonry paint
b.	Exterior concrete exposed aggregate finish	one coat water repellant
c.	Exterior metal ferrous	prime with epoxy enamel primer
d.	Exterior metal galvanized	prime with zinc chromate primer
e.	Exterior wood painted	3 coats oil based paint
f.	Exterior wood varnished	water repellant varnish

INTERIOR

a.	Interior concrete or masonry painted	2 coats acrylic base masonry paint
b.	Interior concrete exposed aggregate finish	no paint
c.	Interior metal ferrous	prime with epoxy enamel primer follow 2 coats enamel paint
d.	Interior wood work sea-mist	3 coats 3 part thinner 1 part lacquer paint apply wood filler
e.	Interior wood work varnish	1st coat - one part sanding sealer to one part solvent 2nd coat - 2/3 sanding sealer, 1/3 solvent 3rd coat - same as 2nd coat

		4th coat pure solvent
f.	Interior woodwork painted	3 coats oil base paint

PART 3 : EXECUTION

09900.8 PREPARATION OF SURFACES

	PREPARATION	**TREATMENT**	**SURFACE CORRECTION**
CONCRETE AND MASONRY WORKS	Remove all loose dirt excess mortar or any film left from oil, grease, or concrete curing compound	Treat with one kilo of zinc sulphate crystal to a 4.5liters of water (1 gal.)	Putty surface with patching compound
WOOD WORK	Thoroughly sand to remove excessive roughness, loose edges silvers and splinters then brush to remove dust	Knots, sappy streaks, and stain from wood preservatives shall be given a thin coat of shellac.	Fill all cracks, nail holes and other surface defects with patching paste or putty
METAL WORK	Remove rust, grease or other foreign matter	Wash with metal treatment solution	Scrape, wire-brush, sand-blast or clean with flame

09900.9 GENERAL WORKMANSHIP

a. All paints shall be evenly applied. Coats shall be of proper consistency and well brushed out so as to show a minimum of brush marks.

b. Thoroughly stir paint to keep pigment evenly in suspension when paint is being applied.

c. All coats shall be thoroughly dry before the succeeding coat is applied. Allow at least 24 hours between application of coats.

d. If surface are not fully covered or cannot be satisfactorily finished in the number of coats specified, such preparatory coats and subsequent coats as may be required shall be applied to attain the desired evenness of the paint without extra cost to the Owner.

e. If surface is not in proper condition to receive paint, the Project Inspector shall be notified immediately. Work on the questioned portion shall not commenced until receipt of order to proceed from the Project Inspector.

f. Hardware, hardware accessories, plates, lighting fixtures and other similar items shall be removed or otherwise protected during the painting operations and reinstalled after completion of work.

09900.10 PROCEDURE FOR SEA-MIST FINISH

a. Depress wood grain by steel brush and sand surface lightly.

b. Apply sanding sealer

c. Apply two coats of industrial lacquer paint.

d. Spray last coat mixed with lacquer.

e. Apply paste wood filler thinned with turnpentine or paint thinner to wood surface

f. Wipe off pastewood filler immediately

g. Spray flat or gloss lacquer whichever is specified.

09900.11 PROCEDURE FOR VARNISH FINISH

a. Sand surface thoroughly

b. Putty all cracks and other wood imperfections with paste filler

c. Apply oil stain

d. Apply lacquer sanding sealer

e. Sand surface along grain

f. Spray three coats of clear lead flat lacquer

g. Polish surface using cloth pad

h. Spray gloss lacquer if glass finish is desired.

09900.12 PROCEDURE FOR DUCCO FINISH

a. Sand surface thoroughly

b. Apply primer surface white or gray by brush or spray

c. Apply lacquer paint spot putty in thin coat. Allow each coat to become thoroughly dry before applying next coat.

d. Apply primer surfacer, Allow 2 hours drying time before applying the next coat.

e. Apply one (1) coat of flat tone semi-gloss enamel as per Architect's color scheme.

DIVISION 12 - MECHANICAL

SECTION 1200 - AIR CONDITIONING AND REFRIGERATION SYSTEM

1200.1 Description

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.

1200.2 Material Requirements

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.

1200.2.1 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.

1200.2.2 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.

1200.2.3 Pipe Insulation

Insulation shall be performed fiberglass or its equivalent. The insulating materials shall be covered with 100mm x. 13mm thick polythelene 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.

1200.2.4 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.

1200.2.5 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.

1200.2.7 Dampers

Dampers shall be of same materials as duct, at least one gage 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.

1200.2.8 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.

1200.2.9 Equivalent 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.

1200.2.10 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.

1200.3 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.

1200.3.1 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.

1200.3.2 Guarantee and Service

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.

1200.3.3 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.

1200.4 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.

1200.5 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.

Payment shall be made under:

Item	Description	Unit of Measurement
A	Compressor, condenser and evaporators	Set
B	Diffuser, grilles and valves	Piece
C	Pipes	Length
D	Ducts and Insulations	Square meter
E	Pipe Insulation	Meter

SECTION 1201 - WATER PUMPING SYSTEM

1201.1 Description

This Item shall consist of furnishing and installation of water pumping system, inclusive of all piping and pipe fitting connections, valves, controls, electrical wiring, tanks and all accessories ready for service in accordance with the approved Plans and Specifications.

1201.2 Material Requirements

1201.2.1 Water Pump

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

1201.2.2 Overhead Tank

The tank shall be provided with manhole, cover, drain pipes, distribution pipe outlet, overflow pipes and air vent.

Suitable float switch or electrode shall be provided in the tank to stop and start the operation of the pump.

1201.2.3 Pneumatic Tank

Tank shall be designed for twice the maximum total dynamic pressure required and shall have the following accessories.

(a) A suitable pressure switch to stop pump if pressure required is attained.

(b) Air volume control device to maintain correct air volume inside the tank.

(c) Pressure relief valve should be installed on top of the tank

(d) Electrode to be connected in the motor pump control the water level.

(e) Air compressor shall be provided for tank of 3,785 liters to maintain air pressure inside the tank.

1201.2.4 Pipes and Fittings

All pipes and fittings shall be G.I. pipe Schedule 40.

All piping 100 mm and larger shall be welded or flanged while smaller sizes shall be screwed.

1203.3.6 Valves

A gate valve followed by a check valve shall be placed between discharge of pump and tank to prevent back flow of water when pump stops.

1203.3.6 Foundation

Refer to sub-section 1200.2.9 - Air Conditioning System

1203.3.6 Electrical Works

Refer to sub-section 1200.2.10 - Air Conditioning System

1203.3.6 Construction Requirements

Exposed piping shall be provided with concrete saddle or steel clamps or hangers to secure them firmly to the building structures.

Pipe threads shall be lubricated by white lead, red lead, Teflon or other approved lubrication before tightening.

Piping supports shall be placed at 3mm interval or less.

1201.3.1 Test

Appropriate test shall be done to demonstrate that the system complies with the requirements of the Plans and Specifications.

1201.3.2 Guarantee and Service

Refer to sub-section 1200.3.2 - Air Conditioning System.

1201.3.3 Miscellaneous

Refer to sub-section 1200.3.3 - Air conditioning System.

1201.4 Method of Measurement

The work under this Item shall be measured either by set, length and piece actually placed and intalled as indicated on the Plans. Equipment shall be measured by set pipes by length, valves and fittings by piece.

1201.5 Basis of Payment

All work performed and measured and as provided for in this Bill of Quantities shall be paid for at the Unit Bid or Contract Unit Price which payment and incidentals necessary to complete this item.

Payment shall be made under:

Item	Description	Unit of Measurement
A	Pump and Water Tank	Set
B	Air Compressor	Set
C	Pipes	Length
D	Valves and Fittings	Piece

SECTION 1202 - AUTOMATIC WATER SPRINKLER SYSTEM

1202.2 Description

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.

1202.2 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 diesel engine 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 diesel engine 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 engine to drive the fire pump with the aid of a battery automatic controller. The required accessories are: tachometer, oil pressure gauge, temperature gauge and control panel. A diesel fuel day tank shall be provided to supply the engine for a minimum of two (2) hours running time.

A fuel storage tank shall be asphalt coated with necessary piping and fittings for connection.

1202.2.2. 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.

1202.2.3 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.

1202.2.4 Alarm Check Valve and Fire Alarm 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 signed 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.

1202.2.5 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 annuciator panel.

1202.2.6 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.

1202.2.7 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.

1202.2.8 Pipe Hangers

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

a) Anchorage in concrete - expansion shield should preferable 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 be expansion shield in the vertical position, the supports shall be spaced not more than 3m apart.

c) For pipe running through concrete beans use sleeves at least two (2) sizes larger than the piping.

1202.2.9 Foundation

Refer to sub-section 1200.2.9 Air Conditioning System

1202.2.10 Electrical Work

Refer to sub-section 1200.2.10, Air Conditioning System

1202.3 Construction Requirements

1202.3.1 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.

A. Conduct of Tests - shall be by the Sprinkler System Contractor in the presence of an inspector or Authority having jurisdiction.

B. 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.

C. Hydrostatic Test

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.

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. 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.

D. 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.

E. 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.

1202.3.2 Maintenance Service

a) 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.

b) 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.

1202.3.3 Guarantee & Service

Refer to sub-section 1200.3.2, Air Conditioning System

1202.3.4 Miscellaneous

Refer to sub-section 1200.3.3, Air Conditioning System

1202.4 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.

1202.5 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.

Payment shall be made under :

Item	Description	Unit of Measurement
A	Fire and Jockey Pump	Set
B	Sprinkler head, valves and fittings	Piece
C	Pipes	Piece

SECTION 1203 - ELECTRIC ELEVATOR

1203.1 Description

This Item shall consist of furnishing and installation of electric elevators, inclusive of all necessary wiring, rails, concreting of machine room floor slabs and all other accessories ready for service in accordance with the Plans and Specifications.

1203.2 Materials Requirements

1203.2.1 Traction or Hydraulic Machine

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

1203.2.2 Car Bodies and Platform

Car bodies shall be of furniture steel, smooth and not lighter than gage no. 14.

The car platform shall consist of structural steel frame with wood flooring so treated against the attack of termites. The undersides of the platform shall be covered with sheet steel which shall be treated to prevent corrosion before the wooden platform is laid.

The rubber tiles floor covering shall be not less than 3mm thick of approved design, color and quality, and shall be lid in 1.5mm thick asphalt.

The car shall be wired and fitted with a compact ceiling type electric combination fan and light fixture controlled by a flush type standard switch within the car.

1203.2.3 Car Doors

The type of doors shall be specified on the project Specification or as shown on the Plans.

The car doors shall be provided with electric interlock designed to prevent operation of the elevator unless all the doors are locked in the closed position or to prevent operation of the elevator unless all the doors are locked in the closed position or to prevent opening of any when the car is not in proper position.

1203.2.4 Hoistway Entrance and Doors

All hoistway entrance shall be provided with ornamental steel furniture with furnished trimmings of such design to match the interior of the car.

The hoistway entrance shall be properly reinforced where hangers, doors control and other fittings are to be attached.

The same electric interlock for car doors shall prevent opening of any doors when the car is not in proper position.

The type and size of the hoistway entrance and doors shall be shown on the Plans.

1203.2.5 Counterweight and Guide Rails

Counterweight shall be of cast iron made in section properly shaped for adjusting the total weight, and fitted into suitable guide shoes and structural steel framing. Guides for the cars and counterweights shall be planned steel, erected plumbed, and secured to heavy steel brackets. Guides for the car shall have a section weighing not less than 19kg/m and counterweight guides shall have a section weighing not less than 12kg/m.

The elevator and counterweight shall be fitted with guide rail lubrication, preferably of the automatic type.

1203.2.6 Annunciator System

An electric annunciator call system with push buttons at each entrance on each floor shall be provided. It shall be of the electric lamp indicating type showing “UP” and “DOWN” calls for the intermediate landing.

1203.2.7 Hall Position Indicators

Hall position indicator shall be electric multi-lighted panel type, shall be installed at each entrance on each floor.

1203.2.8 Car Position Indicators

A car position indicator shall be provided inside the cat at the most convenient location and visible to all passenger in the car.

1203.2.9 Operating Devices

The operating device shall consist of bank of buttons in the car numbered to correspond to the various floor served. Button shall be placed at each floor landing to bring the car to the floor by momentary pressure of the respective button. An emergency stop button shall be provided in the car to interrupt the power supply and apply the brake and stop the car independently of the operating device.

1203.2.10 Controlling Devices

The controlling device shall be held inoperative until all the doors and hoistway doors are properly closed.

A hall time relay shall be provided to render the car inoperative from any hall button from a predetermined period of time after the car stopped at a lending in response to a hall call.

Reverse phase relay shall be mounted in the controller conveniently located and easily accessible to the operator.

1203.2.11 Foundation

Refer to sub-section 1200.2.9 Air Conditioning System

1203.2.12 Electrical Work

Refer to sub-section 1200.2.10, Air Conditioning System

1203.3 Construction Requirements

1203.3.1 Car

An emergency exit located at the top of the car and opening outward shall be provided. It shall be not less than 406mm in width by 635mm in length.

1203.3.2 Capacity, Loading and Speed

The elevator shall be capable of starting, accelerating, retarding and stopping with safety and accuracy as to loading, in either direction, with dead and live loads ranging from no load to full rated load to full rated load, and to 33 1/3 overload. The acceleration and retardation shall be done uniformly and smoothly as much as practicable to eliminate discomfort to passenger.

The speed variation of the elevator shall not exceed 15% plus or minus with load variation ranging from no load to full load where variation in the power supply voltage does not exceed 5% and the variation of current frequency does not exceed 1%.

1203.3.6 Guarantee and Service

Refer to sub-section 1200.3.2, Air Conditioning System

1203.3.4 Miscellaneous

Refer to sub-section 1200.3.3, Air Conditioning System

1203.3.6 Method of Measurement

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

or Hydraulic Machine and car shall be measured by set, hoistway doors, counter weight, Guide rails, annunciator and hall position indicators by piece, electrical wire and conduit by length.

1203.3.6 Basis of Payment

All work performed and measured 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.

Payment shall be made under :

Item	Description	Unit of Measurement
A	Traction or Hydraulic Machine and car	Set
B	Hoistway, doors, counter-weights, guide rails annunciators and hall position indicators	Piece
C	Electric wires and conduits	Length

SECTION 1204 – *(RESERVED FOR ELECTRIC DUMBWAITER)*

SECTION 1205 – MEDICAL GAS PIPELINE SYSTEM

1205.1 Description

This Item shall consist of furnishing and installation of MEDICAL OXYGEN, COMPRESSED MEDICAL AIR AND MEDICAL VACCUM, inclusive of pipes, outlets, fittings connections, vacuum pumps and other accessories ready for service in accordance with the approved Plans and Specifications.

1205.2 Materials Requirements

1205.2.1 Medical Oxygen Manifold

Oxygen manifold shall AUTOMATIC CHANGEOVER consist of two (2) banks of fully charged oxygen cylinders, all connected to a

common header. Each bank shall be provided with a ball type pressure check valve, pressure regulating valve and shut-off valve, pressure regulating valve and shut-off valve.

The manifold shall be equipped with digital display and alarm system which shall provide an audio-visual switchover warning signal. It shall also include the necessary facilities for actuating the remote combination switch-over and Hi-low line pressure alarm panels. The Hi and Low pressure warning shall operate when the pressure in the main varies 20% above or below normal line of 345 kPa (50 psi). The alarm control shall include one (1) mercury tube type adjustable pressure switch for energizing the switch over alarm circuit and one (1) double mercury tube pressure switch for energizing the Hi-low pressure alarm circuit. A single control box shall contain 220/24 volt transformer, relays for actuating all alarm panels. An audio-visual switch over alarm panel containing “Normal” and Reserve Supply in Use” warning lights, a momentary switch and automatic reset to shut-off the buzzer.

1205.2.2 Medical Air Manifold

The nitrous manifold shall AUTOMATIC CHANGEOVER consist of two (2) banks of fully charged medical air cylinders, all connected to a common header. Each bank shall be complete with pressure regulators, safety valve set at 483 kPa, all necessary fittings, and adapters to complete the assembly. The digital display audio-visual alarm shall include pressure switches, isolating valve, 220/24 volt transformer and remote alarm panel, consisting of pilot light, buzzers, momentary switch for silencing the buzzer and automatic reset relay.

1205.2.3 Fuel Gas Manifold

Fuel Gas manifold shall consist of two (2) banks fully charged gas cylinders, all connected to a common header. Each cylinder connection shall be provided with a cylinder valve. The manifold control shall include two (2) shut-off valve, automatic throw over manifold, pressure regulator and relief valve.

1205.2.4 Vacuum Pumps

Vacuum pumps shall be duplex type each with a capacity to handle the total load without loss of vacuum in the system.

The duplex vacuum pumps shall be provided with sequence master alternator to automatically reverse the sequence of operation from single to both units in the event that one pump can not bring the system to the desired vacuum level in the case of heavy demand.

1205.2.5 Humidifier

The humidifier shall be of jet and bubbles type which the aspirator element injects water into stream of oxygen. The humidifier bottles shall be pliable, heat resistant and shall be sufficiently transparent to permit the water level to be easily seen and with usable water capacity at least 300cc. The unit shall have integral warning whistle which operates in the supply tubing.

1205.2.6 Vacuum Trap Bottles

Vacuum trap bottles complete with adapter connection to the vacuum outlet shall consist of a wall bracket, cap assembly with float operated shut-off valve regulator, gauge assembly and 1.5 liters glass vacuum trap bottle for collecting fluids. The vacuum bottles shall have an integral arm for securing the cap and bottle to the bracket. The cap shall also have a positive sealing overflow shut-off valve fluid assembly for closing off the vacuum in the event the collection bottles become full. The collection bottles shall have cubic centimeter graduation and imprinted operating instructions. The vacuum regulator shall be diaphragm type with regulator mechanism and gauged housed in a simple compact case.

1205.2.7 Service Outlet

All wall outlets shall be double or triple units for the following services; oxygen, air and vacuum. The outlet shall be surface mounted type with satin finish stainless steel cover plate suitable for exposed piping system. Each service outlet shall consist of an outlet valve with outlet thread, dust cap and chain, nameplate specifying gas service. The safety keyed coupler shall be installed to provide a gas seal when equipment is disconnected.

1205.2.8 Pipes, Valves and Fittings

All piping shall be of seamless type “K” hard tampered copper tubing suitable for silver brazing except piping for gas which shall be of B.I. pipe Schedule 40. Joint and fittings for copper tubing shall be cast bronze designated for brazing. Screwed connections shall be applied with thin paste of litharge and glycerine to the external only. Shut-off valves shall be furnished and installed as indicated in the drawings and shall be provided with boxes to avoid tampering.

1205.2.9 Equipment Foundation

Refer to Sub-section 1200.2.9, Air Conditioning System

1205.2.10 Electrical Works

Refer to Sub-section 1200.2.10, Air Conditioning System

1205.3 Construction Requirements

1205.3.1 Pipes, Valves and Fittings

All piping, tubing, valves, and fittings shall be thoroughly cleaned of oil, grease or other combustible materials by washing in hot solution of sodium carbonate or trisodium phosphate mixed in the proportion of 373 grams to 11.4 litre of water. Scrubbing and continuous agitation of the parts shall be employed whenever necessary to remove all deposits and insure complete cleaning. After washing, all materials shall be rinsed thoroughly with clean hot water.

All piping shall be spaced correctly for adequate support of all lines so that weight shall be on the support and not on the joints. Horizontal piping of 16 mm (5/8 inch) and larger shall be supported 3m (10 ft.) apart. On vertical lines the support shall be one each storey for piping 25mm (one inch) and smaller, for larger piping one support for each two storey.

1202.3.2 Testing

After installation of all pipes and tubing, but prior to the installation of the service outlet, the system shall be blown clear of moisture and foreign matters by means of water pumped nitrogen or air. After installing the device outlet the system shall be subjected to a test pressure of 1035.5 kPa (150 psi) by means of nitrogen or air continuously for 24 hours. This test pressure shall be maintained after each joint has been thoroughly examined for leaks by means of soapy water.

1205.3.3 Guarantee and Service

Refer to sub-section 1200.3.2, Air Conditioning System

1205.4 Method of Measurement

The work under this item shall be measured either by set, length, piece actually placed and installed as indicated in the Plans. Oxygen, air, gas manifold and duplex vacuum pump shall be measured by set, humidifier vacuum trap bottles, outlet and valve by piece, pipes by length.

1205.5 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.

Payment shall be made under :

Item	Description	Unit of Measurement
A	Oxygen, Air, Gas Manifold and Duplex Vacuum Pump	Set
B	Humidifier, Vacuum Trap Bottle, outlets valves	Piece
C	Pipes and Tubing	Length
D	Valves and Fittings	Piece

DIVISION 15 - SANITARY/PLUMBING

SECTION 15400 PLUMBING SYSTEM

PART 1 GENERAL PROVISIONS

15400.1 EXPLANATION

OWNER-GENERAL CONTRACTOR-PLUMBING RELATIONSHIP

a. The plumbing and sanitary work is a Specialty Trade which shall be performed by a Contractor hereinafter referred to as Plumber Contractor.

b. The scope of work and responsibility of the Plumbing Contractor is stipulated in this Specification and is treated separately from the function of the General Contractor and other Specialty Trade Contractor for the sole purpose of delineating the plumbing work.

c. Should the General Contractor subcontract the Plumbing Work to a specialty trade Plumbing Contractor all responsibilities and functions of the Plumbing Contractor stipulated in the Specifications shall be assumed by the General Contractor

d. There shall be no contractual relation between the Owner and the Plumbing Specialty Trade Contractor.

15400.2 GENERAL REQUIREMENTS

a. All works shall be performed in accordance with the requirements of all applicable laws of the Republic of the Philippines and all codes and ordinances so required.

b. The Plumbing Contractor is required to refer to all architectural, structural, mechanical and electrical plans and specifications and shall investigate all possible interference and conditions affecting his work.

c. Contractor and all providing labor, material, or both, for this project are specifically referred to the General Conditions of the Contract, to contract drawings, to all the divisions of the specifications and the various other contract documents which may affect the completion of any work in other divisions. In the absence of any agreement between sub-contractor as the General Contractors (authorized by the Owner), supply of others affected by the construction of this project, the General Contractor shall be held responsible for the coordination and completion of all work.

d. All plumbing work to be done and sizes to be used shall be in accordance with the National Plumbing Code of the Philippines as so required under the direct supervision of the licensed Sanitary Engineer or Master Plumber.

15400.3 WORK INCLUDED

Furnish all materials and equipment and perform all labor necessary for all complete installation, testing and operation of the plumbing system in accordance with the applicable drawings and this division of the specification consisting of, but not limited to the following:

a. Sanitary drainage system

b. Storm drainage system

c. Soil, waste, and vent pipe systems within the building.

d. Water distribution and supply pipes, and fitting.

e. Fire standpipe system

f. Installation of drinking fountain, (Verify)

g. Water services connections

h. Plumbing fixtures of exposed pipes and appurtenances and asphalt protective coating and concrete covering for all pipes laid underground.

i. Any and all other works involved in providing the complete operation of the domestic water supply system, fire protection system, sanitary plumbing and storm drainage system for the above-named project.

15400.4 ITEMS BY OTHERS

a. General cutting and patching of openings except for pipe hangers and inserts.

b. All concrete foundations or based required for plumbing equipment.

c. Concrete sumps and pits.

d. Flashing of roof drains and pipes penetrating the roof.

e. Water for construction and testing purposes will be supplied by the General Contractor.

15400.5 COORDINATION WITH OTHER TRADES

Refer to all electrical, structural, mechanical and architectural plans and specifications and investigate all possible interference and conditions affecting the plumbing works. Proposed solutions to anticipated problems shall be submitted to the Sanitary Engineer for approval as least one (1) week ahead of the construction schedule.

15400.6 INTENT

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

15400.7 EXTRA WORK

Cost estimate of all extra works that shall be deemed necessary during the progress of the work shall be submitted to the Owner for approval as least two (2) days before any extra work shall be started.

PART 2 REQUIREMENTS OF REGULATORY AGENCIES

15400.8 CODES AND PERMITS

a. Execute the work in full accordance with the requirement of all governmental agencies having jurisdiction thereof as well as with the requirements and/or recommendation of the National Plumbing Code of the Philippines, the Philippine Rating Bureau, the Underwriters, all

applicable laws of the Republic of the Philippine and all codes and ordinances.

b. Secure and pay for all necessary approvals, permit, inspection, and the like, before starting work, and turn over the official records of the granting permits to the Owner without additional cost.

c. Obtain all necessary allowances, pay all royalties, and the like, in connection with the use of any patented devices or system, and save the Owner harm from any claim or law suit arising from such use.

15400.9 All materials shall conform to the standard tabulated below:

a. Concrete sewer and drainage pipes - ASTM 076 - 59T and ASTM C-14-59

b. Cast iron soil pipes and fittings, extra heavy, ASTM 076-595 and ASTM G-14-59, service weight pipes conforming to federal specifications or "SILVA" or approved equal.

c. Cast iron drainage fittings - ASC B16.12 1953.

d. Wrought iron pipe - ASTM A72-52T

e. Malleable iron fittings - ASTM A-338-51T

f. Caulking Lead- Federal Specifications QQ-L-156

g. Galvanized iron pipes and fittings - ASTM A-120-57T

h. Bronze gate valves-Federal Specifications Wx-V-54

i. Gate Valves - AWWA c500-59

k. Lead sheet-Federal Specifications - QQ-L-201

l. Water meter - MWSS or LUWA approved

m. PVC Pipes and fittings-Neltex Series 1000, Moldex Sch. 40 or approved equal.

n. Plumbing Fixtures - Saniware or approved equal.

15400.10 IDENTIFICATION OF MATERIALS

a. Each length or pipe, fittings, trap, fixture and device used in the plumbing system shall have cast, stamped or indelible marked on it the manufacturer's trade mark or name, the weight, the type, the

classes of product when so required by the standard mentioned above.

b. All plumbing fixtures and fittings installed without the above trademarks shall be removed and replaced with properly marked fixtures and fittings without any extra cost to the Owner.

PART 3 PLUMBING FIXTURES

15400.11

All bids to be considered shall include all plumbing fixtures shown on the drawings and specified herein or by the Architect.

a. All plumbing fixtures shall be installed free and open in a manner to afford access for cleaning and shall be furnished with brackets, cleats, plates, and anchors required to support the fixtures rigidly in place.
b. After the installation of any or all the plumbing fixtures of the building same shall be kept clean and in working order but shall not be used by anybody until the building has been turned over and accepted by the Owner.

c. Fixture trim, traps, faucets, escutcheons and waste pipes that are exposed to view in finishing or finished spaces shall be brass with polisher chromium plating or nickel finish, unless otherwise specified. Exposed supply pipes shall be brass or copper tubing plates in the same manner otherwise specified.

d. The Plumbing Contractor shall be responsible for providing those portions of fixture fittings (as trims), which are not provided with the fixture but are required for the complete installation. All fixtures shall be carefully checked to determine the portions, which must be provided to complete the installation.

e. All fixtures shall be provided with separate stop valves for cold water so that each fixture may be separately controlled without affecting any other fixtures.

f. All flush valves shall be equipped with vacuum breaking device.

15400.12 GUARANTEE

The Plumbing Contractor shall furnish to the Owner a written guarantee covering satisfactory operations of the plumbing installation in all its parts for a period of one (1) year after date of final acceptance. During this period, the Plumbing Contractor shall repair or replace any defective work and pay for any repair or replacement costs. Included with this guarantee certificate shall be the guarantee certificates of every material supplier employed by this Trade.

15400.13 AS-BUILT DRAWINGS

a. The Plumbing Contractor with the approval of the Engineer shall mark down with red pencil, on two sets of plumbing plans all the revisions, omissions and/or additions to the various plumbing installation drawing as the construction progresses one set of the plans as marked shall be submitted to the Engineer after completion of work.

b. Before the final payment to the Contractor is made, he shall submit to the Owner an As-Built Drawing incorporating all the changes made and noted in the marked plans retained by him. The As-Built Drawings shall be prepared on reproducible form.

c. The Plumbing Contractor shall prepare and submit the As-Built Drawings without extra cost to the Owner.

PART 5 PROTECTION

15400.14 The Plumbing Contractor shall protect all the work and materials from loss, injury or defacement. Protection of fixtures and materials shall be by boards, papers and/or cloth as required and any lost, damaged, or defaced material be replaced by the Contractor as his own expense.

15400.15 Cover and protect all openings left in floor or wall for passage of pipes. Protect pipes with suitable coverings as soon as set. Close all open ends of pipes with a plug or cap fitting to prevent obstruction and damage.

15400.16 Seal all set traps.

15400.17 Do not use new, permanent, water closet and other new plumbing fixtures during the progress of the work.

15400.18 Do not use new, permanent, roof and floor drains for the plumbing of waste cement mixed during the progress of the work.

15400.19 As soon as installed, cover all metal fixture trimming with non-corrosive grease and maintain it until construction work is completed.

PART 6 OPERATING AND MAINTENANCE INSTRUCTIONS

15400.20 Provide three (3) sets of operating and maintenance instructions covering completely the operations and maintenance of plumbing equipment controls and accessories.

PART 7 ALTERNATE

15400.21 Use of any materials, device, fixtures or appurtenance not specified in these specifications may be allowed, provided that such alternate has been approved, in writing, by the Owner to substantiate Contractor claims, the cost shall be borne by the Contractor.

15400.22 Test shall be done by an agency approved by the Owner and in accordance with generally accepted standards. In the absence of such standards, the Owner may specify the test procedure.

15400.23 In any substitution, all health and safety requirements shall be observed.

SECTION 15401 COLD WATER SYSTEMS

PART 1 CLEARING AND GRUBBING

15401.1 The pipeline route shall be cleared and grubbed prior to performing any excavation or placing any fill.

15401.2 Clearing and grubbing refer to brush, roots, stumps, vegetation, pavements sidewalks and surface obstructions of any kind that are required to be temporarily or permanently removed and that lie within the actual area to be excavated.

15401.3 No trees shall be fitted, destroyed, or interfere with by the Contractor without the approval of the Owner.

PART 2 EXCAVATION

15401.4 Excavation shall include the removal of all materials of whatever nature encountered that would interfere with the proper execution and completion of work. The removal of said materials shall conform to the required grade line. Materials unsuitable for backfill must be removed from the site.

15401.5 The width and length of the area to be excavated for the installation of pipes and fittings shall not exceed the maximum linear dimensions of such structure by more than 300 mm on each side.

15401.6 Excavated material that cannot be used to backfill an excavation shall be stockpiled or wasted in a manner approved by the Owner.

PART 3 BACKFILL

15401.7 Backfill shall include the supply placing and compacting of all materials to fill pipe trenches and excavations for other structures. Excavated material suitable for backfill shall be used for that purpose.

PART 4 SUPPLY, LAY AND JOINT PIPES AND FITTINGS

15401.8 The Contractor shall provide and maintain in good condition the proper tools and equipment for the handling and laying of pipe, valves and fittings. Methods of pipe laying and use of tools and equipment shall also conform to applicable manufacturer's recommendations. For the laying of the first 100 meters of pipe, the pipe manufacturer shall provide a supervisor to instruct the Contractor's pipelaying crew in the procedures to be followed.

The interior of all laid pipes, valves, and fittings shall be kept clean and free of foreign matter and dirt at all times. Precautions shall include the liberal use of cleaning cloth during laying, and the watertight plugging of all openings at the close of work each day. Pipe valves and fittings shall be carefully examined for defects at the time of laying. Any defective material discovered before, during or after being laid shall be permanently marked, removed from the job site, and replaced with sound material. Where it is required to join pipe, valves, or fittings of different types, size or joint combination, adapt here shall be used of a class and type appropriate to the connecting ends.

PART 5 PAINTING AND PROTECTIVE COATINGS

The Contractor shall give the Architect at least 48-hours advance notice of the start of any surface preparation work or coating application work. All such work shall be performed in the presence of the Architect unless the Architect has granted prior written approval to perform such work in his absence. Galvanized, and other metal surfaces shall be treated with a phosperic acid etching cleaned before painting, abrasions and bare spots in shop prime coatings shall be repaired with metal primer of the same type. All surfaces to be coated shall be cleaned with the approved equipment before the application of coating material.

PART 6 TESTING AND DISINFECTION

All testing and disinfecting operations shall be done in the presence of the Architect. Late delivery of valves would not be allowed to delay testing and commissioning of a pipeline. In such cases, the Contractor shall supply and install spool or make up pieces so that existing and commissioning may proceed. The Contractor shall install valves later in a manner that minimized interruption of service.

a. Field Hydrostatic Pressure Test

All tests shall be conducted on the pipeline in sections after the trench is backfilled, but before pavement restoration. The pipeline shall be prepared for testing by closing all valves, putting substantial stops and bulkheads at openings, opening aid valve assemblies and fitting aid release taps at all other high points along the pipeline. These taps shall later be removed after completion of the testing and disinfection and unless otherwise specified, replaced with permanent plugs. The pipeline shall be slowly filled with water, allowing all aid pockets to be released until the pipe is completely filled and under slight pressure at which condition it should be allowed to stand for 24 hours. Any apparent defects in the pipeline at this stage shall be rectified by the Contractor. The duration of the pressure test shall be for a period of two (2) hours. Any defective pipe, fitting, point, valve or service connection shall be removed and replaced and the test shall be repeated until satisfactory to the Architect.

b. Field Leakage Test

The leakage test shall be conducted concurrently with the pressure test. The pipeline and service connection tubing leakage shall be taken as the amount of water, as measured by the metering service, needed to be injected into the line to maintain the test pressure for the two (2) hour leakage test period.

c. Disinfection

1. The entire water system shall be thoroughly flushed and disinfected with chlorine before it is placed in service.

2. Chlorine shall be liquid chlorine or hypochlorite (HTH) and shall be introduced into the water lines in a manner approved by the Architect.

3. Chlorine dosage shall be to provide no less than 50 parts per million (50ppm) of available chlorine and allowed to stand for 24 hours, after which the system shall be flushed with potable water until the residual chlorine content is about 0.2 parts per million. All valves in the system shall be opened and closed several times during the chlorinating period.

4. The Contractor shall furnish and pay for all devices, chlorine materials, labor and power required for disinfection purposes. Disinfection shall be made in the presence of the Architect.

5. Before being place into service and before certification of completion by the Owner, all new water mains, or extensions and connections to existing systems, or valves section of such

extension, any replacement in the existing water system, shall be disinfected with chlorine, and a satisfactory bacteriological analysis of the water certified shall be submitted to the Architect.

d. Color Coding for Pipes

1. Cold Water Pipes - - - - - Blue

2. Storm Water Pump - - - - - Aluminum

3. Sewage Pipes - - - - - - - Gray

4. Vent Pipes - - - - - - - - Green

5. Fire Lines - - - - - - - - Red

SECTION 15405 SOIL AND WASTE PIPING SYSTEMS

PART 1 HOUSE SEWER SYSTEM

15405.1 Provide house sewers to conduct the sanitary drainage from the building to the main sewer system, including all piping, trenching, shoring, manholes and/or pumping as required, backfilling, final connection to the main sewers, street openings and repaving as required to make the system complete.

a. Make the connection to the main sewers, open the street and repave in accordance with the requirements of the authorities.

b. Commence the sewer pipe installation as the connection to the main sewer with all spigot ends pointing in the direction of flow. Lay all pipe with ends abutting and in a true line, carefully centered to form a sewer with a uniform inverts.

PART 2 DRAINAGE VENT

15405.2 Provide ventilating pipes from the various sanitary plumbing fixtures and other equipment to which drainage connections are made. Connect ventilating pipes to the discharge of each trap and carry individually to a point above the rim of the fixture before connecting with any other vent pipe, in general, this will be approximately 1.067 meters (3 feet, 6 inches) above the finished floor. Pitch branch vents back to fixtures.

15405.3 Collect individual vent pipes together in branch vent lines and connect to vent stacks, paralleling soil and waste stacks. Whether possible, vent stack offsets shall be made with 45-degree fittings. Vent

stack shall be connected to adjacent soil stack as the base of the stacks.

15405.4 Extend the tops of ventilating stack independently through the roof or collect together and run through the roof in series of larger pipes, as shown on the drawings. Provide roof couplings at a level 45 millimeters (18 inches) above the finished roof to receive flashing.

PART 3 DRAINAGE SYSTEM TEST

15405.5

a. 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 stack vent and/or vent stack above the roof.

b. The system shall hold this water for a full thirty (30) minutes during which time there shall be no drop more than 100 millimeters (4").

c. If and when the Architect decide that an additional test is needed, such as an aid or smoke test on the drainage system, the Contractor shall perform such test without additional cost to the Owner.

SECTION 15406 ROOF DRAINAGE SYSTEMS

PART 1 STORM DRAINAGE

15406.1 Provide a complete system of storm drainage piping for all roofs and setback areas, parking areas, and canopies. All horizontal drains should connect to the house drainage system as the building wall.

a. Provide all drains required to conduct rainwater from the building surfaces to the storm drainage system, including all of the schedules drains and any special drains indicated on the Architectural and/or Plumbing Drawings.

b. Take special care in setting roof drains to assure that they are set an elevation, which will preclude formation of puddles.

c. Install connections to roof drains in conjunction with the roofing specified under Specifications of another Trade, and as such times as designated by the Architect so that the building is adequately protected during construction from damage by storm water. Storm drainage pipes, underdrains, open canal or trenches shall have slope not less than .005.

15406.2 Make all branch connections to drainage system with "Wye and long "Tee-Wye fittings. Do not use short 1/4 bends, common offsets and double hubs. Use shore "Tee-Wye fittings, in vertical piping only, and only where space conditions will not permit the use of long turn fittings. Use only fittings conforming to code requirements.

PART 2 UNDERGROUND DRAINAGE SYSTEM

15406.3 EXCAVATING

a. Trenches for all underground pipelines shall be excavated to the required depths and grades.

b. Bell holes shall be provided so that pipe will rest on well tamped solid ground for its entire length.

c. Where rock is encountered, excavation shall extend to a depth six inches below the pipe bottom and before pipe is laid, the space between the bottom of pipe and rock surface shall be filled with sand or gravel or other filling materials.

15406.4 PIPE LAYING

Pipes in trenches shall be laid true to line and grade on a stable or suitably prepared foundation, each section of the pipe being bedded and bottom of the trench shaped to fit the lowest quadrant of the pipe circumference.

15406.5 BACKFILLING

a. After pipelines have been tested, inspected and approved by the Architect, and prior to backfilling, all forms and bracing shall be removed and the excavation shall be cleaned from trash and debris.

b. Materials for backfilling shall consist of approved materials and shall be free of debris or big rocks.

c. Backfill shall be placed in horizontal layers, properly moistened and compacted to an optimum density that will prevent excessive settlement and shrinkage.

15406.6 All downspouts, fittings and connections shall conform with the plans and specifications.

PART 3 DRAINAGE SYSTEM TEST

15406.7 (Refer to Section 15405.5 Part 3 Soil and Waste Piping Systems)

PART 4 GUARANTEE AND WARRANTY

15406.8 GUARANTEE FOR PLUMBING SYSTEM

The Plumbing Contractor shall furnish to the Owner a written guarantee covering the satisfactory operations of the plumbing installation in all its parts for a period of one (1) year after the date of acceptance. During this period, the Plumbing Contractor shall repair or replace any defective work and pay for any repair or replacement cost.

15406.9 WARRANTY FOR EQUIPMENT

The following equipment as furnished by the Contractor in any section of the specifications shall be guaranteed against defective design, materials and workmanship for a period of one year from the date of final acceptance.

1. Constant Pressure Pumping System

2. Elevator Pit Pumps

3. Deepwell Pump

15406.10 Upon receipt of a written complaint and during the period of the guarantee, all defective parts shall be replaced by the Contractor as his own expense.

SECTION 15420 PLUMBING EQUIPMENT

PART 1 MATERIAL SCHEDULE

15420.1 WATER SUPPLY

a. Service pipe from Existing Water Main: Galvanized Iron Pipe ASTM Schedule 40 with tar coating, or Centrifugally Cast Iron Pipe (CCIP) AWWA C600-59.

b. Pipes for Cold Water Line and Toilet Roughing-In: Galvanized Iron (G. I.) Pipes Schedule 40.

15420.2 STORM DRAINAGE SYSTEM

a. Drainage Pipes: Plain concrete drain pipe and fittings, T&G for 10 centimeters to 20 centimeters (4” to 6”) diameter conforming to ASTM C11-59; and reinforced concrete drain pipes and fittings for 10” and

larger, centrifugally cast iron or vibrated, T&G conforming to ASTM C-76-74

b. Jointing Materials: shall be cement of one part cement to two parts sand in proportion with oakum yarning.

c. Roof Drains and Downspouts: All roof drains, downspout, fittings and connections shall be Neltex Series 1000 or Moldex Schedule 40 or approved equal. Each vent pipe thru roof and each conductor connection to gutter channel shall have a copper #6 gauge wire ball strainer fitted to the opening and roof drain respectively.

d. Area Drain - Catch Basin: Load-bearing Concrete Hollow Blocks (CHB) Jackbilt or approved equal) or reinforced concrete with R.C. grating covers as shown on the drawings.

e. Manholes: Manholes for the drainage line on the roadway shall be pre-cast R.C. Sections with galvanized steel ladder rungs and cast-iron frame and covers.

f. Building storm drain connections to street mains shall be reinforced concrete pipe, PERMANENT, PACIFIC or approved equal.

15420.3 SANITARY DRAINAGE SYSTEM

a. Soil and Waste Pipe: Cast Iron soil pipes, service weight manufactured locally by ASA or SILVA brand or approved equal for pipes buried underground as well as in pipe chases. For stacks embedded in structural concrete members use wrought iron pipe with drainage pattern fittings. For pipes passing under building or driveways, roadways, use cast iron extra heavy by SILVA or approved equal.

b. Vent Pipes: Pipes and fittings for all circuit vents shall be PVC manufactured locally by Neltex or Moldex or approved equal. Main and Vent stack pipe shall be cast iron pipe.

c. Laboratory waste pipes: Cast-iron service weight by SILVA or approved equal.

d. Shower and floor drain: Shall be made of high grade, strong, tough and even grained metals. No shower or floor drains must be on the way of person that may step on it.

e. Castings: Shall be free from blowholes, porosity, hard spots, excessive shrinkage, cracks or other injurious defects. They shall be smooth and well cleaned both inside and outside. Castings shall not

be repaired. Plugged, brazed of “burned-in”. The wall thickness of iron castings shall not be less than 6millimeters (one-quarter inch.)

f. All drains installed in connection with waterproof roofs shall be equipped with a clamping device.

g. When drains are installed in connection with membrane waterproofing, a sheet of 454 grams (16oz) copper sheet 30 centimeters square (1 foot square) shall be place between the layers in an approved with hot asphalt and bonded to the membrane.

15420.4 IDENTIFICATION OF MATERIALS

a. Each length of pipe, fitting, trap, fixture and device use in the plumbing system shall have cast, stamped or indelibly marked on it the manufacturer’s trade or name, the weight, the type, and class of product when so required by the standards mentioned above.

b. All plumbing fixtures and fittings installed without the above trademarks shall be removed and replaced with properly marked fixtures and fittings without any extra cost to the owner.

15420.5 PIPE JOINTS AND FITTINGS

All joints shall be air and watertight. For jointing pipes, the following shall be used:

a. For PVC pipes - PVC solvent cement

b. For cast iron soil and waste pipes -bell and spigot joints calked with oakum and soft peg lead or epoxy.

c. Galvanized wrought or steel pipes - screwed or threaded joints carefully reamed and jointed with red lead applied on male thread

d. Concrete pipes - bell and spigot or tongue and groove by use of oakum and cement mortar.

e. Dissimilar pipes - screwed pipe to cast iron joints shall be either calked or threaded joints. Adapter fittings are acceptable. PVC pipe joint to metal pipe with flanged fittings. Rigid pipe - taper sleeve method.

15420.6 CLEANOUT PLUGS AND TRAPS

a. Cleanout Plugs:

1. Cleanout installed in connection with cast iron bell and spigot pipes shall consists of a long-sweep quarter bend or one or two eight-bends extended to an easily accessible place, where indicated on the drawings.

2. An extra heavy, cast-brass ferrule, with countersunk tap screw cover shall be calked into the hub of the fitting and shall be flushed with the finished floor or wall.

3. Where cleanout in connection with threaded pipes are indicated and are accessible, they shall be cast-iron drainage pattern 90 branch fittings with extra-heavy screw plugs of the same size as the pipe up to and including 100 millimeters (4 inches).

4. Cleanout plugs: Comply with the National Plumbing Code, with American Standard Pipe Thread, “Permacel” teflon tape applied to the male thread, or as approved.

5. No floor clean out must be on the ay of person that may step on it.

b. Traps:

1. Every plumbing fixtures connected to the sanitary drainage system shall be equipped with a trap. Traps are specified to be supplied with the fixtures.

2. Each trap shall be placed as near to the fixtures as possible.

3. Traps installed on hub-spigot pipe shall be extra-heavy cast iron.

4. Traps installed on threaded pipe shall be recessed drainage pattern.

5. Traps shall be set level with respect to their waterseal.

15420.7 VALVE AND HOSE BIBBS

a. The entire plumbing system shall be provided with the valves so located that they can be operated, replaced, repaired, and provide complete control of the water supply to each group of fixtures, to each cold water riser and where indicated on drawings. Pressure reducing valves shall be provided as shown on drawings or as required by the Sanitary Engineers.

b. Valves 20 millimeters (3/4 inch) and smaller shall be glove valves; larger size shall be solid-wedge type gate valve 65 millimeters (2-1.2 inches) and smaller shall be brass or bronze; larger size shall be iron body, brass mounted. Valves 65 millimeters (2-1/2 inches) and

smaller shall have screwed ends. Valves 85millimeters (3 inches) and larger, unless otherwise noted, shall have flanged ends. Check valves shall be 68 kgs. (150 lbs.) working pressure type. Walworth or approved equal.

c. Hose bibbs shall be size 13 millimeters (1/2 inch) male inlet and 20millimeters (3/4") hose thread bronze body conforming to ASTM Specifications BG2 suitable for cold water pressure up to 689kpa (100psi). Equal or similar to No. 58 Chicago Hose valve. Every hose bibbs shall be provided with a gate valve.

15420.8 SLEEVES

a. Provide sleeves for all pipes passing through floors, walls and concrete pits or concrete fireproofed beams.

    1. Sleeves in concrete beams, through concrete walls, and where serving exposed pipes penetrating floors - Schedule 40 Steel Pipes

    2. Sleeves within furred cut enclosure, through steel beams and concrete blocks walls: gauge 18 galvanized sheet metal.

    3. Provide sleeves in foundation walls and in concrete pits with anchor flanges.

b. Provide sleeves with an I. D. at least 12millimeters (1/2inch) and 25millimeters (1 inch) outside of the pipe served, including pipe insulation, which must be continuous through the sleeve.

    1. Finish sleeve flush with underside of slab and 25millimeters (1 inch) above finished floor. Pack the space between pipes and other sleeves with Fiberglass and finish with BF 60-30 trowel grade non-hardening mastic or as approved.

    2. Calk the space between pipes and sleeves in exterior walls, foundation walls, pits and membrane waterproofed floors with lead and oakum.

c. Set sleeves as construction progresses and secure in place during curing of concrete

d. Do not support pipes by resting clamps on sleeves

e. Plastering of floor drains in membrane waterproofed floors and roof drains will be performed under specifications of another trade. Provide drains with suitable flashing devices.

1. Where drains are installed in non-waterproofed floors, with fill, provide 910 millimeters (3 ft x 3 ft) square copper flashing at each drain

2. Provide waterproofed type pipe sleeves, Zurn Z-195 galvanized with flashing clamp, brass bolts where penetrating membrane waterproofed floors.

f. Pipes passing through wall be flashed under the Specifications of another trade, provide roof couplings Zurn Z 196 or approved equivalent at suitable level above roof to terminate flashing

g. Whenever pipes are exposed and pass through walls, floors partitions or coiling, fit them with chromium plated cast brass escutcheons held in place with setscrew. Fit escutcheons snug over insulation, secure in place. Take special care to protect the escutcheons during the construction progress.

15420.9 FIXTURES AND EQUIPMENT SUPPORTS AND FASTENING

a. All fixtures and equipment shall be supported and fastened in a safe and satisfactory manner.

b. Inserts shall be securely anchored and the anchors shall be properly slushed with mortar, insert shall be installed flush with the finished wall and shall be completely concealed when the fixtures are installed.

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

15420.10 HANGERS, ANCHORS, GUIDES IN BUILDING

a. All piping shall be rigidly supported by means of approved hangers and supports. Piping shall be supported to maintain required position and pitching of lines, to prevent vibration and to secure piping in place and shall be arranged as to provide for expansion and contraction.

b. Pipe hangers shall be thoroughly cleaned and painted with one coat of asphalt varnish.

c. Horizontal runs of pipes shall be hung with adjustable wrought iron or malleable iron pipe hungers space one length apart but not over 3 meters (10ft.), except hub and spigot soil pipes which shall have hangers spaced not over five (5) feet apart and located near the hub.

PVC pipes and tubing shall have hangers spaced not over six (6) feet apart.

d. Hangers shall conform to the standard details but the contractor may, if he elects, use other commercial hangers having parts not lighter than indicated on the detail, provided that he has obtained prior written approval of the Architect/Engineer. Chain, straps, perforated bars or wire hangers will not be permitted.

e. Inserts shall be cast steel and shall be of a type to receive a machine bolt or nut after installation. Inserts shall permit adjustment of the bolt in one horizontal direction and shall installed before the concrete is poured.

f. Vertical runs of pipe shall be supported by wrought-iron clamp or collars spaced not more than two floors apart.

g. Chromium-plated pipes shall have a clearance of not less 20millimeters (3/4 inch) or more than 25millimeters (1 inch) where run on the face of plaster and the pipe shall be supported where required by cast brass supports finished to match the pipe.

h. Hangers on water piping 65millimeters (2-1/2inch) and larger vent lines shall be band type 6millimeters x 25millimeters (1/4" x 1") flat mild steel or black iron with 12 millimeters (1/2") round iron rod with plates and nuts, flat iron clamps or expansion shields installed to developed their full strength. Hangers on water piping 50millimeters (2") and smaller shall be split ring type with 10millimeters (3/8") iron rods with inserts, plates and nuts, toggle bolts, clamps or expansion shields as specified above.

i. Space hangers on all cast-iron soil, waste, drain and vent lines 1.50m (5ft) on centers and at all changes in direction.

j. All soil, waste, vent and water riser shall be provided at the base of riser and on each floor, heavy blacksmith construction friction clamps.

k. Approved bolts and inserts and clamps shall be used for connecting hangers, supports, fixtures or equipment. Wood plugs shall not be used.

15420.11 CEILING PLATES AND FLASHING

a. Floor, Wall and Ceiling Plates:

1. Where uncovered exposed pipes pass through floors, finished walls or finishing ceiling, they shall be fitted with chromium plated pipes or with cast-iron or steel plates on ferrous pipes.

2. Plates shall be large enough to completely close the hole around the pipe and shall be square, octagonal or round, with the least dimensions not less than 38millimetrs (1-1/2”) larger than the diameter of the pipe.

3. Plates shall be secured in an approved manner.

b. Flashing:

1. All pipes passing through roof shall be provided with lead flashing.

2. All flashing shall be built of 2.72 kilograms (6lbs.) sheet lead and shall extend up to the pipe at least 150mm (6”) above the roof and along the roof plans not less than 300millimeters (12”) distance around.

3. Lead counter flashing of the same weight shall be turn down over the top of pipe and shall fit over flashing to make waterproof joint.

4. All drain flashing installed in connection with membrane waterproofed floors shall be equipped with clamping devices.

5. Roof drains and floor drains installed in connection with membrane waterproofing shall be made watertight with a sheet of 16 ounces soft copper sheet one (1) foot square placed between the layer in an approved manner. The metal surfaces mopped with hot asphalt and bonded to the membrane. The copper sheet shall extend at least twelve (12) inches from drain rim into membrane waterproofing.

6. Roof drains shall be cast iron body, with removable lock type mushroom dome strainer or flat strainer; clamping collar with integral gravel guard, corrosion resistant clamping bolts bronze expansion joint with graphite asbestos packing, female threaded connection similar and equal to that manufactured by Metma Foundry and Machine Shop, figures K 278, K-279 and K-280; size as indicated on drawings.

7. Floor drains for mechanical equipment room shall be cast-iron body and grate; combination drip and floor drain with integral seepage pan and adjustable strainer head circular slotted floor level crate, similar and equally manufactured by Metma Foundry or M-200-0, or approved equal; size as indicated on drawings.

PART 2 FIRE PROTECTION SYSTEM

15420.12 FIRE HOSE STATION

Cabinet for fire hose stations shall be recessed 1.52mm (gauge 16) steel or aluminum body, door and trim. Cabinet shall accommodate a 38mm x 30m fire hose and a 4.55 kg. Fire extinguisher. Door shall be full plate glass and aluminum frame. Cabinet finish shall be baked white enamel inside and red enamel outside. Pin rack for fire hose station cabinets shall be semi-automatic type, designed for 30m of 38mm hose and furnished with a 38mm brass rack nipple.

Hose for fire hose station shall be 30m of 38mm cotton, single jacketed, rubber lined and subjected to wax and gum treatment. Hose coupling shall be 38mm male/female National Standard hose threads.

Nozzle for fire hose station shall be 38mm adjustable, capable of complete shut-off, solid straight stream, or any degree of solid conical fog, polished brass or led lexan type. A suitable spanner wrench and fireman's ax shall be provided for each fire hose station. Portable extinguisher for each fire hose station shall be 4.55 kg. Dry chemical type, class ABC, tested and listed by UL and/or FM

15420.13 FIRE STAND PIPE SYSTEM

a. Wet stand pipe system shall consist of risers, siamese connections and hose valves; valves to be underwriters approved high grade cast bronze mounted, 175 lbs working pressure.

b. Pipe shall be schedule 40 G.I. and fittings shall be 150lbs malleable iron.

c. All wet standpipe have to be tested by the Plumbing Contractor at a pressure designated by the Architect/Engineer and the Fire Department concerned.

PART 3 PREPARATION AND INSTALLATION

15420.14 CUTTING AND REPAIRING

The Work shall be laid in advance and any cutting of construction shall be done with the written permission of the Owner or his authorized representative. "Roughing-in" for fixtures shall be carried along with the building construction. Opening shall be left in walls and floors of proper sizes correctly located for the pipes but the contractor shall do any additional cutting needed in case of error or omission and shall properly replace any concrete work or flashing around the pipe as may be required without additional cost to the Owner.

15420.15 GENERAL INSTALLATION OF PIPES

a. Install pipe approximately as shown on the Drawings and as directed during installation as straight and direct as possible, forming right angle or parallel lines with building walls and other pipes, and neatly spaced. Erect pipe risers plumb and true, and parallel with walls and other pipes and neatly spaced.

b. Keep all horizontal runs of piping, except where concealed in particulars, as high as possible and close to the walls. Maintain minimum 10millimeters fall per meter (1/8" fall per foot) on all soil, waste and drain line.

c. Do not install pipes or other apparatus in a manner, which interferes with the full swing of the door or windows.

d. The arrangement, positions and connections, of pipes, fixtures, drains, valves, and the like indicated on the drawing shall be followed as closely as possible, but the right is reserved by the Architect/Engineer to change location and elevation to accommodate condition which may arise during the progress of the work, prior to installation without additional cost to the Owner for such changes. The responsibility for accurately laying out of the work, and coordinating the installation with other Trades rests with the Contractor. Should it be found that any work if laid out, interference will occur, will report matter to the Architect/Engineer before commencing work.

e. Ream all screwed pipe smooth before installation. DO not bend, flatten, split or injure the pipe in any way.

f. Use reducing fitting, unless otherwise approved in special cases, in making reduction in size of pipe. Bushing will not be allowed unless specifically approved.

g. Where chrome piping is installed, cut and thread pipe so that no unplated pipe threads are visible when the work is completed.

h. Carry fixtures connections, concealed in building construction, to point above floor, break out close to the underside of fixtures and rise exposed to fixtures.

i. Provide protective pans under and over individual pipes passing high voltage (460V) electrical bus duct or switchgear equipment. Construct the pans of 12 gauges black with a 150millimeters (6inches) lip, the corners being welded to make the pans watertight. Give each pan three coats of Rust-Oleum paint or approved equal and support pan with pipe hangers, and drain. Clear off the bus duct or switchgear.

j. Do not install exterior piping in water or when trench or weather conditions are unsuitable for the work, as decided by the Architect/Engineer.

k. Wedge fitting at bends or toes in buried water pipes against concrete thrust blocks poured between the vertical natural face of the trench and the fittings to prevent the fittings from being blown of the lines when under pressure. The size of the concrete block is based on the working pressure plus 586(kpa) (85psi), the pipe size and the bearing capacity of the soil, all as recommended in the Standards of the American Water Works Association.

l. Use friction type wrench and vises on all copper tubing and brass piping. Remove and replace pipe showing tools marks with new materials.

15420.16 INSTALLATION OF WATER SUPPLY PIPES AND FITTINGS

a. The piping shall be extended to all fixtures, outlets and equipment from the gate valve installed in the branch near the riser. The coldwater piping shall be installed with a fall toward main shut-off valve and drains. Ends of pipes and outlets shall be capped or plugged and left ready for future connections.

b. The branch water piping to the fixtures, shall not be less than the following sizes:

Fixtures	Cold Water Supply
Water closet flush-o-meter type	32mm (1 - ¼”)
Water closet - tank type	15mm (1/2 “)
Urinal, flush-o-meter type	25mm (1”)
Slop sink	15mm (1/2”)
Lavatories	15mm (1/2”)
Shower	15mm (1/2”)
Laboratory sink	15mm (1/2”)
Sill cocks	20mm (3/4”)
Drinking fountain	15mm (1/2”)
Hose Bibb	15mm (1/2”)

c. Where the branch serves more than one fixture, the branch shall be increase in size in proportion to sizes as shown above or as shown on the drawings

d. Other fixtures not definitely detailed herein are to have stand and pipe connections and valves to correspond to the fixtures connected

e. Cast bronze unions shall be installed at the connection to any equipment so that they may be conveniently disassembled.

f. Upon completion of water system, flush out line and all valve seats to clear system of particle and dirt.

g. Air chamber. All individual branches to fixtures and/or equipment shall be provided with air chambers, shock absorbers as shown on the drawings.

15420.17 JOINTS AND CONNECTIONS

a. Fixture Connections:

1. Where space condition will not permit the use of standard fittings in conjunction with cast iron floor flanges, special short-radius fittings shall be provided

2. Connection between fixtures and flanges on soil, pipe shall be made absolutely air and watertight with an approved setting compound. Rubber gaskets or putty will not be permitted to this connection.

3. Closet bolts shall be less than 6 millimeters (1/4”) in diameter and shall be equipped with chromium plated nuts and washers.

4. Fixtures without outlet flanges shall be set at the proper distance from floor or wall to make first class joint with the use of closet-setting compound or gasket.

5. No fixtures shall be set in place until the Owner or his representative has examined and approved such flanged.

b. Unions:

1. Unions on ferrous pipe shall be malleable iron and conform to the requirement of U.S. Federal Specifications WW-U 531. Type B, zinc-coated.

2. Provide unions where indicated and in the following locations even if not indicated:

a. In long runs for piping for water supply and other services, each drainage at intervals as directed to permit convenient disassembly for alterations and repairs.

b. In by-passes around equipment

c. In connection to water tanks and other equipment which requires disconnection for repair and replacement

d. On inlet side of fixture traps.

3. Unions shall be located between shut-off and equipment

4. Unions shall not be concealed in walls, partitions or ceilings.

c. Cast Iron Pipe Joints

All joints in bell and spigot cast iron soil waste and vent pipe, or between cast iron soil waste and vent pipes and threaded pipes or calking ferrules, shall be firmly packed with oakum and calked with lead at least 25mm (1”) deep. Cast Iron pressure pipe joints shall be calked with lead at least 50mm (2”) deep.

d. Threaded Pipe Joints

1. Threaded joints shall be standard taper screw thread in accordance with a U.S. Federal Specifications GG-P-351 with graphite and oil compound applied to the male thread.

2. Connection between threaded pipe and soil pipe shall be calked joint. The threaded pipe shall have a ring or half coupling screwed on the hub-end of soil pipe

e. Concrete Pipe joints:

1. Ends must be cleaned thoroughly before laying joints and the pipe properly aligned.

2. Joints must be spaced evenly before cement mortar is applied

3. Press the mortar evenly into the joint and bank for about 50millimeters (2”) and smooth with towel.

4. Remove surplus mortar inside joint to leave interior of pipe free from construction.

f. Union Connection:

1. Slip joint shall be permitted only in trap seals or on the inlet side of the trap.

2. Brass ground joint seat union connection shall be used.

3. Use of long threads and bushings for underground piping is prohibited.

g. PVC Pipe Joints:

1. All joints in PVC pressure DW pipes with pre-moulded fittings shall be made in accordance with the pipe manufacturers recommendations.

2. Joints, between PVC and other pipe materials shall be made with adaptors.

15420.18 EXCAVATION, PIPE LAYING AND BACKFILLING

a. Excavation and Pipe Laying:

1. Trenches for all underground pipelines shall be excavated to the required depths and grades.

2. Bell holes shall be provided, so that pipe will rest on well-tamped solid bedding for its entire length.

3. Cast iron, galvanized or concrete pipe in trenches shall be laid true to line and grade on a stable or suitably prepared foundations, each section of the pipe being properly bedded and the bottom of the trench shaped to fit the lowest 90 Arc of the pipe circumference.

4. When rock is encountered, excavation shall extend to a depth six (6) inches below the pipe bottom, and before pipe is laid, the space between the bottom of pipe and rock surface shall be filled with sand or gravel, or other approved filling materials.

5. Water supply pipes and sewers shall be laid in separate trenches

6. Width of an open pipe trenches for all sizes of pipes shall be twelve (12) inches greater than the outside diameter of the bell of the pipe.

b. Backfilling:

1. After the pipe have been tested, inspected and approved by the Architect/Engineer and prior to backfilling, all sheatings leggings and bracings shall be removed and the excavation shall be cleaned of all trash and debris.

2. Materials for backfilling shall consist of the materials excavated or other approved materials. Backfilling materials shall be free of debris and big stones and shall be placed in horizontal layers not exceeding those included on the drawings.

3. Backfilling shall be carefully placed and tamped under and around the pipe barrel in such manner that the pipeline and joints are not

disturbed. Each layer shall be properly moistened and compacted by hand or machine tamper or by other suitable equipment to an optimum density that will prevent excessive settlement and shrinkage.

4. Backfill shall be brought to a suitable elevation above grade o provide for anticipated settlement and shrinkage.

15420.19 WORKMANSHIP

All labor shall perform in first class, neat and workmanlike manner by mechanics skilled in their trades, and such mechanics and work shall be satisfactory to the Owner.

PART 4 EXPANSION AND CONTRACTION OF PIPING

15420.20

Accessible contraction-expansion joints shall be made where necessary horizontal runs of pipe over 15meers (50ft) length shall be anchored to the wall or to the supporting structure about midway on the run to force expansion and contraction equally towards the ends.

15420.21 CLEANING AND PAINTING

a. All exposed meal surfaces shall be rid of grease, dirt or other foreign materials. Chrome or nickel-plated pipings, fittings and trimmings shall be polished upon completion. All equipment pipes, valves and fittings shall be cleaned of grease and sludge, which may have accumulated.

b. Any stoppage or discoloration or other damages to part of the building or its finish of furnishing, due to the contractor’s failure to properly clean the piping system, shall be repaired by the contractor at his expense.

15420.22 PAINTING

a. All exterior of surface of piping to be installed in or through concrete floor fill of tile floor and underground shall be given one coat of acid resistant paint having a bituminous base.

b. Pipe hangers, support and all other ironwork in concealed space shall be thoroughly cleaned and painted with one coat of red lead and finish coat of oil enamel paint.

c. All exposed soil, waste and vent piping of cast-iron that are asphalt or tar-coated shall be given two (2) coats of shellac and two (2) coats of oil paint.

d. Color Code: All exposed pipings shall be adequately and durably identified by distinctive colored paints as follows:

Cold water pipes	----------	Blue
Storm Water Pipes	----------	Aluminum
Soil pipes	----------	Gray
Vent Pipes	----------	Green
Fire lines	----------	Red

PART 6 WARRANTY AND DISINFECTIONS

15420.23 DRAINAGE SYSTEM TEST

a. 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 stack vent and/or vent stack above roof.

b. The system shall hold this water for a full 30 minutes during which time there shall be no drop greater than four (4) inches.

c. 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 ten (10) feet above the highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure or a water pump may be used to supply the required pressure.

d. If and when the Architect/Engineer decides an additional test, such as air or smoke test, on the drainage system, the Plumbing Contractor shall perform such test without additional cost.

15420.24 WATER SYSTEM TEST

a. Upon completion of the roughing-in and before connecting fixtures, the entire cold water piping system shall be tested at a hydrostatic pressure of one and a half (1-1/2) times the expected working pressure in the system when in operation, and proved tight at this pressure.

b. Where a portion of the water piping system is to be concealed, before completing this portion, shall be tested separately in a manner similar

to that described for the entire system, and in the presence of the Architect/Engineer.

15420.25 DEFECTIVE WORK

a. If the inspection or test shows any defects, such defective work or materials shall be replaced and the inspection and test repeated, until satisfactory to the Architect/Engineer.

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

c. Calking of screwed joints or holes will not be permitted.

15420.26 DISINFECTION

a. The entire system shall be thoroughly flushed and disinfected with chlorine before it is placed in operation.

b. Chlorination materials shall be liquid chlorine or hypochlorite as specified and shall be introduced into the manner approved by the Architect/Engineer into the water lines.

c. The chlorine dosage shall be such as to provide no less that fifty parts per million (50ppm) of available chlorine.

d. Following a contact period of not less than sixteen (16) hours, the heavily chlorinated water shall be flushed from the system with clean water until the residual chlorine content is not greater than two-tenths (0.2) ppm

e. All valves in waterlines being disinfected shall be opened and closed several times during the 16-hour chlorination period.

PART 7 PERMITS, DRAWINGS AND GUARANTEE

15420.27 “AS-BUILT” DRAWINGS

Upon completion of the work, the Plumbing Contractor shall submit two (2) sets of prints with all “AS-BUILT” changes shown on the drawings in a neat and professional manner. Such prints shall show changes or actual installation and condition of the plumbing system in comparison with the original drawings. The prints shall be marked “Revised to show As-Built Conditions”. Failure to submit the As-Built drawings may be considered cause from withholding final payment until drawings have been submitted and approved by the Architect/Engineer.

15420.28 PERMITS

All construction permit, inspection fees, license and taxes due to local, National Government necessary for the prosecution of the work shall be secured and paid by the Plumbing Contractor, who shall solely be responsible should there be any delay by reason of his failure to comply with the provision of this clause. He shall also be responsible for any penalties, incurred by himself or his Agents. He shall secure the Plumbing Certificate after final inspection of the proper authorities concerned.

15420.29 PUBLIC SAFETY AND GUARANTEE

a. The Plumbing Contractor shall furnish, erect and maintain such barrier, lights and signs as necessary to give adequate warning or instruction in installation for safety and personal security.

b. The Plumbing Contractor shall guarantee his work from defects or installation of materials or equipment for a period of one (1) year, after acceptance of his work. A written guarantee to this effect shall be furnished to the Architect/Engineer. During this period, the Plumbing Contractor shall repair or replace any defective work and pay for any repair or replacement cost.

PART 8 SEPTIC TANK AND WATER METER

15420.30 SEPTIC TANK

The Plumbing Contractor shall construct the septic tank, in such like manner, size and its dimension based on the detailed plans.

15420.31 WATER METERS

a. Water meter and their parts, especially parts that are in continuous contact with water shall be made of materials resistant to corrosion and should be non-toxic. Use of dissimilar metals in contact under water should be avoided in order to minimize electrolytic corrosion.

b. All internal parts of the measuring unit that is in contact with water should be smooth in order to prevent adhesion of sediments.

c. Best suitable materials to fulfill the above requirements both for internal and external parts are thermoplastics, brass and stainless steel.

d. Water meter shall be approved by the MWSS.

PART 9 MISCELLANEOUS

15420.32

a. Throughout the construction period, open ends of all installed pipelines shall be kept closed by temporary plugs. Drainage lines shall not be used to conduct dirty construction washwater, specially those with cement mixes, to avoid possible clogging.

b. A temporary fire protection system shall be provided by the Plumbing Contractor during the construction period. This shall be of sufficient capacity to put out any fire that may break out due to construction operations. This is in addition to temporary fire extinguisher required.

c. A temporary potable water supply shall be made available at all times to construction workers as construction work progresses.

d. A temporary sanitary human excreta disposal system shall be provided by the Plumbing Contractor during the construction period.

DIVISION 16 ELECTRICAL SYSTEMS

SECTION 16000 GENERAL PROVISIONS

PART 1 GENERAL

16000.1 EXPLANATION

OWNER-GENERALCONTRACTOR-ELECTRICAL CONTRACTOR RELATIONSHIP

a. The Electrical Work is a Specialty Trade which shall be performed by a Contractor hereinafter referred to as the CONTRACTOR

b. The scope of work and responsibility of the CONTRACTOR is stipulated in this specification and is treated separately from the function of the General Contractor and other Specialty Trade Contractors for the sole purpose of delineating the electrical work.

c. Should the General Contractor subcontract the Electrical Work to a Specialty Trade Contractor, all responsibilities and functions of the Specialty Trade Contractor stipulated in the Specifications shall be assumed by the General Contractor.

d. There shall be no contractual relation between the Owner and the Specialty Trade Contractor subcontracted by the General Contractor.

16000.2 GENERAL REQUIREMENTS

a. The General Conditions and Provisions of the Civil Works Contract not in conflict with these specifications and the Drawings form part of and are included in this Specification.

b. Examine the Specifications and Drawings of the Civil Works, the Airconditioning Works and Sanitary Works, for requirements, which affect work under this Division whether or not such work is specifically mentioned in this Division.

c. Visit the site and ascertain local conditions and facilities, the nature of the soil, and other conditions as may affect the work. The CONTRACTOR will be deemed to have done this before preparing his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

16000.3 WORK INCLUDED

The work of the CONTRACTOR consists of furnishing all plant, labor and supervision, equipment and materials, and performing all operations in connection with the electrical system shown of the Drawings, their test and inspections, complete and in accordance with this specifications and the Drawings and subject to the terms and conditions of the contract and all other labor and materials not specifically mentioned as furnished and/or installed by others, to bring the electrical system to operating condition and ready for use by the Owner. The specific scope of work of the CONTRACTOR (by area and/or by work items) shall be as outlined in other contract documents.

16000.4 WORK BY OTHERS

The following will be by others unless otherwise shown in the Drawings.

a. Service connection to the utility companies facilities.

b. Others as may be specified IN the Drawings, elsewhere in the specifications, the addenda, or in the contract documents

16000.5 INTENT

a. It is the intention of the Specifications and Drawings to call for finished work tested and ready for operation, and/or continuation.

b. Any apparatus, appliance, material, or work not shown of Drawings but mentioned in the Specifications or vice versa, or any incidental accessories necessary to make the work complete in accordance with the scope set forth elsewhere, even if not particularly specified, shall be furnished, delivered and installed by the CONTRACTOR without additional expenses to the Owner.

c. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the Contractor's estimate, the same as if herein specified shown

d. With submission of bid, the CONTRACTOR shall give written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules and necessary items of work omitted. In the absence of such written notice, it is mutually agreed that the CONTRACTOR has included the cost of all required items in his proposal and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

16000.6 DRAWINGS

a. The Drawings accompanying this Specifications, addendum drawings and additional detail or clarification drawings as may be subsequently prepared by the ARCHITECT and shop drawings as may be submitted by supplier and/or manufacturer are hereby made part of this Specifications.

b. The Drawings are diagrammatic and indicate the general layout of the system and the CONTRACTOR shall be responsible for the proper installation of the system without substantial alterations or modifications. The Contractor shall follow drawings in laying out work and check drawings of other trade to verify spaces in which work will be installed. Whenever field conditions or exigencies of construction make departure from these Specifications and other Drawings necessary, detail of such departure and reason thereof shall be submitted without delay to the Architect and no departure shall be made without written approval of the ARCHITECT.

c. If directed by the ARCHITECT, the CONTRACTOR shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trade or not proper execution of the work.

d. The Drawings and these Specifications are complementary to each other and what is called for by one shall be binding as if call for by both. Any apparent conflict between the Drawings and this Specifications and unclear points of either shall be referred to the ARCHITECT for final decision.

16000.7 EXTRA WORK AND CHANGE ORDERS

Cost estimates of all extra works and change order that are deemed necessary during the progress of the work shall be submitted to the Owner for approval at least ten (10) days before any work shall be started, or within a reasonable length of time so as not to impede the progress of the work.

16000.8 TEMPORARY FACILITIES

The CONTRACTOR shall make all arrangements and pay for the provisions of the necessary electricity required for the work and shall clean away all temporary installation before or upon completion of the work.

16000.9 INSPECTIONS AND TESTS

The ARCHITECT or his representative shall be allowed access to all parts of the work at all times and shall be furnished such information and assistance by the CONTRACTOR as may be required to make a complete detailed inspection. Materials and installation shall be subject to such test as are deemed necessary by the ARCHITECT to properly ascertain their fitness both during installation and after installation is complete. The cost of such test shall be borne by the CONTRACTOR.

16000.10 LEAVING THE SITE

The CONTRACTOR shall not withdraw from the site until the OWNER has agreed that no further work is necessary at the time.

16000.11 SUSPENSION OR DELAYS

The CONTRACTOR shall not suspend or fail to make proper progress with the work without justifiable cause. The OWNER, in the event of delay or suspension of work still persisting after written complaint, in accordance with existing laws and regulations shall have the right to take over the work and all materials of the site and make arrangements as are necessary to have the work completed by others.

16000.12 CLEANING UP

During the process of the work and of the completion of the project, the CONTRACTOR shall remove from the premises all dirt, debris, rubbish and waste materials caused by him in the

performance of his work. He shall remove all tools, scaffolding and surplus materials after completion and acceptance of the work.

PART 2 GENERAL REQUIREMENTS

16000.13 CODES AND REGULATIONS

The installation specified herein shall comply with the following, which are hereby made part of this Specification:

a. All laws and regulations applying to electrical installation in effect;

b. The provisions of the latest approved edition of the Philippine Electrical Code, Part I and Part II

c. The rules and regulations of the local utility companies concerned.

16000.14 PERMITS AND APPROVAL

The CONTRACTOR shall obtain at his own expense all permits required by the Government Authorities. Work shall not be started unless the plans have been approved by said authorities and a valid wiring permit has been issued. Likewise, the CONTRACTOR shall secure from the power company their approval of the plans prior to start of the work.

All work done in violation of the above conditions shall be at the risk of subsequent rejection. The replacement of correction of such rejected work shall be the sole responsibility of the CONTRACTOR.

16000.15 OTHER REQUIREMENTS

The CONTRACTOR shall obtain all necessary allowances, pay all royalties and the like, in connection with the use of any patented devices or systems and save the OWNER from any claim or lawsuit arising from such use.

PART 3 WORK STANDARDS

16000.16 STANDARD OF WORKMANSHIP

a. The CONTRACTOR shall execute all work in a neat and workmanlike manner and shall do all necessary work whether it is clearly specified in these Specifications or shown on the Drawings or not. All work shall be done in accordance with the best practices employed in modern electrical installations.

b. The CONTRACTOR shall employ only competent and efficient workmen and shall, upon written request of the ARCHITECT, discharge or otherwise remove from work any employee who is, in the opinion of the ARCHITECT, careless or incompetent, or who obstructs the progress of the work or acts contrary to instructions or conducts himself improperly.

16000.17 REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

Any defective work whether the result of poor workmanship, defective materials, damage through carelessness or any other cause, found to exist prior to acceptance of, or final payment for, the work shall be removed immediately and replaced by work and material which shall conform to these Specifications, or shall be otherwise remedied in an acceptable manner. This clause shall have full effect regardless of the fact that the work may have been done with the full knowledge of the ARCHITECT or the Implementing Agency

16000.18 COORDINATION WITH OTHER CONTRACTORS

a. The CONTRACTOR shall arrange his work and dispose his materials so as not to interfere with the work or storage of materials of the other Contractors.

b. Where the work of the CONTRACTOR will be installed in close proximity to work of other trades, or where there is evidence that the work of the CONTRACTOR will interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the ARCHITECT, the CONTRACTOR shall prepare a composite working drawing and sections at a suitable scale clearly showing other trades.

If the CONTRACTOR installs his electrical work before coordinating with the work of other trades, he shall make necessary changes in his work to correct the condition without extra charge.

c. The complexity of equipment and the variation between equipment manufacturers require complete coordination of all trades. The CONTRACTOR, who offers for consideration, substitute of equal products of reliable manufacturers, has to be responsible for all changes that affect his installation and the installation of equipment of other trades.

16000.19 CUTTING AND PATCHING

The CONTRACTOR shall do all cutting and patching required by the work by engaging men who are skilled in the particular trade to do the work. Surfaced obtained by cutting and patching shall exactly match

surrounding work so that there will be no evidence of alteration and patching.

PART 4 MATERIALS

16000.20 STANDARD OF MATERIALS

All materials shall be new and shall conform to the Technical Specifications. All materials shall be the standard products of reputable manufacturers and shall bear the name of the manufacturer. All local materials shall bear the PS mark when such standards have been set. All materials of foreign origin shall bear marks of approval by standards agencies of the country of origin.

16000.21 EQUIVALENTS

a. Where the Technical Specifications or the Drawings give the name of the manufacturer and/or catalog number of materials, it is given as a guide to the size, strength, quality or class of the materials, desired and shall be interpret to mean that item or another fully equal for the service intended. Substitution shall be subject to prior written approval of the ARCHITECT.

b. The apparent silence of the Specifications and Drawings as to any detail, or apparent omission from the of a detailed description concerning any material shall be required to mean that only material of first class quality shall be used.

16000.22 APPROVAL

a. All materials shall be subject to the approval of the ARCHITECT. All materials and equipment installed without prior approval of the ARCHITECT shall be at the risk of subsequent rejection.

b. Approval by the ARCHITECT shall not relieve the CONTRACTOR of the responsibility of inspecting such materials for defects or not-conformance with the Specifications.

16000.23 DEFECTIVE MATERIALS

a. All materials not conforming to the requirements of the Specifications shall be considered as defective.

b. No defective material, the defect of which has been subsequently corrected, shall be re-used until approval has been given by the ARCHITECT.

PART 5 SUBMITTALS

16000.24

The CONTRACTOR shall, within Forty five (45) days after the award of the contract, submit for the approval of the ARCHITECT a list of materials he proposes to use in the work, including such samples, catalog, drawings, and descriptive data as far be required by the ARCHITECT.

16000.25 SHOP DRAWINGS

The CONTRACTOR shall submit to the ARCHITECT with such promptness as not to cause delay in his work or in that of any Contractor, five (5) copies of all shop drawings and the schedules required by the work. Shop Drawings shall be submitted on all major pieces of electrical equipment, specifically panelboards, wireways and gutters, and all fabricated items. The shop drawing shall give complete information on the proposed equipment. Each item of the drawings shall be properly labeled, indicating the intended service of the material, the job name, and Contractor's name.

The CONTRACTOR shall make any corrections required by the ARCHITECT, and submit five (5) corrected copies and other copies as needed. The Architect's approval of such drawings shall not relieve the CONTRACTOR of responsibility for deviations from the Drawings and Specifications unless he has in writing called attention to such deviation at the time of submission, nor shall it relieve him of responsibility for errors of any sort.

16000.26 "AS-BUILT" DRAWINGS

a. Upon substantial completion of the project, the CONTRACTOR shall submit to the OWNER five (5) sets of "AS-BUILT" Drawings showing all changes and deviations from the Contract Drawings. The "AS-BUILT" Drawings shall be identical to the Contract Drawings except for the said changes and deviations.

b. Where the changes and deviations are substantial, the CONTRACTOR shall also submit additional sets of "AS-BUILT" Drawings for submission to the Government Approving Authorities.

16000.27 CERTIFICATION OF FINAL INSPECTION AND APPROVAL

After completion of the work, the CONTRACTOR shall furnish the Owner with a Certificate of Final Inspection and Approval issued by the government authorities who issued the wiring permit. The

CONTRACTOR shall pay all inspection fee, other fees and penalties, which said authorities would impose.

16000.28 GUARANTEE

The CONTRACTOR shall furnish the Owner a written guarantee covering the satisfactory operation of the electrical installation in all its parts for a period of one (1) year from the date of final certificate of approval issued by government authorities having jurisdiction or from the date of final acceptance by the Owner whichever comes first. During this period, the CONTRACTOR shall repaid or replace any defective work and pay for any repaid or replacement costs. Included with this guarantee certificate shall be the guarantee certificate of the material suppliers employed by this trade. Should any part of the work be accepted and occupied or utilized by the owner prior to final acceptance, the guarantee period for that portion of the work shall commence on the mutually acknowledged date of said acceptance, use or occupancy.

PART 6 PROTECTION

16000.29 CONTRACTOR'S WORK AND MATERIALS

The CONTRACTOR shall protect all his work and material from loss, injury or defacement. Any cost, damaged or defaced material shall be replaced by the CONTRACTOR at his own expense.

a. All conduit openings shall be closed with caps in plugs during installation.

b. All equipment shall be tightly covered and protected against dirt, water or mechanical injury, and shall be installed in perfect condition.

16000.30 OTHER CONTRACTOR’S WORK AND MATERIALS

Should the CONTRACTOR cause damage to any other Contractor on the work, the CONTRACTOR shall, upon due notices, settle with such Contractor by agreement or arbitration. The CONTRACTOR shall be liable for any claims by other Parties against the Owner on account of such damage.

16000.31 INJURY TO PERSONS OR DAMAGE TO PROPERTY

The CONTRACTOR shall be responsible for all injury to persons and damage to property caused by the works or by workmen and shall be liable for any claims against the OWNER on account of such injury and/or damage.

The CONTRACTOR shall likewise take necessary precautions to protect the property of the OWNER against rain or other inclemency of the weather and against theft. Where exposure to such inclement weather or theft is due to the performance of his work, the CONTRACTOR shall be liable for any such damage or loss.

SECTION 16050 BASIC MATERIALS AND METHODS

PART 1 RACEWAY MATERIALS AND WORKMANSHIP

16050.1 GENERAL

Install a complete raceway system as shown on the drawings and stated in other section of the Specifications. All materials used in the raceway system shall be new and the proper material for the service intended.

16050.2 MATERIAL SPECIFICATIONS

Raceway materials shall be as hereunder specified:

a. Rigid Steel Conduit (RSC) shall be hot-dipped galvanized, manufactured to U.L. and ANSÉ Standards, 3 meters in length, taper threaded at both ends with one coupling, conduit shall be "KOREA", "PUSAN" brand, or any PS approved local equivalent.

b. Electric Metallic Tubing (EMT) shall be hot-dipped galvanized mill steel pipe, manufactured to ANSE Standards, 3 meters in length, not-threaded: tubing shall be "MATSUSHITA", "MARUICHI", or PS approved local equivalent.

c. Rigid PVC Conduit shall be schedule 40 or thick wall unplasticized PVC (uPVC) pipe 3 meters in length for electrical use (red orange), it shall be suitable for installation in concrete slab and manufactured to PSC Standard PNS 14 conduit shall be "ATLANTA", "NELTEX" or "EMERALD".

d. Flexible PVC Conduit shall be corrugated unplasticized Polyvinyl Chloride (PVC) and shall be manufactured to applicable PSC Standards conduit shall be "MOLDFLEX".

e. Fittings for rigid steel conduit shall be U.L. listed or PS approved local equivalent. Connectors and coupling for EMT shall be approved for the purpose, U.L. listed.

f. Other raceways not mentioned above but called for of the Drawings shall be as specified thereon.

16050.3 INSTALLATION

a. Not more than four 90 degree bends shall occur in any run. When it becomes necessary to have more than four (4) 90 degrees bends in any run, an intermediate pull box shall be installed to facilitate pulling-in of wires. All bends shall be free of dents or flattening. Field bends shall not be allowed for conduits larger than 20 mm dia. trade size except by hydraulic in motor operated benders.

b. All raceways runs shall be in floors, ceilings, and walls. Embedded runs shall be installed in such manner as not to weaken or interfere with the structure of the building. No horizontal runs of embedded conduit or tubing shall be permitted in solid walls and partitions. Concealed raceways shall be run in as direct manner and with as long a bend as possible. Exposed raceways shall be run parallel to or at right angle with lines of the building. Where raceways cross building joints, furnish and install expansion fittings for contraction, expansion and settlement.

c. Raceway shall be of ample size to permit the ready insertion and withdrawal of conductors without abrasion. All joints shall be cut square, reamed smooth, and drawn up tight.

d. Open ends shall be capped with suitable seals as soon as installed and keep capped until ready to install conductors. A No. 16 galvanized iron or steel fish wire shall be left in all conduits in which the permanent wiring is not installed.

e. Hangers and supports

    1. Raceway shall be securely and rigidly supported to the building structure in a neat and workmanlike manner and wherever possible, parallel runs of horizontal raceways shall be grouped together of adjustable trapeze hangers. Support spacing shall not be more than 300 mm.

    2. Exposed raceways shall be supported by one-hole malleable iron straps, two-hole straps, suitable beam clamps, or spilt ring hanger with support rod.

    3. Single raceways 32 mm dia. and larger run concealed horizontally shall be supported by suitable beam clamps or spilt-ring hangers with support rod. Multiple runs shall be grouped together of a trapeze hangers where possible.

    4. Raceways 20 mm diameter and smaller run concealed above a ceiling may be supported directly to the building structure with

strap hangers or No. 16 gauge galvanized wire provided the support spacing does not exceed 122 mm.

5. Raceways shall be firmly supported and fastened at three (3) meter intervals and within 0.1 meter of each outlet or cabinet.

f. Coupling and connection to boxed and cabinets

1. Metallic conduit shall be securely fastened to all sheet metal outlets, junction and pull boxed with galvanized locknuts and bushings, care being observed to see that the full number of threads project through to permit the bushing to be drawn tight against the end of the conduit, after which the locknuts shall be made up sufficiently tight to draw the bushings into firm electrical contact with the box.

2. Electric metallic tubing shall not be coupled together nor connected to boxes, fittings, or cabinets by means of threads in the wall of the tubing. Only fittings approved for the purpose shall be used. Treadles couplings and connectors used with the tubing shall be of the concrete tight type where not exposed to the weather and raintight type where exposed to the weather.

3. Metallic raceways shall be continuous from outlet to outlet to cabinets or junction or pull boxed in such a manner that each system shall be electrically continuous throughout.

4. Not-metallic raceways shall be securely fastened to outlet boxes, junction and pull boxed with proper adapters to permit the installation of metallic bushings.

g. Other raceways shall be installed in the manner prescribed in the latest approved edition of the Philippine Electrical Code, in accordance with the best practices employed in modern electrical installations, and in accordance with the manufacturer's instructions.

PART 2 OUTLET BOXES

16050.4 GENERAL

Install all junction and outlet boxes as shown of the Drawings or as required by the construction. The Drawings indicate only the approximate location of each fixture, receptacle, special purpose outlet and wall switch. The exact location shall be determined later at the site as the work progresses. The right is reserve by the ARCHITECT to change the exact location of any switch, light outlet, receptacle outlet and any other outlet in any room before the

same is installed. If any outlet is installed by the CONTRACTOR in such a manner as to be out of proper relation to beams, walls, or other details of the building construction its position or location shall be corrected by and at the expense of the CONTRACTOR and under the direction of the ARCHITECT.

16050.5 MATERIAL SPECIFICATIONS

a. Outlet boxed and junction boxed shall be galvanized, pressed-steel boxed where not exposed to the weather and case metal boxed where exposed to the weather as in outdoor or roof deck installations. Minimum thickness of pressed-steel boxes shall be 1.6 mm and case-metal boxes shall be at least 3.2 mm thick. The boxes shall be complete with the approved type of connectors and required accessories. Cast-metal boxes shall have threaded hubs.

b. Boxed shall be of approved design and construction, and of such for and dimensions as required to serve the kinds of devices or fixtures to be used and the number, size and arrangement of conduits connecting thereto.

   The allowable conduit fill as given in Section 5.7.2.2 of the Philippine Electrical Code shall not be exceeded. Deep boxes, box rings and raised plastic covers shall be used, when necessary, to obtain the required conductor capacity.

16050.6 INSTALLATION

a. Receptacle Outlet Boxes. Wall receptacles shall be mounted approximately 300 mm above the finished floor (AFF) at center unless otherwise noted. All receptacle outlet boxes shall be equipped with grounding leaf, which shall be connected to grounding terminal of device. The leaf shall be properly bonded to the box and to the separate ground wire, if any.

b. Switch Outlet Boxes. Wall switched shall be mounted approximately 1200 mm above the finished floor (AFF) at center unless otherwise noted. When the switch is mounted in a masonry wall, the bottom of the outlet box shall be in line with the bottom of a masonry unit.

c. Lighting Fixture Outlet Boxes. The lighting fixtures outlet boxes shall be furnished with the necessary accessories to install the fixture. The support must be such as not to deepen of the outlet box supporting the fixture. The supports for the lighting fixtures shall be independent of the ceiling system.

d. Boxes for outlet of auxiliary systems shall be as specified elsewhere in this Specification or as shown of the Drawings.

PART 3 PULL BOXES, WIREWAYS AND AUXILIARY GUTTERS

16050.7 GENERAL

a. Pull boxes shall be installed at all necessary points, whether indicated of the drawings or not, to prevent injury to the insulation or other damage that might result from pulling resistance, or for other reasons necessary to proper installation. Pull box locations shall be approve by the ARCHITECT prior to installation. Minimum dimensions shall be not less than PEC requirements and shall be increased if necessary for practical reasons or where required to fit a job condition.

b. Wireways shall be used where indicated of the Drawings or as required by the construction.

c. Auxiliary gutters shall be used to supplement wiring spaces as required by the construction or as indicated of the Drawings.

16050.8 CONSTRUCTION SPECIFICATIONS

a. All pull boxes, wireways and auxiliary gutters shall be constructed of galvanized sheet steel, with minimum thickness of 1.2 mm, and painted inside and outside to prevent corrosion.

b. Covers shall be attached to the box with a suitable number of countersunk flathead machine screws. Screws, which may cause injury to the insulation shall not be used.

c. Each circuit in box shall be marked with a tag guide denoting panels to which they connect.

PART 4 CONDUCTOR MATERIAL AND WORKMANSHIP

16050.9 GENERAL

Provide and install a complete wiring system as shown of the Drawings.

16050.10 CONDUCTOR SPECIFICATIONS

a. Conductors used in the wiring system shall be of soft-annealed copper having a conductivity of not less than 98% of that of pure copper and insulate for 600 V.

b. The wires and cables shall be delivered to the site in its original package whenever possible, plainly marked or tagged as follows:

1. Size, kind, and insulation of wire

2. Name of Manufacturer

3. Trade name of wire

c. Wires and cables shall be PHELPS DODGE, COLUMBIA or DURAFLEX.

l6050.ll CONDUCTOR WORKMANSHIP

a. Install conductors in all raceways as required to a neat and workmanlike manner. Empty conduits, as noted, shall have a No.l4 gauge galvanized pull wire left in place for future use. No wires shall be drawn into the raceways until all works, which may cause injury to the wire are completed.

b. Conductors shall be color-coded in accordance with the Philippine Electrical Code. Mains, feeders and sub-feeders shall be tagged in all pull, junction, and outlet boxed and in the gutter of panels with approved wire markers.

c. No lubricant other than powdered soapstone or approved pulling compound may be used to pull conductors.

d. At least 200 mm of slack wire shall be left in every outlet box whether it be in use or left for future use.

e. All conductors and connections shall test free of grounds, shorts, and opens before turning the job over to the Owner.

f. Branch circuits splices shall be soldered or joined by the use of insulate splicing devices (wire nuts). All soldered joints shall be made mechanically strong before soldering and shall be carefully soldered without the use of acid, then taped with plastic tape to a thickness equal to or exceeding that of the insulation.

g. Unless otherwise indicated in the Drawings or specified, not more than the specified number of conductors constituting a single circuit or branch shall be drawn in one conduit.

SECTION 16400 SERVICE ENTRANCE AND DISTRIBUTION SYSTEM

PART 1 SERVICE ENTRANCE

16400.1 GENERAL

Provide and install a complete service-entrance system as shown on the Drawings and as required for a complete system. All materials and workmanship shall conform to Section 16050 of these Specifications, the Philippine Electrical Code, and the local laws and regulations. The electric service-entrance shall conform to the requirements and regulations of the electric utility serving the project.

16400.2 MATERIALS

a. Conduits used for service-entrance shall be galvanized rigid steel conduit.

b. Conductors for service-entrance shall be copper, type THWW.

16400.3 SCOPE

a. Verify with the electric utility company serving the project the point of connection to the utility facilities before preparing the bid and include therein all work entailed for such connection.

b. Verify with the electric utility company the scope of the work regarding the metering facilities and include in the bid all materials, labor, and charges that the utility company may require of the Owner, for the purpose of installing permanent metering connection.

PART 2 FEEDERS AND BRANCH CIRCUITS

16400.4 GENERAL

Provide and install a complete electrical distribution system as shown on the Drawings or as required for a complete system. All materials and workmanship shall conform to Section 16050 of the Specifications, the Philippine Electrical Code, and the local laws and regulations.

16400.5 MATERIALS

a. Raceways shall be as indicated on the Drawings.

b. Conductor type shall be as indicated on the Drawings. No wire smaller than 1.2 mm diameter or 2.0 square mm (AWG No. 14) shall be used for any lighting or power circuit Conductors smaller than 5.5

square mm shall be solid. Conductors 5.5 square mm and larger shall be stranded.

16400.6 INSTALLATION

a. Feeder conductors and raceways shall be installed as shown on the Drawings and no change in size shall be made without written consent of the ARCHITECT. Feeder conductors shall be continuous, and without splices between terminals unless expressly indicated in the Drawings. When feeders are run in multiple, they shall be exactly of the same length to avoid unbalanced division of the current.

b. The Drawings indicate the general methods of installation of all circuit wiring and the outlet, which are to be supplied for these circuits. Branch circuit raceways shall be run from outlet to panelboards as direct as the building conditions will allow. Circuit allocations shall be as indicated on the Drawings. Where it becomes necessary to connect any outlet to a circuit other than the one shown on the Drawing, this shall be done without extra charge and only upon written consent of the ARCHITECT. All lighting outlet shall be supplied from single-phase circuits. Number of wires for all circuits shall be as indicated on the Drawings.

PART 3 DISCONNECT AND SAFETY SWITCHES

16400.7 GENERAL

Furnish and install safety switches as indicated on the Drawings or as required. All safety switched shall be General Duty Type. The switched shall be Fuse Safety Switched (FSS) or Not-Fuse Safety Switched (NFSS) as shown on the Drawings or required.

16400.8 MATERIAL SPECIFICATIONS

Safety Switched shall be approved by the Bureau of Product Standards and shall exhibit the "PS" mark as proof thereof.

16400.9 INSTALLATION

The safety switched shall be securely mounted in accordance with the Philippine Electrical Code. The CONTRACTOR shall provide all mounting materials.

PART 4 PANELBOARDS - CIRCUIT BREAKERS

16400.10 GENERAL

Furnish all install circuit-breaker panelboards as indicated in the panelboards schedule and where shown on the Drawings.

16400.11 MATERIAL SPECIFICATIONS

a. The panelboards shall be dead-front type equipped with molded-case circuit breakers and shall be the type as indicated in the panelboards schedule/detail.

b. Provide molded-case circuit breakers of frame, trip rating and interrupting capacity as shown on the Drawings. Also provide the number of spacer for future circuit breakers as shown in the schedule. The circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip-indicating, and have common trip on all multiple breakers with internal trip mechanism.

c. But bad connections to the branch circuit breakers shall be the "phase-sequence" type. Single-phase three-wire panelboards bussing shall be such that any two adjacent single-pole breakers are connected to opposite polarities in such a manner that two-pole breakers can be installed in any location. Three-phase four-wire bussing shall be such that any three adjacent single-pole breakers are individually connected to each of the three different phases in such a manner that two or three-pole breakers can be installed at any location. All current-carrying parts of the panelboards shall be plated. Provide solid neutral (S/N) assembly when required. The assembly shall be isolated from the enclosure.

d. Terminals for feeder conductors to the panelboards mains and neutral shall be suitable for the type of conductor specified. Terminals for branch-circuit wiring, both breaker and neutral, shall be suitable for the type of conductor specified.

e. The panelboards buy assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA Standards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Fronts shall include door and have flushed, brushed stainless steel, spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboards locks shall be keyed alike. Fronts shall have hash provisions for padlocking onto the tub.

f. On the inside of the door of each cabinet, provide a typewritten directory, which will indicate the location of the equipment or outlet supplied by each circuit. The directory shall be mounted in a metal frame with a non-breakable transparent cover. The panelboards

designation shall be stenciled in 1-1/2 inch-high letters on the inside of the door.

g. Panelboards and circuit breakers shall be FUJI, MITSUBISHI, GE, ITE, SQUARE A or WESTINGHOUSE, GOLDSTAR.

h. There shall be no intermixing of brands in one panel.

16400.12 INSTALLATION

a. Before installing panelboards, check all the architectural drawings for possible conflict of space. Adjust the location of the panelboards to prevent such conflict with other items.

b. When the panelboards is recessed into a wall serving an area with accessible ceiling space, provide and install an empty conduit system for each spare circuit for future wiring. A 1-1/2 inch conduit shall be stubbed into the ceiling space above the panelboards as such accessible ceiling space exists.

c. The panelboards shall be mounted in accordance with Article 5.8 of the Philippine Electrical Code. Furnish all materials for mounting the panelboards.

PART 5 WIRING DEVICES

16400.13 GENERAL

Furnish and install all wiring devices and plate as called for on the Drawings and as specified herein.

16400.14 MATERIAL SPECIFICATIONS

a. Switched shall be 15A, 250V or 300V except as otherwise noted. Terminals shall be screw-type or quick-connect type.

b. General use receptacle shall be 10A, 240V grounding type unless otherwise indicated on the Drawings. Terminals shall be screw-type or quick-connect type. Hospital grade receptacles shall be used when called for on the Drawings.

c. Special purpose receptacles shall be as called for on the Drawings. Matching plugs shall be supplied.

d. Wiring devices shall be EAGLE, NATIONAL, MEIKOSHA, TOSHIBA, JIMBO, or as called for on the Drawings.

16400.15 INSTALLATION

a. Mounting height shall be as follows unless otherwise noted on the Drawings:

   1. Switched - 1.20 meters above floor finish.

   2. Receptacle - 0.30 meter above floor finish.

b. For screw type devices, the wire connected thereto shall be formed into a clockwise look to fit around the screws. For quick-connect devices, the exact length of wire shall be stripe of insulation and then pushed in.

SECTION 16500 LIGHTING

16500.1 GENERAL

Furnish, install and connect all lighting fixtures to the building wiring system unless otherwise noted.

16500.2 SPECIFICATIONS

a. Fixture type shall be as indicated on the Drawings.

b. Fluorescent ballast shall be pre-heat, high power factor or high frequency (electric) energy saving type. The ballast shall be subject to one (1) year manufacturer's guarantee. The guarantee shall be filed with the Owner. The ballast shall indicate Bureau of Produce Standards approval (with "PS" mark)

c. Fluorescent fixture housing shall be GA. 22 minimum, with baked enamel finish.

d. Downlights and pinlights shall be of heavy gauge spun aluminum with wooden plaster bevel and equipped with the lamp type indicated on the drawings. Pinlights shall have no live parts exposed at the back of the fixtures. Minimum opening diameter shall be 150 mm and minimum depth shall be 200 mm.

e. Fluorescent lamps shall be cool-white and lampholders shall be made of thermosetting plastic.

f. Special lighting requirements shall be as call for the Drawings.

16500.3 INSTALLATION

Coordinate with the Ceiling Contractor and the General Contractor in order that the proper type of fixture be furnished to match the ceiling system or building construction material.

SECTION 16721 FIRE ALARM AND DETECTION SYSTEM

16721.1 GENERAL

Furnish and install a fire-alarm system as described in these Specifications and indicated on the Drawings. The system is to be wired and installed in accordance with the Manufacturer's Specifications and left in first class operating condition.

16721.2 OPERATION

At each designated exit, and other locations shown on the plans, there shall be a non-coded fire alarm station. At each location, where shown, there shall be a bell or horn. Operating any station shall cause all sounding devices to operate continuously until the fire alarm has been restored to normal. It shall also be possible for those in authority to transmit a test signal from any station. The stations and sounding devices shall be connected to a control panel, which shall permit a small supervisory current to pass through the entire system. A trouble bell shall also be provided and shall sound continuously in the event of failure of the main power supply source or a ground fault of its installation wiring circuit.

16721.3 EQUIPMENT

a. Install where shown a non-coded manual fire alarm station. Station shall mount on standard outlet boxes with single gang cover.

b. Install where shown on plans an underdome vibrating bell

c. Install where shown a close-circuit fire alarm control panel n wall-type steel cabinet equipped with hinged door and with lock and keys. Panel shall contain all necessary relays, meters, resistance, thermal cutouts, terminals and fuses for the control and double supervision of the system. Panel shall contain the number of zone and station circuits required. A trouble bell shall be provided for external connection.

d. All interior wiring shall be strictly in accordance with NFPA Code 72 and all local electrical and fire codes applying. Size and number of wire shall be in accordance with wiring diagram supplied by manufacturer of fire-alarm system, but shall not be less than as shown on the Drawings.

e. Provide and install smoke detector and other automatic detectors as required. The fire alarm panel shall be factory-wired to accept these any other devices specified herein or as shown on the Drawings.

f. All materials and equipment shall be U.L. listed.

SECTION 16740 TELEPHONE SYSTEM

16740.1 GENERAL

Furnish and install the complete telephone system from the point indicated on the Drawings up to all outlets including raceways, cables, cabinets, terminals, outlets and wall plates.

16740.2 MATERIAL SPECIFICATIONS

a. Material shall conform to the latest PLDT Manual of Building Telephone Facilities, or the requirement of the telephone company holding the franchise.

b. Cabinets and pull boxes shall be gauge 18 sheet steel, with anti-corrosive and acrylic paint finish. Terminal or protector cabinets shall be provided with 19mm thick anti-termite pressure treated plywood backboard and with knockouts for conduit entrances.

c. Station wiring to outlets shall be 0.65mm diameter, 3 conductor (0.65/3C) (No. 22/3C) jacketed wires.

d. Terminal shall be acceptable to PLDT or the local telephone company.

16740.3 DRAWINGS

Prepare the necessary drawings for PLDT, or the local telephone company signed and sealed by a licensed Electronics and Communication Engineer. Any change in layout and sizes required by the local telephone company shall be incorporated on the plans and in the installation.

SECTION 16401 OVERHEAD DISTRIBUTION SYSTEM

PART I : PRIMARY (HIGH VOLTAGE) - not included

PART II : SECONDARY (LOW VOLTAGE) DISTRIBUTION

16401.1 GENERAL

Provide and install complete outside secondary distribution system or systems as indicated on the drawings specific scope of works shall be as described on the drawings or as indicated elsewhere in the Specifications. Connections and tapping work shall include the following:

a. To utility company facilities - sufficient length of cables (2meters minimum) and quantity of solderless connection shall be provided by the contractor.

b. To building under construction or renovation - sufficient length of cables

c. To existing building - sufficient length of cable, quantity of properly sized connector and the tapping work itself shall be provided by the contractor.

16401.2 MATERIALS TYPE OF CONSTRUCTION

Supply lines shall be insulated power cables supported by messenger cable from clamps bolted to the sides of poles or crossarms. Poles shall be pre-cast concrete round poles.

16401.3 CONCRETE POLES SPECIFICATIONS

Concrete poles shall be Class 7A per Meralco and NEA Standards.

16401.4 POLE SETTING

a. Holes for poles should be large enough to admit the poles without any slicing or chapping and should be of the same diameter from top to bottom. The diameter of the hole shall be large enough so that a tamping bag can be worked on all sides between the pole and the sides of the hole.

b. Poles shall be set in alignment and plumb except at corners, terminals, angles, junctions or other points of strains where they shall be set and raked against the strain so that the tension of the cables will tend to straighten them. Poles shall be raked against the conductor strain not less than 2.5cm for each 3meters of pole length nor more than 7.6cm for each 3 meters of pole length after the conductor are installed at the required tension. Pole backfill must be thoroughly and slowly tampered the full depth.. Excess earth must be banked around pole.

16401.5 CROSSARMS

a. Crossarms shall withstand all the vertical and transverse loads that the structure will experience, computed in accordance with or a specified in the pertinent provisions of the Philippine Electrical Code, Part II without exceeding 50% of the designated fiber stress of the material or a minimum of 320kg., applied horizontal load applied at the outermost conductor attachment point, whichever is greater.

b. Wood crossarm shall be of selected tanguile or lauan with a minimum cross section of 83mm x 110mm.

c. Wood crossarm shall be free from all defects (subject to inspection prior to installation) and shall be treated with approved preservative preferably creosote Petroleum (70-30)

16401.6 LINE HARDWARE

a. Line hardware shall be hot dip galvanized iron or steel, with U.S. Standard cut threads.

b. Belts shall have sufficient length for the intended use.

c. Round washers shall be used under heads of carriage bolts, which fasten crossarms to crossarm. Square washer shall be used for others.

d. Guy clamps shall be 3 bolts heavy type.

16401.7 CABLES

Cables shall be as specified on the Drawings. Conductors shall be U.L. listed. Steel cable messenger wires and guying shall be U.S. made.

16401.8 GUYING

a. Poles shall be provided with guys to ensure continuity of service under the most severe condition that are likely to be obtained.

b. Terminal poles and poles carrying two sets of double crossams shall be head guyed. Side guys shall be installed on other poles.

c. Where it impractical to install a guy directly from the attachment to the ground, a side walk guy shall be used.

SECTION 16612 GENERATOR

16612.1 GENERAL

Unless expressly deleted or not included in other contract documents defining the scope of work, the contractor shall furnish the install, as indicated on the Drawings, a complete standby engine generator set rated as shown on the Drawings.

16612.2 SPECIFICATIONS

a. All materials shall be new and of current manufacture.

b. Voltage, phase and kilowatt (or kva) rating shall be as shown on the Drawings. Alternators shall be 4-pole, 1800 RPM, 60Hz. Alternator shall be manufactured to NEMA Standards. Voltage regulation shall be as specified on the Drawings.

c. The engine shall operate satisfactorily on the fuel specified. The horsepower rating shall be adequate for the requirements of the alternator including the motor starting capability. The engine shall have a battery, a starting motor and a charging generator. Engine control shall include start-stop mechanism, high-water-temperature shutdown, low oil pressure shutdown, over speed shutdown and cranking limiter.

d. Instrument panel: The instrument panel on the standby unit shall contain engine oil-pressure and water temperature indicators, battery charge rate ammeter, start and stop button for manual operation of unit, manual reset circuit breaker, voltage regulator ammeter with phase selector switch, running time and frequency meter.

e. Control panel: The control panel shall contain the necessary control equipment to automatically start the standby generator set when the line voltage drops to 70 percent of normal value.

f. Other accessories shall include an air cleaner, lube oil filter, 8-hr capacity fuel tank and fuel lines, muffler and flexible exhaust fittings, parts list and maintenance manual.

g. The transfer switch shall be as described on the Drawings.

    1. Automatic Transfer Switch and Control (ATS) shall be contactor type, electrically and mechanically interlocked and mechanically held at both positions. Time delay of transfer from normal to emergency shall be 1-10 seconds. Time delay transfer from emergency to normal source shall be 2-10 minutes. The cool off

time delay shall be as required by the engines. The ATS shall contain N.O. and N.C, auxiliary contacts.

2. Manual transfer switch shall be double throw, quick make, quick break switches or mechanically interlocked circuit breakers, as specified on the Drawings. Green and Red power available indicating lights for normal and emergency respectively shall be provided.

16612.3 INSTALLATION

a. The generator set shall be cushion mounted on a heavy steel base and be free from torsional vibration.

b. An operational test shall be conducted after installation to insure that all units of the system will operate satisfactorily under all conditions required by the specifications. This shall be done in the presence of an approved representative of the Architect/Engineer.

SECTION 16671 NURSES' CALL SYSTEM

16671.1 GENERAL

Supply and install a complete nurses' call system as described on the drawings and as specified herein.

16671.2 GENERAL SPECIFICATIONS

The nurses' call system shall be an integrated nurse/patient communications system consisting of central monitors, call stations, auxiliary annunciators configured to meet the hospital's specific needs to enable the hospital to attend promptly to the patient's needs with minimum personnel.

a. The system shall utilize low-voltage solid-state electronics for safe, reliable and quiet operation.

b. The system shall have a call acknowledgment feature. Calls shall lock into the central monitor until canceled at the origin. Monitor indicators and corridor lights shall remain ON until the call is canceled at the calling station.

c. The system shall provide for both normal and emergency calls. Calls from the lavatory callstation shall always be in the emergency mode. Calls from the bedside shall be optionally programmable at the central monitor to be either in the emergency or normal mode, depending on the patient status.

16761.3 COMPONENT SPECIFICATIONS

The system components shall be as manufactured by Trident Electronics Corporation or approved equivalent, and as hereunder specified.

a. The CENTRAL MONITOR, including expansion monitor units shall be a desk-mounted unit or units with a total callstation capacity equal to or exceeding the number of proposed call stations as specifically indicated on the drawings. The front panel/panels shall contain individual call indicators, call acknowledge buttons, slots for room/bed number labels, as well as common indicators for normal calls, beepers for normal and emergency calls and power indicators. If the drawing so specifies, the monitor/s shall allow voice communication between nurse and patient, and shall be provided with phone handset, paging button and volume control for incoming voice level.

b. The BED SIDE CALL STATION shall have a call assurance indicator and one call switch on a two meter cord as called for on the drawings. If so specified therein the bedside call stations shall provide for voice communication between nurse and patient through a built-in speaker/microphone.

c. The LAVATORY CALL STATION shall have a plate mounted push-on/push-off call switch and a call assurance indicator.

d. A STAFF CALL STATION shall transmit to the staff room by voice communication and visual indication any current call received at the central monitor.

e. CORRIDOR LIGHTS, used to announce call originating from within a room shall be of two sections, an upper section and a lower section. The upper section shall blink for normal calls while the lower section shall blink for emergency calls. The two sections shall be of different colors, preferably white for normal and red for emergency

f. The POWER SUPPLY shall contain sealed rechargeable batteries and automatic charger and shall provide four (4) hours of back-up power in case of power failure.

16761.4 INSTALLATION

The system shall be installed by skilled workmen knowledgeable on the system installation and operation. The wiring system shall be as required by the equipment supplier but shall not be less than or inferior to the wiring system required by the plans.

16761.5 APPROVAL AND GUARANTEE

The brochures, specifications and shop drawings of the system intended to be installed by the Contractor shall be submitted for approval by the Architect/Engineer not later than 30 calendar days from start of contract period or 50% of contract duration exclusive of any time extensions and suspensions duly granted. The installed system shall be guaranteed by the contractor for one year upon acceptance. This guarantee shall be apart from the guarantee by the equipment supplier. The documents attesting to the supplier's guarantee shall also be filed with the Owner.