TECHNICAL SPECIFICATIONS

PROPOSED PROJECT: CONSTRUCTION OF PINEAPPLE PROCESSING CENTER

LOCATION: BRGY. NIEVA, GEN. LUNA, QUEZON

CATEGORY: BUILDING

GENERAL REQUIREMENTS

All parts of the construction shall be finished with first class workmanship to the fullest panel and meaning of the plans and this specification, and to the satisfaction of the Engineer and the owner.

The construction shall confirm to all the requirement of Department of Public Works and Highways (DPWH), and the local: rules and regulations of the Municipality of General Luna, Quezon.

1.1 Mobilization Include all the transportation to the site of Contractor's plans, materials, equipment, employees, furnishing, and temporary facilities.
1.2 Temporary Facilities Temporary facilities shall include but not be limited to the following items:
a. Site/Field Office- it shall be 4m x 5m field office located by the Engineer. The field office shall be wooden construction with plywood siding and corrugated G.I. Sheet roofing. It shall be provided with necessary facilities specified by the Engineer.
b. Workshops, warehouse, stockpile areas and storage areas for materials equipment.
c. Construction camp for housing and accommodation of Contractor's employees.
d. Community facilities including potable water supply, electric power requirements, drainage, sewerage disposal, first aid, refuse collection, temporary fence and barricades, and fire protection facilities.

SITE OF WORKING

Site Clearing and Grubbing

All superficial obstruction shall be demolished and removed from the site and spread uniformly over the areas adjacent to the proposed building or otherwise disposed off to disposal areas approved by the engineer.
The building site shall be leveled according to the plans and cleared of rubbish, roots and other deleterious materials to a suitable sub-grade.

Excavation

All excavation shall be made to grade shown in the drawings. A backhoe shall be used in the performance of the work, where the building site is covered with any kind of fill, the excavations for footing shall be made deeper until the stratum of the safe bearing capacity of the soil reached. Then it shall be refilled to the proper grade with thoroughly compacted suitable materials approved by the Engineer.
Whenever water is encountered in the excavation process, it shall be removed by building or pumping diverted to suitable disposal points.

Backfills and Fills

Whenever the concrete for foundations is hard enough ti withstand the pressure resulting from fills. The materials removed from excavation shall used for backfill around them. The fill and backfill materials shall be free from roots, wood scraps and other

extraneous materials.
Backfills and Fills shall be placed in layers not exceeding 150mm in thickness, and each layer shall be thoroughly compacted.

REINFORCED CONCRETE

DESCRIPTION

This Item shall consist of furnishing, placing and finishing concrete in buildings and related structures, flood control and drainage, ports, and water supply structures in accordance with this specification and conforming to the lines, grades, and dimension shown on the plans.

Materials Requirements

Portland Cement

This shall conform to the requirement of ITEM 700, Volume II (BlueBook), Hydraulic cement.

Concrete Aggregates

Concrete Quality
All plans submitted for approval or used for any project shall clearly show the specified strength, fc', of concrete of the specified age for which each part of the structure was designed.
Concrete that will be exposed to sulfate containing or other chemically aggressive solutions shall be proportioned in accordance with "Recommended Practice for Selecting Proportions for Concrete (ACI 613)" and Recommended Practice for Selecting Proportions for Structural Lightweight Concrete (ACI 613A)."

METHODS OF DETERMINING THE PROPORTIONS OF CONCRETE

The determination of the proportions of cement, aggregate, and water to attain the required
strengths shall be made by one of the following methods, but lower water-cement ratios may be required for conformance with the quality of concrete.

TABLE 900.1 MAXIMUM PERMISSIBLEWATER-CEMENT RATIOS FOR CONCRETE (METHOD NO.1)

Specified compressive strength at 28 days, psi fc	Maximum permissible water-cement ratio			
	Non air-entrained concrete		Air-entrained concrete	
	U.S. gal. per 42.6 kg. bag of cement	Absolute ratio by weight	U.S. gal per 42.6 kg. bag of cement	Absolute ratio by weight
2500	7 ¼	0.642	6 ¼	0.554
3000	6 ½	0.576	5 ¼	0.465
3500	5 ¾	0.510	4 ½	0.399
4000	5	0.443	4	0.354

Concrete Proportions and Consistency

The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the form and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface. The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work.

Sampling and Testing of Structural Concrete

As work progress, at least one (1) set of sample consisting of three (3) concrete cylinder test specimens, 150 x 300 mm shall be taken from each class of concrete placed each day, and each set to represent not more than 75 cu m of concrete.

Consistency

Concrete shall have a consistency such that it will be workable in the required position. It shall be such a consistency that it will flow around reinforcing steel but individual particles of the coarse aggregate when isolated shall show a coating or mortar containing its proportionate amount of sand. The consistency of concrete shall be gauged by the ability of the equipment to properly placed it and not by the difficulty of mixing water shall be determined by the Engineer and shall not be varied without his consent. Concrete as dry as it is practical to place with the equipment specified shall be used.

Strength Test of Concrete

When strength is a basis for acceptance, each class of concrete shall be represented by at least five test (10 specimens). Two specimens shall be made for each test at a given age, and not less than one test shall be made for each 150 cu yd of structural concrete, but there shall be at least one test for each days concreting. The Building Official may require a reasonable number of additional tests during the progress of the work. Samples from which compression test specimens are molded shall be secured in accordance with ASTM C 172. Specimens made to check the adequacy of the proportions for strength of concrete or as a basis for acceptance of concrete shall be made and laboratory-cured in accordance with ASTM C 31. Additional test specimens cured entirely under field conditions may be required by the Building Official to check the adequacy of curing and protection of the concrete. Strength tests shall be made in accordance with ASTM C 39.
The age for strength tests shall be 28 days Of, where specified, the earlier age at which the concrete is to receive its full load or maximum j stress. Additional test may be made at earlier ages to obtain advance information on the adequacy of strength development where age-strength relationships have been established for the materials and proportions used.

Minimum Strength, Concrete other than fill, shall have a minimum compressive strength at 28 days of 140 kilograms per square centimeter (2000 psi).

Batching
Batching shall conform to the requirements of Item 405, Structural Concrete.

Mixing and Delivery
Mixing and delivery shall conform to the requirements of Item 405, Structural Concrete.

Concrete Surface Finishing: General

This shall be in accordance with Item 407, Concrete Structures.

Curing Concrete (See subsection 407)

Acceptance of Concrete

The strength of concrete shall be deemed acceptable if the average of 3 consecutive strength test results is equal to or exceed the specified strength and no individual test result falls below the specified strength by more than 15 %.
Concrete deemed to be not acceptable using the above criteria may be rejected unless contractor can provide evidence, by means of core tests, that the quality of concrete represented by the failed test result is acceptable in place. Three (3) cores shall be obtained from the affected area and cured and tested in accordance with AASHTO T24.
Concrete in the area represented by the cores will be deemed acceptable if the average of cores is equal to or at least 85 % and no sample core is less than 75 % of the specified strength otherwise it shall be rejected.

METHOD OF MEASUREMENT

The quantity of concrete to be paid shall be the quantity shown in the Bid Schedule, unless changes in design are made in which case the quantity shown in the Bid Schedule will be adjusted by the amount of the change for the purpose of payment. No deduction will be made for the volume occupied by the pipe less than 101 mm (4") in diameter nor for reinforcing steel. anchors, weepholes or expansion materials.

BASIS OF PAYMENT

The accepted quantities of structural concrete completed in place will be paid for at the contract unit price for cubic meter as indicated on the Bid Schedule.

Pay Item and Description Unit of measurement

Structural Concrete Cubic Meter

Such prices and payment shall be full compensation for furnishing all materials, including metal water stops, joints, joint fillers, weep holes, and rock backing and timber bumpers; for all form and false work; for mixing, placing, furnishing, and curing the concrete;

STORM DRAINAGE AND SEWERAGE SYSTEM

DESCRIPTION

This Item shall consist of furnishing all materials, equipment and labor for the complete installation of the storm drainage system to include all piping's, gutters, canals, catch basins, junction boxes, hand holes, manholes and other appurtenant structures, and sewerage system to include all sanitary sewer piping and septic vault where no public sewer exist, from the building to the point of discharge.

MATERIAL REQUIREMENTS

Materials for storm drainage system shall meet the requirements specified in the following standard specifications:

Portland Cement ASTM C-150
Fine and Coarse Aggregate ASTM C-33
Reinforcing Steel ASTM A-615

Non-reinforced Concrete Pipes ASTM C-14
Reinforced Concrete Pipes ASTM C-76 (AASHTO M-86)
Cast Iron Pipes (for conductors ASTM A-74 and downspout)
Galvanized Iron Pipes Scheduled 40 ASTM A-120 (for conductors and downspouts)
Polyvinyl Chloride (PVC) ASTM 2729

Where the covers for catch basins, junction boxes, manholes and canals for gratings are required same shall be made of wrought iron and of the dimensions as shown on the Plans.

CONCRETE STRUCTURES

Concrete structures such as catch basins, canal gutters, junction boxes and manholes for the drainage system, and septic vault for sewerage system, shall be constructed in accordance with the Plans and Specifications on Concrete Work.

SEWER CONNECTIONS AND CLEAN-OUTS

The outlet of the septic vault shall be connected to the street drain or to other discharge point where no sanitary sewer exists. Connection with the sanitary sewer shall not be made without the permission of the proper authorities, but shall be made in such a manner that any and all the service water, as well as house and other liquid wastes, will flow to the sanitary sewer. Provided, that isolated faucets used exclusively for garden purposes may, in the discretion of the proper authorities, be allowed not to flow into the sanitary sewer.

Clean-outs or rodding holes consisting of cast iron extensions with long sweep elbow fittings shall be provided at the ends of runs and at every change of directions. Clean-outs shall be capped with cast brass ferrules with threads and screwed-on removable brass plugs. Clean- outs extended outside the building and raised to the level of finished grade shall be terminated with the same cast brass ferrule with brass plug set into a concrete slab shall be 150mm thick and 300mm square, finish flush with grade.

INCIDENTAL EARTHWORK

Incidental earthwork for the storm drainage and sewerage systems, such as excavation and backfilling shall be undertaken in accordance with applicable part of Excavation Filling and Grading.

INSPECTION AND QUALITY CONTROL

Materials shall be inspected and accepted as to quality before same are installed. Piping's installed in trenches shall first be inspected, tested and approved by the Engineer before these are covered
or backfilled. All defects/ lakes disclosed by the water test shall be remedied to the satisfaction of
the Engineer and any extra cost shall be at the expense of the Contractor.
BASIS OF PAYMENT

The quantities as determined in sub-section 1001.4 shall be paid at the contract unit price for each of the Items which shall constitute full compensation for all materials, labor, tools and equipment and all other incidentals necessary to complete the Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1001.2 (a)	Pipe (kind and size)	meter
1001.2 (b)	Fitting (kind and size)	each
1001.2 (c)	Concrete Gutter	meter
1001.2 (d)	Concrete Canal	meter
1001.2 (e)	W. I. Grating	meter
1001.2 (f)	Catch Basin	each
1001.2 (g)	Junction Box	Each

PLUMBING

DESCRIPTION

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

MATERIAL REQUIREMENTS

All piping materials, fixtures and appliances fitting accessories whether specifically mentioned or not but necessary to complete this Item shall be furnished and installed.

DISINFECTION

a. The entire water distribution system shall be thoroughly flushed and treated with chlorine before it is operated for public use.
b. Disinfection materials shall be liquid chlorine or hypochlerite and shall be introduced in a manner approved as practiced or approved by the Engineer into the water distribution system.
c. After a contact period of not less than sixteen hours, the heavenly chlorinated water shall be flushed from the system with potable water.
d. Valves for the water distribution system shall be opened and closed several times during the 16 hours chlorination treatment is done.

AS-BUILT DRAWINGS

Upon completion of the work, the Contractor shall submit two sets of prints with all as-built changes shown on the drawings in a neat workmanship manner. Such prints shall show changes or actual installation and conditions of the plumbing system in comparison with the original drawings.

METHOD OF MEASUREMENT

The work done under this Item shall be quantified per length and/or number of units as provided in the Bill of Quantities, tested and accepted to the satisfaction of the Engineer.

BASIS OF PAYMENT

The quantified items, installed in place shall be the basis for payment based from the unit bid price for which prices and payments shall constitute full compensation including labor, materials and incidentals necessary to complete this Item.

Payment shall be made:

Pay Item Number	Description	Unit of Measurement
1002 (a)	Cast Iron Soil Pipes and Fittings	pieces/length
1002 (b)	Galvanized Iron Pipes and Fittings	pieces/length
1002(c)	Plumbing Fixtures	set
1002 (d)	Roof Drain with Strainer	set

CARPENTRY AND JOINERY WORKS

DESCRIPTION

The work under this Item shall consist of furnishing all required materials, fabricated woodwork, tools, equipment and labor and performing all operations necessary for the satisfactory completion of all carpentry and joinery works in strict accord with applicable drawings, details and these Specifications.

MATERIAL REQUIREMENTS

Lumber

Lumber of the different species herein specified for the various parts of the structure shall be well seasoned, sawn straight, sundried or kilndried and free from defects such as loose unsound knots, pitch I~- pockets, sapwood, cracks and other imperfections impairing its strength, durability and appearance.

Grades of Lumber and Usage

a. Stress grade is seasoned, close-grained and high quality lumber 1~ of the specified specie free from defects and suitable for sustaining heavy loads.
Stress grade lumber shall be used for wooden structural members, subject to heavy loads, and for sub-floor, framing embedded or in contact with concrete or masonry.

b. Select grade lumber of the specified specie is generally of high quality, of good appearance, without imperfections, and suitable for use ff without waste due to defects and suitable also for natural finish. Select grade lumber shall be used for flooring; sidings, facia and it base boards, trims, mouldings, millwork, railings, stairs, cabinet work, shelvings, doors, windows and frames of openings.
c. Common grade lumber has minimum tight medium knot not larger, than 25 mm in diameter, with minimal imperfections, without sapwood, without decay, insect holes, and suitable for use with some waste due to minor defects and suitable also for paint finish.

STEEL WINDOWS

DESCRIPTION

This Item shall consist of all fabricated steel windows fully equipped with fixing accessories and locking devices as shown on the Plans and in accordance with this Specification.

MATERIAL REQUIREMENTS

All members shall be of hot-rolled, low carbon, new billet steel, heavy section with depth of at least 33mm and web thickness of at least 3mm. Frame members shall be of equal leg design section only at points where called for or shown on detailed drawings. Continuous angle fins, as indicated shall be furnished. Zee type section of special design with offset permitting down turned leg of the ventilator member to seat flush when ventilator is in a fully closed position, shall be used for frame at sills.Ventilator members shall be special angle shape. Frames of ventilator members shall have integral weather baffles providing double flat parallel weathering contacts of not less than 6mm width on all four sides of the ventilator. Muntins shall be 25mm by 25mm rolled-tee sections. All members to be used shall conform to the specification requirements of ASTM A "505. The frame member shall afford not less than 16mm continuous anchorage to surrounding masonry. Unless otherwise specified/or indicated on Plan as residential casement, special size of section shall be used.

METHOD OF MEASUREMENT

Steel windows shall be measured by actual in place installed with respective design/style and type of operation in square meters.

BASIS OF PAYMENT

The actual area in square meters of steel windows satisfactorily installed and ready for service shall be the basis for payment based on the unit bid or contract unit price.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1005 (a)	Residential Casement	square meters
1005(b)	Heavy Duty Side-hinged Ventilator	square meters
1005 (c)	Projected Ventilator	square meters
1005 (d)	Awing ventilator	square meters

STEEL DOORS AND FRAMES

DESCRIPTION

This Item shall consist of furnishing and installing all fabricated steel doors and frames equipped with fixing accessories and locking devices in accordance with the Plans and/or shop drawings and as herein specified.

MATERIAL REQUIREMENTS

All door cladding plates or panels shall be formed from gauge 20 cold-rolled, prime quality steel. Frames shall be formed from gauge 16 cold-rolled steel. The materials used shall conform to the specification requirement of ASTM-A505.

Tubular Door (Casement/Sliding)

Hollow steel doors shall be custom built of size and details as indicated on the Plans and/or shop drawings. Cladding of doors shall be flush or louver type. Doors shall be 44 mm thick, side hinged or overhead· hung, as called for on the Plans.

Flush doors shall be constructed from two outer steel sheets not lighter than gauge 20, with edges welded and finished flush. The outer face sheets shall be reinforced with gauge 24 vertical channels or interlocking zee members. Sound insulation fillers of cork fiberboard, mineral wool board or asbestos shall be placed full height in spaces between reinforcing channels. Doors shall have smooth, flush surfaces without any visible joints or seams on exposed faces or stile edges except around glazed or louvered pane inserts. Top and bottom frame of doors shall have continuous reinforcing channels welded to face sheets. The channel for exterior doors shall be inverted type, not lighter than gauge 16, constructed to form a weather seal. Glazed opening shall be provided where indicated and molding around glazed openings shall not be lighter than gauge 20 metal.

CONSTRUCTION REQUIREMENTS

Fabrication

Corner joints of frames shall be mitered and welded conforming to manufacturer's standard manual for metal doors. All contact edges be closed tight. Welds on exposed surface shall be ground smooth and shall be neat in appearance. Joints for knock-down type frame corners shall be designed for simple field assembly of header to jamb members by concealed tenon, splice plates, or other type concealed in interlocking joint that will produce square and rigid corners. Joints shall be securely locked in place during erection and the alignment of adjoining members shall be maintained. All bolted connections shall be provided with lock units.

Shop Finish

a. Hot or Cold Phosphate Surface Treatment
All steel doors, frames and louvers shall be cleaned thoroughly, phosphate-treated to assure maximum paint adherence and prime finish, in accordance with the following operations:

After fabrication, grease and dirt shall be removed by a hot alkali solution and rinsed with hot water.
After cleaning, all parts shall be immersed in hot or cold phosphate solution and rinsed with a diluted solution or chronic acid.
After drying under controlled temperature, one coat of shop primer shall be applied by dipping type especially developed for materials treated with phosphates.
The cleaning, phosphate, dipping or spraying of shop primer and even drying shall be done on a continuous operation in the factory.

INSTALLATION

Steel doors, frames and louvers shall be set plumb and true in 'The joint between frame and masonry shall be carefully contacts between door/frame and adjacent steel shall be sealed with mastic.

WALL ANCHORS

A minimum of three anchors shall be provided for each jamb. Anchors shall be located opposite the top and bottom hinges and midway between top and bottom anchors.

METHOD OF MEASUREMENT

Steel doors, frames, louvers, accessories and hardware shall be measured in square meters/per set as shown on the Plans. A set shall consist of metal door, jambs, anchors and hardware except locksets.

BASIS OF PAYMENT

The area in m2 for every hollow steel door, flush door, grille door and steel louver installed ready for service shall be the basis of payment based on the unit bid or contract unit price

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
1006 (a)	Hollow Steel Door	m2/set
1006 (b)	Flush Door	m2/set
1006 (c)	Grille Door	m2/set
1006 (d)	Steel Louver Door	m2/set

ALUMINUM GLASS DOORS

DESCRIPTION

This Item shall consist of furnishing all aluminum glass door materials, labor, tools and equipment required in undertaking the proper installation as shown on the Plans and in accordance with this Specification.

MATERIAL REQUIREMENTS

Frame and panel members shall be fabricated from extruded aluminum sections true to details with clean, straight, sharply defined profiles and free from defects impairing strength or durability. Extruded aluminum sections shall conform to the specification requirements as defined in ASTM B 211.

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

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

Vinyl weather strip shall be first class quality flexible vinyl forming an effective seal and without adverse deformation when installed.

Pile weather strip shall be silicon treated and free from residual wetting agents and made of soft fine hair as on wool, fur, etc.

Glazing shall conform to the requirement specified in Item 1012 - Glass and Glazing.
1007.3 Construction Requirements

For all assembly and fabrication works the cut ends shall be true and accurately jointed, free of burrs and rough edges. Cut-out recesses, mortising, grinding operation for hardware shall be accurately made and properly reinforced when necessary.

INSTALLATION PROCEDURE

Main frame shall consist of head sill and jamb stiles specifically designed and machined to interfit and are joined at corners with self-threading screws.

Frame sill shall be stepped and sloped with offset weep holes for efficient drainage to the exterior.

Door panel shall be accurately joined at corners assembled and fixed rigidly to ensure weather tightness.

Aluminum glass door and main frame shall be installed in a prepared opening to be set plumb, square. Level and true to details.

All joints between metal surface and masonry shall be fully caulked to ensure weather tightness.

Sliding type door panel shall be equipped with concealed roller overhead tracks with bottom guide.

Double action type door panel shall be ~quipped with heavy duty hinges that will control the door leaf in a close or open position.

Weather-strip shall be furnished on edges at the meeting stiles of doors.

Where aluminum is to be in contact with steel concrete cinder, block, tile, plaster or other similar masonry construction the aluminum surface shall be back pain-ted before erection with a bituminous paint.

CLEANING

The Contractor does not only protect all entrance units during construction but also responsible for removal of protective materials and cleaning aluminum surfaces.
Aluminum shall be thoroughly cleaned with plain water with kerosene or gasoline and then wipe surfaces using clean cotton fabric. No abrasive cleaning agents shall be permitted.

METHOD OF MEASUREMENT

Aluminum glass door, fully equipped with fixing accessories and locking devices shall be measured in square meters base on actual in place installed as shown on the Plans accepted to the satisfaction of the Engineer.

1007.5 Basis of Payment
The area in square meters of aluminum glass doors installed including main frame and ready for service as provided in Item 1007.4 shall be the basis of payment based on the unit bid or contract unit price.

ALUMINUM GLASS WINDOWS

DESCRIPTION

This Item shall consist of furnishing all aluminum glass window materials, labor, tools and equipment required in undertaking the proper installation as shown on the Plans and in accordance with this Specification.

MATERIAL REQUIREMENTS

Frame and panel members shall be fabricated from extruded aluminum section true to details with clean, straight, sharply defined profiles and free from defects impairing

strength or durability. Extruded aluminum section shall conform to the specification requirements defined in ASTM B 211.

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

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

Weather-strip shall be first class quality flexible vinyl forming an effective seal and without adverse deformation when installed.

Glazing shall conform to the requirements specified in Item 1012.

Pile weatherstrip shall be silicon treated and free from residual wetting agents made of soft fine hair as on wool, fur, etc.

CONSTRUCTION REQUIREMENTS

For all assembly and fabrication works the cut end shall be: true and accurate, free of burrs and rough edges. Cut-outs recesses, mortising and grinding operation for hardware shall be accurately made and properly reinforced.

CORRUGATED METAL ROOFING

DESCRIPTION

This Item shall consist of furnishing all plant equipment, tools, materials and labor required to properly perform and complete the corrugated metal roofing, together with related accessories such as ridge/hip rolls, valleys, gutters and flashing, when called for on Plans all in conformity with his Specifications.

MATERIAL REQUIREMENTS

Corrugated and Plain Galvanized Iron Sheets. Corrugated galvanized iron (G.I.) sheets, including plain G.I. sheets for roofing accessories, shall be cold-rolled meeting ASTM A 153 and with spelter coating of zinc of not less than 0.381 kg/m^2 (1.25 ounces/square foot), conforming to ASTM A 525 OR pns 67:1985. Unless otherwise specified or shown on Plans roofing sheets shall be gauge 26 (0.48 mm thick) and provided in long span sizes to minimize end laps. Sheets shall weigh not less than 3.74 kg/m^2 and shall be marked or stamped showing the gauge, size, amount of zinc coating, brand and name of manufacturer. Test specimens shall stand being bent through 180° flat on itself without fracture of the base metal and without flaking of the zinc coating.

Strap Fasteners

Strap fasteners shall be gauge 26 G.I. 25 mm wide and sufficiently long to bend around up to the opposite face of purlin, with corners chipped off at the riveting ends.

Rivets, Washers and Burrs

Rivets and washers shall be galvanized mild iron. Rivets shall not be less than 5 mm in diameter and 10 mm in length. Washers shall not be less than 1.5 mm thick and 20 mm in outside diameter. Washer’s inside diameter shall provide snug fir to the rivet.

FABRICATED METAL ROOFING ACCESSORIES

Ridge/hip rolls, valleys, flashing and counter flashings, gutters and downspouts, whenever required, shall be fabricated from plain G.I. sheets. Ridge/hip rolls, flashings and counter flashings shall be gauge 26. Valleys, gutters and downspouts shall be gauge 24 unless otherwise specified on Plans. Wire basket strainers shall be galvanized, gauge 24.
Roof ventilators, whenever required shall be fabricated from gauge 26 plain G.I. sheets and constructed to the dimensions and details shown on Plans.

Construction Requirements

Preparatory Work

Preparatory Work to the installation of the corrugated G.I. roofing, purlins should have been placed and spaced properly to fit the length of roofing sheets to be used such that the centerline of the purlins at end laps are 150 mm from the bottom line of end laps and intermediate purlins are place equidistantly. Top of purlins should be at the same plane.

INSTALLATION OF CORRUGATED G.I. SHEETS

Installation of corrugated G.I. sheets with end laps shall start at the lower part of the roof and proceed towards the directon of monsoon wind with side laps of two-and-a-half (2-1/2) corrugations. End laps shall be 250 mm minimum. Each sheet shall be fastened temporarily by
1.83 mm diameter by 25 mm long galvanized flat head nails at valleys of corrugations covered by side or end laps. Succeeding upper rows of corrugated G.I. sheets shall be installed in the same manner until the entire roof area is covered. Valleys, ridge/hip rolls and flashings when required, shall be installed before fastening the roofing sheets with galvanized straps and rivets. One strap shall be riveted at each alternate corrugation at the gutter line, the ridge line and at end laps and the straps bent around and nailed to the purlins. Riveting at intermediate purlins between end laps shall be done at every fourth corrugation. Rivet shall be provided with a galvanized mild iron washer below and one lead and one galvanized iron washer above the sheet. Rivet shall be sufficiently long to permit forming a hemispherical head. Riveting shall be done such that the lead washer shall be compressed to provide a watertight fit around the rivet.

INSTALLATION OF ROOFING ACCESSORIES

a) Ridge and Hip Rolls

Ridge and hip rolls shall lap at least 250 mm over roofing sheets and, together, shall be riveted at every second corrugation.

b) Valleys

Valleys shall lap at least 450 mm each way under the roofing sheets and shall be secured to the framework with galvanized nails, such nails placed below the roofing sheets. Rivets along side of the valley shall be at every second corrugation.

c) Flashing

Flashing, of gauge 26 plain G.I. sheets, unless otherwise specified, shall be installed along intersections of roofs with concrete or masonry walls in accordance with details shown on Plans. Flashing running parallel to sheet corrugation shall lap at least two corrugations with edge turned down. Flashing across sheet corrugation or at an angle

thereto, shall lap at least 250 mm and the edge of flashing turned down at each corrugation. The vertical portion of flashing adjoining wall shall be at least 200 mm wide and provided with counter flashing.

c) Counter Flashing

Counter flashing sheets of gauge 24 plain GI shall be built into preformed wedge-shape groove of concrete or masonry wall. The edge to be built into wall groove shall have a 25 mm strip bent 45 degrees and shall be sealed in the groove with cement mortar or caulking compound.

d) Reglets

Reglets when required per plans in connection with counter flashing shall be fabricated products approved by the Engineer, complete with fittings. Reglets shall be located not less than 200 mm or more than 40 mm above roofing. Reglet plugs shall be spaced not more than 300 mm on centers. Open-type reglets shall be filled with fiber board or other suitable separator to prevent crushing of the slot during installation. The counter flashing shall be
inserted into the full depth of reglet and the reglet lightly punched- every 300'mm to crimp the reglet and the counter flashing together.

e) Gutters

Gutters, from gauge 24 plain G.I. sheets, shall be fabricated to the shape and dimensions indicated on the Plans. The rear side of the gutter shall have a 12.5 mm strip bent 30 degrees and shall be not less than 12.5 mm higher than the opposite side. Gutter joints shall be flat seam folded in the direction of flow and soldered evenly. Otherwise, gutter joints shall be lapped at least 25 mm, fastened together with 3.175 mm diameter (No.8) copper rivets and burrs, and sealed by soldering along both exposed edges of lap. Gutter shall be attached to fascia board or roof nailer with galvanized nails or screws spaced at not more than 900 mm on centers and at a point slightly higher than leading edge of gutter. As additional support, gutter shall have plain G.I. strap hangers 25 mm wide fastened to roof nailers by screw shank-type nails and riveted to the gutter':; leading edge. Strap hangers shall be spaced at not more than 900 mm on centers. When shown on Plans that gutter is not fixed to fascia board or purlin, gutter shall be supported by wrought iron (W.I.) hangers not less than 4.75 mm thick and 19 mm wide spaced at not more than 900 mm on centers. W.I. hanger shall be fabricated to fit configuration of the gutter and attached to fascia board or purlin with two (2) No.8 flat head wood screws. Gutter shall be installed with a pitch of 1 in 100 slope to downspout.

f) Downspouts

1) Downspouts

Unless specified otherwise, downspouts shall be plain G.I., thickness fabricated to the dimensions shown on the Plans and installed at indicated locations. Downspout shall be secured to the wall with G.I. straps 25 mm wide, spaced at more than 1000 mm and anchored with concrete nails. Inlets of downspouts shall be fitted with gauge 14 wire basket strainers.

2) Unplasticized Polyvinyl Chloride Downspouts

When shown on Plans that downspouts are other than G.I. sheets, downspouts shall be unplasticized polyvinyl chloride (UPVC) pipes and fittings with dimensions indicated and conforming with ASTM D 3033 and D 3034. Joints shall be made with either solvent

cement or rubber "O-rings" depending on the design of fitting for the joints. Rubber "O-rings" shall be neoprene type, heat and oil resistant, complying with ASTM F-477. Downspout shall be secured to adjoining wall with plain G.I. straps 25 mm wide and spaced at not more than 1000 mm.

f) Roof Ventillators

Roof ventillators, whenever shown on Plans shall be firmly secured to the roofing or roof structure by means of rivets, Roof ventillators installed on the roof at places other than the ridge shall be provided with adequate flashing around intersection with roofing to ensure watertight joints.

JOINTS OF G.I. ROOFING ACCESSORIES

a) Soldered Joints

Joints made by lapping coupled with riveting shall be rendered watertight by soldering. All edges of uncoated sheet metal to be soldered shall be pretinned before soldering. Soldering shall be done slowly with well heated iron in order to thoroughly heat the seam and sweat the solder completely through the full length of the seam. Upon completion of soldering, acid shall be neutralized by washing thoroughly with water.

b) Non-soldered Joints

Non-soldered joints of G.I. gutters, downspouts and flashings shall be done by flat lock seams. Two adjoining edges of lock seam shall be bent 90°. One bent strip shall be at least 15 mm wide and the connecting piece shall have a bent strip twice in width which shall be bent down over the upturned narrower strip and pressed together. Once properly interlocked, the joint shall be flattened such that the edge of the wider strip be concealed.

ROOF INSTALLATION ON METAL PURLINS

Installation on metal purlins shall follow the same procedure as that on wood purlins, except that fastening shall be done with thread-cutting, zinc-coated steel screws, No. 12 by 50 mm. having hexagonal heads and provided with neoprene washers. Screw holes shall be drilled using 5 mm (13/64") diameter bit.

1013.3.6 Water Leak Test

The completed roofing shall be tested for water tightness at side and end laps at joints of roofing sheets with ridge/hips rolls, valleys and flashings by means of water spray system. The water-spray system shall have nozzle which will deliver water pressure of 2 kg/cm2 directly to the joint being tested in such manner and for a duration directed by the Engineer. All defective works as determined by this test shall be remedied by the contractor at his expense and the test shall be repeated until the work is found satisfactory.

BASIS OF PAYMENT

Payment for completely installed and accepted roofing sheets and required fabricated metal roofing accessories shall be based on actual measurement and the corresponding contract unit price thereof. Payment based on contract unit price shall constitute full compensation.

PREPAINTED METAL SHEETS

Description

This Item shall consist of furnishing all pre-painted metal sheet materials, tools and equipment, plant including labor required in undertaking the proper installation complete as shown on the Plans and in accordance with this Specification.

Material Requirements

All pre-painted metal sheet and roofing accessories shall be oven baked painted true to profiles indicated on the •Plans.

PRE-PAINTED ROOFING SHEETS

Pre-painted roofing sheets shall be fabricated from cold rolled galvanized iron sheets specially tempered steel for extra strength and durability. It shall conform to the material requirements defined in PNS 67: 1985. Profile section in identifying the architectural moulded rib to, be used are as follows: Regular corrugated, Quad-rib, Tri-wave, Rib-wide, twin-rib, etc. Desired color shall be subject to the approval of the Architect/Engineer.

Gutters, Valleys, Flashings Hip and Ridge roll shall be fabricated from gauge 24 (.600 mm thick) cold-rolled plain galvanized iron sheets specially tempered steel. Profile section shall be as indicated on the Plans.

Fastening hardware shall be of galvanized iron straps and rivets. G.I. straps are of .500 mm thick x 16 mm wide x 267 mm long (gauge 26 x 5/8" x 10-1/2") and standard rivets.

Base metal thickness shall correspond to the following gauge designation available locally as follows:

a) Base Metal Thickness Designated Gauges
.400 mm thick Gauge 28
.500 mm thick Gauge 26
.600 mm thick Gauge 24
.800 mm thick Gauge 22
b) Protective Coatings Thickness
1. Zinc 34.4 microns
(244 gm/m2)
2. Paint coatings
Top coat 15.20 microns Bottom coat 6.8 microns
c) Overall thickness with protective coats
d) .400 mm .428-451 mm
.500 mm .532-551 mm
.600 mm .638-651 mm
e) Length of roofing sheets - available in cut to length long span length up to 18.29 meters
f) Special length and thickness are available by arrangements.

CONSTRUCTION REQUIREMENTS

Before any installation work is commenced, the Contractor shall ascertain that the top faces of the purlins are in proper alignment. Correct the alignment as necessary in order to have the top faces of the purlins on an even plane.

CORRUGATED METAL ROOFING

DESCRIPTION

This Item shall consist of furnishing all plant equipment, tools, materials and labor required to properly perform and complete the corrugated metal roofing, together with related accessories such as ridge/hip rolls, valleys, gutters and flashing, when called for on Plans all in conformity with his Specifications.

MATERIAL REQUIREMENTS

Corrugated and Plain Galvanized Iron Sheets

Corrugated galvanized iron (G.I.) sheets, including plain G.I. sheets for roofing accessories, shall be cold-rolled meeting ASTM A 153 and with spelter coating of zinc of not less than 0.381 kg/m^2 (1.25 ounces/square foot), conforming to ASTM A 525 OR pns 67:1985. Unless otherwise specified or shown on Plans roofing sheets shall be gauge 26 (0.48 mm thick) and provided in long span sizes to minimize end laps. Sheets shall weigh not less than 3.74 kg/m^2 and shall be marked or stamped showing the gauge, size, amount of zinc coating, brand and name of manufacturer. Test specimens shall stand being bent through 180° flat on itself without fracture of the base metal and without flaking of the zinc coating.

Strap Fasteners

Strap fasteners shall be gauge 26 G.I. 25 mm wide and sufficiently long to bend around up to the opposite face of purlin, with corners chipped off at the riveting ends.

Rivets, Washers and Burrs

Rivets and washers shall be galvanized mild iron. Rivets shall not be less than 5 mm in diameter and 10 mm in length. Washers shall not be less than 1.5 mm thick and 20 mm in outside diameter. Washer's inside diameter shall provide snug fir to the rivet.

Soldering Lead

Soldering lead shall have a composition of 50 percent tin and 50 percent lead, conforming to ASTM B 32. Rivets and burrs for lap joints of gutters, downspouts and flashing shall be copper not less than 3.175 mm in diameter (No. 8).

FABRICATED METAL ROOFING ACCESSORIES

Ridge/hip rolls, valleys, flashing and counter flashings, gutters and downspouts, whenever required, shall be fabricated from plain G.I. sheets. Ridge/hip rolls, flashings and counter flashings shall be gauge 26. Valleys, gutters and downspouts shall be gauge 24 unless otherwise specified on Plans. Wire basket strainers shall be galvanized, gauge 24.

Roof ventilators, whenever required shall be fabricated from gauge 26 plain G.I. sheets and constructed to the dimensions and details shown on Plans.

CONSTRUCTION REQUIREMENTS

Preparatory Work

Preparatory Work to the installation of the corrugated G.I. roofing, purlins should have been placed and spaced properly to fit the length of roofing sheets to be used such that

the centerline of the purlins at end laps are 150 mm from the bottom line of end laps and intermediate purlins are place equidistantly. Top of purlins should be at the same plane.

Installation of Corrugated G.I. Sheets

Installation of corrugated G.I. sheets with end laps shall start at the lower part of the roof and proceed towards the directon omonsoon wind with side laps of two-and-a-half (2-1/2) corrugations. End laps shall be 250 mm minimum. Each sheet shall be fastened temporarily by
1.83 mm diameter by 25 mm long galvanized flat head nails at valleys of corrugations covered by side or end laps. Succeeding upper rows of corrugated G.I. sheets shall be installed in the same manner until the entire roof area is covered. Valleys, ridge/hip rolls and flashings when required, shall be installed before fastening the roofing sheets with galvanized straps and rivets. One strap shall be riveted at each alternate corrugation at the gutter line, the ridge line and at end laps and the straps bent around and nailed to the purlins. Riveting at intermediate purlins between end laps shall be done at every fourth corrugation. Rivet shall be provided with a galvanized mild iron washer below and one lead and one galvanized iron washer above the sheet. Rivet shall be sufficiently long to permit forming a hemispherical head. Riveting shall be done such that the lead washer shall be compressed to provide a watertight fit around the rivet.

The completed roofing shall be tested for water tightness at side and end laps at joints of roofing sheets with ridge/hips rolls, valleys and flashings by means of water spray system. The water-spray system shall have nozzle which will deliver water pressure of 2 kg/cm2 directly to the joint being tested in such manner and for a duration directed by the Engineer. All defective works as determined by this test shall be remedied by the contractor at his expense and the test shall be repeated until the work is found satisfactory.

METHOD OF MEASUREMENT

Roofing sheets shall be measured and paid for on an area basis in square meters or part thereof, such roofing sheets including all laps, fasteners and rivets as installed complete and accepted.
Ridge/hip rolls, flashings, valleys, gutters and down-spouts shall be measured in linear metre of completed and accepter work such measurement shall include necessary straps and fixings required for complete installation.
Roof ventilators shall be measured and paid for per unit completely installed and accepted.
The different pay Items under roofing work shall be designated the following number, description and unit of measure:

BASIS OF PAYMENT

Payment for completely installed and accepted roofing sheets and required fabricated metal roofing accessories shall be based on actual measurement and the corresponding contract unit price thereof. Payment based on contract unit price shall constitute full compensation.

PREPAINTED METAL SHEETS

DESCRIPTION

This Item shall consist of furnishing all pre-painted metal sheet materials, tools and equipment, plant including labor required in undertaking the proper installation

complete as shown on the Plans and in accordance with this Specification.

MATERIAL REQUIREMENTS

All pre-painted metal sheet and roofing accessories shall be oven baked painted true to profiles indicated on the ·Plans.

PRE-PAINTED ROOFING SHEETS

Pre-painted roofing sheets shall be fabricated from cold rolled galvanized iron sheets specially tempered steel for extra strength and durability. It shall conform to the material requirements defined in PNS 67: 1985. Profile section in identifying the architectural moulded rib to, be used are as follows: Regular corrugated, Quad-rib, Tri-wave, Rib-wide, twin-rib, etc. Desired color shall be subject to the approval of the Architect/Engineer.
1014.2.2 Gutters, Valleys, Flashings Hip and Ridge roll shall be fabricated from gauge 24 (.600 mm thick) cold-rolled plain galvanized iron sheets specially tempered steel. Profile section shall be as indicated on the Plans.
1014.2.3 Fastening hardware shall be of galvanized iron straps and rivets. G.I. straps are of .500 mm thick x 16 mm wide x 267 mm long (gauge 26 x 5/8" x 10-1/2") and standard rivets.

Base metal thickness shall correspond to the following gauge designation available locally as follows:

Base Metal Thickness	Designated Gauges
.400 mm thick	Gauge 28
.500 mm thick	Gauge 26
.600 mm thick	Gauge 24
.800 mm thick	Gauge 22

Protective Coatings	Thickness
Zinc 34.4 microns (244 gm/m2)	
Paint coatings	
Top coat 15.20 microns	Bottom coat 6.8 microns

Overall thickness with protective coats
d) .400 mm .428-451 mm
.500 mm .532-551 mm
.600 mm .638-651 mm
Length of roofing sheets - available in cut to length long span length up to 18.29 meters
Special length and thickness are available by arrangements.

1014.3 Construction Requirements
Before any installation work is commenced, the Contractor shall ascertain that the top faces of the purlins are in proper alignment. Correct the alignment as necessary in order to have the top faces of the purlins on an even plane.

1014.3.1 Handling/Lifting/Positioning of Sheets
Sheets shall be handled carefully to prevent damage to the paint coating. Lift all sheets or sheet packs on to the roof frame with the overlapping down-turned edge facing towards the side of the roof where installation will commence, otherwise sheets will have to be turned end-to-end during installation.

CERAMIC TILES

DESCRIPTION

This Item shall consist of furnishing all ceramic tiles and cementitious materials, tools and equipment including labor required in undertaking the proper installation of walls and floor tiles as shown on the Plans and in accordance with this Specification.

MATERIAL REQUIREMENTS

Ceramic tiles and trims shall be made of clay, or a mixture of clay and other materials which is called the body of the tile. Tile bodies are classified by ASTM C 242 as to their degree of water absorption. Ceramic tiles and trims are manufactured either by dust-pressed process in which the clays are ground to dust mixed with a minimum of water shaped in steel dies and then fired or by plastic process in which the clays are made plastic by mixing with water, shaped by extrusion or in molds and then fired.

Glazed Tiles and Trims

Glazed tiles' and trims shall have an impervious face of ceramic materials fused onto the body of the tiles and trims. The glazed surface may be clear white or colored depending on the color scheme approved by the Engineer. Standard glazes may be bright (glossy) semimatte (Less glossy) matte (dull) or crystalline (mottled and textured; good resistance to abrasion). Glazed tiles are used principally for walls; crystalline glazed tiles may be used for floors provided how8ver that these are used as light duty floors.

Unglazed Tiles

Unglazed tiles shall be hard dense tile of homogeneous composition.
Its color and characteristics are determined by the materials used in the body, the method of manufacture and the thermal treatment. It is used primarily for floors and walks.

Trims

Trims are manufactured to match wall tile color, texture and to coordinate with it in dimension. These are shaped in various ceramic trim units such as caps, bases, coves, bullnoses, corners, angles, etc. that are necessary for edging or making a transition between intersecting planes.

Accessories

Accessories like some soap holders and shall be made wall mounted type with colors to reconcile with the color of the adjacent wall tiles.

Cement

Cement shall be Portland conforming to the specification requirements defined in Item 700, Hydraulic Cement.

Sand

Sand shall be well graded fine aggregate clean river sand, free from soluble salts and organic impurities.

Lime

Lime shall be hydrated lime with free un hydrated oxide and magnesium oxide content not to exceed 8 percent by weight.

Surface Preparation

Mortar mix for scratch coat and setting bed shall consist of one part Portland cement 1/4 part lime and 3 parts sand by volume. Surface to receive tile must be level, true to elevation, dry, free from dirt, oil and other ointments. Allow at least seven days curing of scratch coat and setting bed.
Installation work shall not be allowed to proceed until unsatisfactory conditions are corrected.
Bond coat shall be portland cement paste.

PAINTING, VARNISHING AND OTHER RELATED WORKS

DESCRIPTION

This Item shall consist of furnishing all paint materials, varnish and other related products, labor, tools, equipment and plant required in undertaking the proper application of painting, varnishing and related works indicated on the Plans and in accordance with this Specification.

MATERIAL REQUIREMENTS

Paint Materials

All types of paint material, varnish and other related product shall be subject to random test as to material composition by the Bureau of Research and Standard, DPWH or the National Institute of Science and Technology. (Use the following approved and tested brand name: Boysen, Davies, Dutch Boy, Fuller 0 Brien, or any approved equal).

Tinting Colors

Tinting colors shall be first grade quality, pigment ground in alkyd resin that disperses and mixes easily with paint to produced the color desired. Use the same brand of paint and tinting color to effect good paint body.

Concrete Neutralizer

Concrete neutralizer shall be first grade quality concentrate diluted with clean water and applied as surface conditioner of new interior and exterior walls thus improving paint adhesion and durability.

Silicon Water Repellant

Silicon water repellant shall be transparent water shield especially formulated to repel rain and moisture on exterior masonry surfaces.

Patching Compound

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

Varnish

Varnish shall be a homogeneous solution of resin, drying oil, drier and solvent. It shall be extremely durable clear coating, highly resistant to wear and tear without cracking, peeling, whitening, spotting, etc. with minimum loss of gloss for a maximum period of time.

Lacquer

Lacquer shall be any type of organic coating that dries rapidly and solely by evaporation of the solvent. Typical solvent are acetates, alcohols and ketones. Although lacquers were generally based on nitrocellulose, manufacturers currently use, vinyl resins, plasticizers and reacted drying oils to improve adhesion and elasticity.

Shellac

Shellac shall be a solution of refined lac resin in denatured alcohol. It dries by evaporation of the alcohol. The resin is generally furnished in orange and bleached grades.

Sanding Sealer

Sanding sealer shall be quick drying lacquer, formulated to provide quick dry, good holdout of succeeding coats, and containing sanding agents such as zinc stearate to allow dry sanding of sealer.

Glazing Putty

Glazing putty shall be alkyd-type product for filling minor surface unevenness.

Natural Wood Paste Filler

Wood paste filler shall be quality filler for filling and sealing open grain of interior wood. It shall produce a level finish for following coats of paint varnish/lacquer and other related products.

SCHEDULE

Exterior

Plain cement plastered finish to be painted -3 coats Acrylic base masonry paint
Concrete exposed aggregate and/or tool finish -1 coat water repellant
Ferrous metal -1 coat primer and 2 coats enamel pain
Galvanized metal -1 coat zinc chromate primer and 2 coats portland cement paint
Wood painted finish -3 coats oil based paint
Wood varnished finish - varnish water repellant

Interior

Plain cement plastered finish to be painted - 2 coats acrylic base masonry paint
Concrete exposed agree gate and/or tool finish - clean surface
Ferrous metal -1 coat primer and 2 coats enamel paint
Woodwork sea-mist -3 coats of 3 parts thinner 1 part lacquer
Woodwork varnish - 1st coat, of one part sanding sealer to one part solvent 2nd coat of 2/3

sanding sealer to 1/3 solvent
Woodwork painted - 3 coats of oil base paint finish 109
Ceiling boards textured finish -1 coat oil based paint allow to dry
then patch surfaces unevenness and apply textured paint coat

CONSTRUCTION REQUIREMENTS

The Contractor prior to commencement of the painting, varnishing and related work shall examine the surfaces to be applied in order not to jeopardize the quality and appearances of the painting varnishing and related works.

Surface Preparation

All surfaces shall be in proper condition to receive the finish. Woodworks shall be hand-sanded smooth and dusted clean. All knotholes pitch pockets or sappy portions shall be sealed with natural wood filler. Nail holes, cracks or defects shall be carefully puttied after the first coat, matching the color of paint. Interior woodworks shall be sandpapered between coats. Cracks, holes of imperfections in plaster shall be filled with patching compound and smoothed off to match adjoining surfaces. Concrete and masonry surfaces shall be coated with concrete neutralizer and allowed to dry before any painting primer coat is applied. When surface is dried apply first coating. Hairline cracks and unevenness shall be patched and sealed with approved putty or patching compound.

Application

Paints when applied by brush shall become non-fluid, thick enough to lay down as adequate film of wet paint. Brush marks shall flaw out after application of paint.
Paints made for application by roller must be similar to brushing paint. It must be nonstick when thinned to spraying viscosity so that it will break up easily into droplets.
Paint is atomized by high pressure pumping rather than broken up by the large volume of air mixed with it. These procedures change the required properties of the paint.

Mixing and Thinning

At the time of application paint shall show no sign of deterioration. Paint shall be thoroughly stirred, strained and kept at a uniform consistency during application. Paints of different manufacture shall not be mixed together. When thinning is necessary, this may be done immediately prior to application in accordance with the manufacturer's directions, but not in excess of 1 pint of suitable thinner per gallon of the paint.

Storage

All material to be used under this Item shall be stored in a single place to be designated by the Engineer and such place shall be kept .
neat and clean at all time. Necessary precaution to avoid fire must be observed by removing oily rags, waste, etc. at the end of daily work.

Cleaning

All cloths and cotton waste which constitute fire hazards shall be placed in metal containers or destroyed at the end of daily works. Upon completion of the work, all staging, scaffolding and paint containers shall be removed. Paint drips, oil, or stains on adjacent surfaces shall be removed and the entire job left clean and acceptable to the Engineer.

ELECTRICAL ITEM 1100 - CONDUITS, BOXES & FITTINGS

DESCRIPTION

This Item shall consist of the furnishing and installation of the complete conduit work consisting of electrical conduits; conduit boxes such as junction boxes, pull boxes, utility boxes, octagonal and square boxes; conduit fittings such as couplings, locknuts and bushings and other electrical materials needed to complete the conduit roughing-in work of this project.

MATERIAL REQUIREMENTS

All materials shall be brand new and shall be of the approved type meeting all the requirements of the Philippine Electrical Code and bearing the Philippine Standard Agency (PSA) mark.

Conduits

Conduits shall be standard rigid steel, zinc coated or galvanized. Intermediate metal conduit may be used if shown or specified on the approved Plans. PVC conduit if required shall be Schedule 40. Enamel coated steel conduits and conduits with rough inner surfaces are not acceptable.

Conduit Boxes

All conduit boxes shall be Code gauge steel and galvanized. Outlet boxes shall be galvanized pressed steel of standard make. In general, outlet boxes shall be at least 100 mm square or octagonal, 53 mm deep and 16 mm minimum gauge.

Conduit Fittings

All conduit fittings such as locknuts and bushings shall be galvanized of standard make.

CONSTRUCTION REQUIREMENTS

All works throughout shall be executed in the best practice in a workmanlike manner by qualified and experienced electricians under the immediate supervision of a duly licensed Electrical Engineer.

Conduits

Conduits should be cut square with a hacksaw and reamed. Bends shall be made with the required radius. In making bends only conduit bending apparatus will be used. The use of a pipe tee or vise for bending conduits shall not be permitted. Conduits which have been crushed, deformed or flattened shall not be installed. No running thread shall be allowed. Conduit runs crossing construction joints of the building shall be provided with standard expansion fittings of the approved type. No conduits shall be used in any system smaller than 12 mm diameter electric trade size nor shall have more than four (4) 90-degree bends in anyone run and where necessary, pull boxes
shall be provided.

All ends of conduits which are left empty in cabinets and conduit boxes shall be plugged with lead or approved pipe caps so as to prevent the entrance of white ants and dirt within the conduit system. Pull wires shall be inserted in the empty ducts before they are closed with lead or pipe caps and shall be left therein for future use.
On exposed work, all pipes and outlet boxes shall be secured by means of galvanized

metal clamps which shall be held in place by means of machine screws. When running over concrete surfaces, the screws shall be held in place by means of expansion sleeves for big pipes and rolled lead sheet for small pipes. All pipes shall be run at right angles to and parallel with the surrounding walls. No diagonal run shall be allowed and all bends and offsets shall be avoided as much as possible. Conduits shall be supported at 1,500 mm intervals maximum.

Conduit Boxes & Fittings

Provide conduit boxes for pulling and splicing wires and outlet boxes for installation of wiring devices.

As a rule, provide junction boxes or pull boxes in all runs greater than 30 meters in length, for horizontal runs. For other lengths, provide boxes as required for splices or pulling. Pull boxes shall be installed in inconspicuous but accessible locations.
Support boxes independently of conduits entering by means of bolts, red hangers or other suitable means.
Conduit boxes shall be installed plumb and securely fastened. They shall be set flush with the surface of the structure in which they are installed where conduits are run concealed.
All convenience and wall switch outlet boxes for concealed conduit work shall be deep, rectangular flush type boxes. Four-inch octagonal flush type boxes shall be used for all ceiling light outlets and shall be of the deep type where three or more conduits connect to a single box.
Floor mounted outlet boxes required shall be waterproof type with flush brass floor plate and brass bell nozzle.
All boxes shall be painted with antirust red lead paint after installation.
All conduits shall be fitted with approved standard galvanized bushing and locknuts where they enter cabinets and conduit boxes.
Junction and pull boxes of code gauge steel shall be provided as indicated or as required to facilitate the pulling of wires and cables.

METHOD OF MEASUREMENT

The work under this Item shall be measured either by lengths, pieces, pairs, lot and set actually placed and installed as shown on the approved Plans.

GENERAL SPECIFICATIONS

The work to be done under this division of specifications consists of the fabrication, furnishing, delivery and installation, complete in all details of the electrical work, at the subject premises and all work material's incidental to the proper completion of the installation, except those portions of the work which are expressly stated to be 90ne by other fields. All' works shall be done in accordance with the rules and regulations and with the specifications.

MATERIAL REQUIREMENTS

All materials to be used shall conform to the BPS specification.
Construction Requirements
All grounding system installation shall be executed in accordance with the approved plans.
Grounding system shall include building perimeter ground wires, ground rods, clamps, connectors, ground wells and ground wire taps as shown in the approved design.

Auxiliary Systems

All auxiliary systems such as telephone and intercom system, time clock system, fire alarm system and public address/nurse's call/paging system installations shall be done in accordance with the approved design.
All materials to be used shall conform to the Bureau of Product Standards (BPS) specifications.

Important requirement regarding supervision of the work and submission of certificate of completion.

All wiring installation herein shall be done under the direct supervision of a licensed Electrical Engineer at the expense of the Contractor. The contractor shall submit the certificate of completion duly approved by the owner's representative.

1100.10 Test and guarantee
Upon completion of the electrical construction work, the contractor shall provide all test equipment and personnel and to submit written copies of all test results.
The contractor shall guarantee the electrical installation are done and in accordance with the approved plans and specifications. The contractor shall guarantee that the electrical systems are free from' all grounds and from all defective workmanship and materials and will remain so for a period of one year from date and acceptance of works. Any defect shall be remedied by the Contractor at his own expense.

WIRES AND WIRING DEVICES

DESCRIPTION

This Item shall consist of the furnishing and installation of all wires and wiring devices consisting of electric wires and cables, wall switches, convenience receptacles, heavy duty receptables and other devices shown on the approved Plans but not mentioned in these specifications.

MATERIAL REQUIREMENTS

Wires and cables shall be of the approved type meeting all the requirements of the Philippine Electrical Code and bearing the PSA mark. Unless specified or indicated otherwise, all power and lighting conductors shall be insulated for 600 volts. All wires shall be copper, soft drawn and annealed, smooth and of cylindrical form and shall be centrally located inside the insulation. All wiring devices shall be standard products of reputable electrical manufacturers. Wall switches shall be rated at least 1 OA, 250 volts and shall be spring operated, flush, tumbler type. Duplex convenience receptacles shall be rated at least 15A, 250 volts, flush, parallel slots.
Single heavy duty receptacles shall be rated at least 20A, 250 volts. 3wire, flush, polarized type.

CONSTRUCTION REQUIREMENTS

Conductors or wires shall not be drawn in conduits until after the cement piaster is dry and the conduits are thoroughly cleaned and free from dirt and moisture. In drawing wires into conduits, sufficient slack shall be allowed to permit easy connections for fixtures, switches, receptacles and other wiring devices without the use of additional splices.
All conductors of convenience outlets and lighting branch circuit home runs shall be wired with a minimum of 3.5 mm in size. Circuit home runs to panel boards shall not be smaller than 3.5 mm but all home runs to panel board more than 30 meters shall not be smaller than 5.5 mm. No conductor shall be less than 2 mm in size.

All wires of 14mm and larger in size shall be connected to panels and apparatus by means of approved type lugs or connectors of the solder less type, sufficiently large enough to enclose all strands of the conductors and securely fastened. They shall not loosen under vibration or normal strain.

All joints, taps and splices on wires larger than 14 mm shall be made of suitable solder less connectors of the approved type and size. They shall be taped with rubber and PVC tapes providing insulation not less than that of the conductors.
No splices or joints shall be permitted in either feeder or branch conductors except within outlet boxes or accessible junction boxes or pull boxes. All joints in branch circuit wiring shall be made mechanically and electrically secured by approved splicing devices and taped with rubber and PVC tapes in a manner which will make their insulation as that of the conductor.
All wall switches and receptacles shall be fitted with standard Bakelite face plate covers. Device plates for flush mounting shall be installed with all four edges in continuous contact with finished wall surfaces without the use of coiled wire or similar devices. Plaster fillings will not be permitted. Plates installed in wet locations shall be gasketed.
When more than one switch or device is indicated in a single location, gang plate shall be used.

METHOD OF MEASUREMENT

The work under this Item shall be measured either by meters, rolls, pieces, and set, actually placed and installed as shown on the Plans.

BASIS OF PAYMENT

All work performed and measured and as provided for in this Bid 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:

Pay Item Number	Description	Unit of Measurement
(1)	Electric Wire	meter of rolls
(2)	Single pole tumbler switch	pieces
(3)	Two-gang tumbler switch	pieces
(4)	Three-gang tumbler switch	pieces
(5)	Three-way tumbler switch	pieces
(6)	Duplex Convenience receptacles	set
(7)	Heavy Duty Convenience receptacles	set
(8)	Standard Telephone outlet bakelite cover with 9.52 center hole	pieces
(9)	Window type air conditioning outlet 3-prong polarized type	pieces
(10)	Bare copper wire	meters
(11)	Grounding clamps for electric wires	pieces
(12)	Messenger wire	meters
(13)	Guy wire	meters
(14)	Vibrating Bell	set
(15)	Traffic light Control Panel	set
(16)	Traffic light metal enclosures complete with red and green light provided	set

with reflectors and 152 mm diameter vibrating bell

POWER LOAD CENTER, SWITCHGEAR AND PANELBOARDS

DESCRIPTION

This Item shall consist of the furnishing and installation of the power load center unit substation or low voltage switchgear and distribution panel boards at the location shown or the approved Plans complete with transformer, circuit breakers, cabinets and all accessories, completely wired and ready for service.

MATERIAL REQUIREMENTS

All materials shall be brand new and shall be of the approved type. It shall conform to the requirements of the Philippine Electrical Code and shall bear the Philippine Standard Agency (PSA) mark.

Power Load Center Unit Substation

The Contractor shall furnish and install an indoor-type Power Load Center Unit Substation at the location shown on the approved Plans if required. It shall be totally metal- enclosed, dead front and shall consist of the following coordinated component parts:

High Voltage Primary Section:

High voltage primary incoming line section consisting of the following parts and related accessories:

One (1) Air-filled Interrupter Switch, 2-position (open-close) installed in a suitable air filled metal enclosure and shall have sufficient interrupting capacity to carry the electrical load. It shall be provided with key interlock with the cubicle for the power fuses to prevent access to the fuses unless the switch is open.
Three (3)-power fuses mounted in separate compartments within the switch housing and accessible by a hinged door.
One 1) set of high voltage potheads or 3-conductor cables or three single conductor cables.
Lightning arresters shall be installed at the high voltage cubicle if required.

Items (a) and (b) above could be substituted with a power circuit breaker with the correct rating and capacity.

Transformer Section

The transformer section shall consist of a power transformer with ratings and capacities as shown on the plans. It shall be oil liquid-filled non-flammable type and designed in accordance with the latest applicable standards.
The transformer shall be provided with four (4 approximately 2 1/2 % rated KVA taps on the primary winding in most cases one (1) above and three (3) below rated primary voltage and shall be changed by means of externally gang-operated manual tap changer only when the transformer is de-energized. Tap changing under load is acceptable if transformer has been so designed.
The following accessories shall be provided with the transformer, namely: drain valve, sampling device, filling connection, oil liquid level gauge, ground pad, top filter press connection, lifting lugs, diagrammatic nameplate, relief valve, thermometer and other

necessary related accessories.
The high-voltage and low-voltage bushings and transition flange shall be properly coordinated for field connection to the incoming line section and low voltage switchboard section, respectively.

Low-Voltage Switchboard Section

The low-voltage switchboard shall be standard modular-unitized units, metal-built, dead front, and safety type construction and shall consist of the following:

Switchboard Housing

The housing shall be heavy gauge steel sheet, dead front type, gray enamel finish complete with frame supports, steel bracings, steel sheet panel boards, removable rear plates, copper bus bars, and all other necessary accessories to insure sufficient mechanical strength and safety. It shall be provided with grounding bolts and clamps.
Secondary Metering Section
The secondary metering section shall consist of one (1) ammeter, AC, indicating type; one (1) voltmeter, AC, indicating type, one (1) ammeter transfer switch for 3-phase; one (1) voltmeter transfer switch for 3phase; and current transformers of suitable rating and capacity.
The above-mentioned instruments shall be installed in one compartment above the main breaker and shall be complete with all necessary accessories completely wired, ready for use.
Main Circuit Breaker
The main circuit breaker shall be draw-out type, manually or electrically operated as required with ratings and capacity as shown on the approved Plans.
The main breaker shall include insulated control switch if electrically operated, manual trip button, magnetic tripping devices, adjustable time over current protection and instantaneous short circuit trip and all necessary accessories to insure safe and efficient operation.
Feeder Circuit Breakers
There shall be as many feeder breakers as are shown on the single line diagram or schematic riser diagram and schedule of loads and computations on the plans. The circuit breakers shall be draw out or molded case as required. The circuit breakers shall each have sufficient interrupting capacity and shall be manually operated complete with trip devices and all necessary accessories to insure safe and efficient operation. The number, ratings, capacities of the feeder branch circuit breakers shall be as shown on the approved Plans.
Circuit breakers shall each be of the indicating type, providing "ON" - "OFF" and "TRIP" positions of the operating handles and shall each be provided with nameplate for branch circuit designation. The circuit breaker shall be so designed that an overload or short on one pole automatically causes all poles to open.

Low-Voltage' Switchgear

(For projects requiring 'low-voltage switchgear only).
The Contractor shall furnish and install low-voltage switchgear at the location shown on the plans. It shall be metal-clad, dead front, free standing, safety type construction and shall have copper bus bars of sufficient size, braced to resist allowable root mean square (RMS) symmetrical short circuit stresses, and all necessary accessories. The low-voltage switchgear shall consist of the switchgear housing, secondary metering, main breaker and feeder branch circuit breakers and all necessary accessories,
completely wired, ready for service.

Grounding System:

All non-current carrying metallic parts like conduits, cabinets and equipment frames shall be properly grounded in accordance with the Philippine Electrical Code, latest edition.
The size of the ground rods and ground wires shall be as shown on the approved Plans. The ground resistance shall not be more than 5 ohms.

Panel boards and Cabinets

Panel boards shall conform to the schedule of panel boards as shown on the approved Plans with respect to supply characteristics, rating of main lugs or main circuit breaker, number and ratings and capacities of branch circuit breakers.
Panel boards shall consist of a factory completed dead front assembly mounted in an enclosing flush type cabinet consisting of code gauge galvanized sheet steel box with trim and door. Each door shall be provided with catch lock and two(2) keys. Panel boards shall be provided with - directories and shall be printed to indicate load served by each circuit.
Panel board cabinets and trims shall be suitable for the type of mounting shown on the approved Plans. The inside and outside of panel board cabinets and trims shall be factory painted with one rust proofing primer coat and two finish shop coats of pearl gray enamel paint.
Main and branch circuit breakers for panel boards shall have the rating, capacity and number of poles as shown on the approved Plans. Breakers shall be thermal magnetic type. Multiple breaker shall be of the common trip type having a single operating handle. For 50-ampere breaker or less, it may consist of single-pole breaker permanently assembled at the factory into a multi-pole unit.

CONSTRUCTION REQUIREMENTS

The Contractor shall install the Power Load Center Unit Substation or Low-Voltage Switchgear and Panel boards at the locations shown on the approved Plans.
Standard panels and cabinets shall be used and assembled on the job. All panels shall be of dead front construction furnished with trims for flush or surface mounting as required.

METHOD OF MEASUREMENT

The work under this Item shall be measured either by set and pieces actually placed and installed as shown on the approved Plans.

BASIS OF PAYMENT

All works 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:

Pay Item Number	Description	Unit of Measurement
(1)	Panel board (Circuit Breaker Type)	set
(2)	Panelboard (Safety Switch Type)	set
(3)	Low-Voltage Switchgear (LVS)	set

	complete with metering devices and accessories	
(4)	Power Fuses	pieces
(5)	Lightning Arresters	pieces
(6)	Air Break Switch	set
(7)	Enclosed ACB NEMA Type I	set
(8)	Enclosed ACB NEMA Type 3R	set
(9)	Automatic Transfer Switch	set
(10)	Manual Transfer Switch without fuses	pieces
(11)	Motor Controller	set