I. INTRODUCTION

The drawings and the Specification are complementary to each other. Drawings are graphic means of showing works to be done. They are particularly suited to showing where materials are located. Thus, drawing exists essentially to show sizes, location, and placement. Not all works, however, can be presented in the drawings. Generalized works are usually in statement form; hence the Contractor is strongly advised to read the specification carefully.

Specification on the other hand, is used to describe the materials, construction techniques, samples, shop drawings, guarantee, and the other contract requirements. Together, the Drawings and the Specification are used to inform the contractor. In cases where specified brand carries with it the manufacture's specifications, the manufacture's specification shall hold the precedence over this specification.

II. THE LANGUAGE OF THE SPECIFICATIONS:

The specifications are the abbreviated type and include incomplete sentences. The selection of sentence structure depends on the underlying principles of the specifications:

a. That the technical specifications are only one part of the Contract Document.

b. That the contract is between the Owner and the General Contractor; and

c. That the General Contractor is the only party responsible for completing the work in accordance with the Contract Document

Therefore:

A. Only the General Contractor is referred to in the specification so as not to violate the intent of the contract and so as not to undermine the proper chain of command.

B. Any reference to Specialty Trade Contractors in the technical Specifications is made only in so far a selection of specialty Trade Contractors is made through bidding. Once the Specialty Trade Contractions are selected and assigned to the General Contractor, the General Contractor assumes all responsibilities for the execution of the whole project in accordance with the Contract Documents. Therefore, in the contract between the Owner and the General Contractor, the Specialty Trade Contractor, the Specialty Trade Contractor is not referred to the entire Contract Document, the work "Contractor" referred to the General Contractor.

C. The omission of the phrase "the contractor shall" is intentional because the whole specifications are directed to the Contractor. Omitted words or phrases shall be supplied by the interference in the same manner, as they are when a "note" occurs in the drawings.

D. Where "as shown", "as intended", "as detailed", or words similar import are used, it shall be understood that the reference in the drawings accompanying the specifications is made unless otherwise stated.

E. Where "as directed", "as required", "as permitted", "as authorized", "as approved", "as accepted", or other words similar import are used, it shall be understood that the direction, requirements, permission, authorization, approval, or acceptance of the Architect is intended unless otherwise stated.

F. As used herein, "provide" shall be understood to mean "provide complete in place" that is "furnished and installed".

III. GENERAL REQUIREMENTS:

1. The contractor shall secure from the government agencies all necessary licenses and permits needed.
2. Cleanliness shall be maintained at all times within the job site and its immediate premises.
3. If errors or omissions appear in the drawings, specifications or other documents, these shall be referred to the designing architect.
4. All applicable provisions of the different divisions of the specification for each work trade shall apply for all items cited in this summary.
5. Materials deemed necessary to complete the work but not specifically mentioned in the specification, working drawings, of in the Contract Document, shall be supplied and installed by the Contractor without extra cost to the Owner. Such material shall be of the highest quality available and install and applied in a workmanlike manner at prescribed or appropriate locations.
6. Materials specifically mentioned in this Summary shall be installed following efficient and sound Engineering and Construction practice, and especially as per Manufacture's application and installation specification, which shall govern over all works, alluded in this Specification.
7. The Contractor shall clean the site and dispose waste after the completion of the project.

IV. SPECIFICATION OUTLINE:

WORK ITEM PER DPWH STANDARD

CIVIL WORKS

Carpentry and Joinery Works

Description

The work under this Item shall consist of furnishing all required materials, fabricated wood work, 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 this Specifications.
Material Requirements

Lumber

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

Grade of Lumber and Usage

Stress grade is seasoned, closed-grained and high quality lumber 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 sub-floor framing embedded or in contact with concrete or masonry.
Stress grade lumber of the specified specie is generally of high quality, of good appearance, without imperfections, and suitable for use without waste due to defects and suitable also for natural finish.
Select grade lumber shall be used for flooring, sidings, facia and base boards, trims, mouldings, millwork, railings, stairs, cabinet work, shelvings, doors, windows and frames of openings.
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. Common grade lumber shall be used for light framework for wall partitions, ceiling joist and nailers.

Lumber Species and Usage

Unless otherwise specified on the Plans, the following lumber species shall be used as indicated:
Yacal (stress grade) for structural member such as post, girders, girts, sleepers door and window frames set or in contact with concrete or masonry.
Guijo (select grade) for door and window frames set in wooden framework, for stairs, for roof framing supporting ceramic or cement tiles, floor joist and other wooden structural parts.
Apitong (common grade) for roof framing supporting light roofing materials such as galvanized iron, aluminum or PVC sheets, for wall framing, ceiling joist, hangers and nailers.
Tanguile (select grade) for doors and windows, facia and base boards, trims, mouldings, millwork, railings, stairs, cabinet work, shelvings, flooring and siding.
Narra (select grade) for stair railings, flooring boards, wall panels, base boards, trims, mouldings, cabinet work, mill work, doors and windows when indicated as such in the Plans.
Dao (select grade) for parts of the structure as enumerated under Section 1003.2.1.2 (e), when indicated as such on the Plans.

Moisture Content

Rough lumber for framing and siding boards shall be air-dried or sun-dried such that its moisture content shall not exceed 22 percent. Dressed lumber for exterior and interior finishing, for doors and windows, mill work, cabinet work and flooring boards shall be kiln-dried and shall not have a moisture content in excess of 14 percent at the time of installation in the structure.

Substitution in Lumber Specie

Any lumber equally good for the purpose intended may be substituted for the specific kind subject to the prior approval of the Engineer, provided the substitution shall be of equal or better specie acceptable to the Engineer. In case of substitution with better specie, no additional cost therefore shall be allowed to the Contractor.

Plyboard

Plyboard shall be good grade and made of laminated wood strips of uniform width and thickness bounded together with water resistant resin glue. The laminated core shall be finished both faces with select grade tanguile or red lauan veneers not less than 2 mm. thick similarly bonded to the core. The plyboard of not less than 19 mm. thick shall be free from defects such as split in veneer, buckling or warping.

Plywood

Plywood shall conform to the requirements of the Philippine Trade Standards 631 – 02. Thickness of a single layer laminae shall not be less than 2 mm. The laminae shall be superimposed in layers with grains crossing at right angles in successive layers to produce stiffness. The face veneers shall be rotary cut from select grade timber. The laminae and face veneers shall be bonded with water resistant resin glue, hot pressed and pressure treated. Ordinary tanguile or red lauan plywood with good quality face veneers, 6 mm. thick shall be used for double walling and ceiling not exposed to moisture; waterproof or marine plywood shall be used for ceiling exposed to moisture such as at toilets and eaves, ceiling to be finished with acrytex.

Lawanit

Lawanit, when required per plans, shall be 6 mm. thick, tempered or oil impregnated for moisture/ water resistance. Texture of lawanit shall be subject to the approval of the Engineer.

Materials other than Lumber

Plastic Sheet

When required for counter top, plastic sheet such as Formica shall not be less than 1.50 mm. thick and shall have hard, durable and glossy surface resistant to stain, abrasion and heat. Color and design shall be as selected from the manufacturer's standard and approved by the Engineer.

Glue

Glue shall be from water resistant resins which, upon hardening, shall not dissolve nor lose its bond or holding power even when soaked with water for extended period. Glue in powder form be in sealed container and shall be without evidence of lumping or deterioration in quality.

Fasteners

Nails, screw, bolts and straps shall be provided and used where suitable for fixing carpentry and joinery works. All fasteners shall be brand new and of adequate size to ensure rigidity of connections.
a. Nails of adequate size shall be steel wire, diamond-pointed, ribbed shank and bright finish.
b. Screws of adequate size shall be cadmium or brass plated steel with slotted head.
c. lag screws of adequate size, for anchoring heavy timber framing in concrete or masonry, shall be galvanized steel.
d. Bolts and nuts shall be of steel having a yield point of not less than 245 Mpa. Bolts shall have a square heads and provided with standard flat steel washers and hexagonal nuts. Threads shall conform to American coarse thread series. The threaded portion shall be long enough such that the nut can be tightened against the bolted members without any need for blocking. The bolt's threaded end shall be finished smooth for ease of engaging and turning of the nut.
e. Wrought iron straps or angles, when require in conjunction with bolts and lag screws to provide proper anchorage, shall be of the shape and size shown on the Plans.

Construction Requirements

Quality of Materials

All materials to be incorporated in the carpentry and joinery works shall be of the quality specified under Section 2. Before incorporation in work, all materials shall have been inspected/ accepted by the Engineer or his authorized representative.

Storage and Protection of Materials

Lumber and other materials shall be protected from dampness during and after delivery at the site. Materials shall be delivered well in advance of actual need and in adequate quantity to prelude delay in the work. Lumber shall be piled in orderly stack at least 150 mm. above ground and at sheltered place where it will be of least obstruction to the work.

Shop Drawings

Shop drawings complete with essential dimensions and details of construction, as may be required by the Engineer in connection with carpentry and joinery work, shall be submitted for approval before proceeding with the work.

Rough Carpentry

Rough carpentry covers timber structural framing for roof, flooring, siding, partition and ceiling.
Framing shall be stress grade or common grade lumber of the specie specified under Section.
Rough carpentry shall be done true to lines, levels and dimensions. It shall be squared, aligned, plumbed and well fitted at joints. Trusses and other roof framing shall be assembled, fitted and set to exact location and slope indicated on the Plans. Fasteners, connectors and anchors of appropriate type and number shall be provided and fitted where necessary.

Structural members shall not be cut, bored or notched for the passage of conduits or pipes without prior approval of the Engineer. Members damaged by such cutting or boring shall be reinforced by means of specifically formed and approved steel plates or shapes, otherwise, damaged structural members shall be removed and replaced to the satisfaction of the Engineer.
Timber framing in contact with concrete or masonry shall be treated with termite-proofing solution and after drying coated with bituminous paint.

Finished Carpentry

Finished carpentry covers works on flooring, siding and ceiling board, stairs, cabinets, fabricated woodwork, millwork and trims

Framing lumber shall be select grade, free from defects and where exposed in finished work, shall be selected for color and grain.

Joints of framing shall be tenoned, mortised or doweled where suitable, closely fitted and secured with water resistant resins glue. Exterior joints shall be mitered and interior angles coped.

Panels shall be fitted, allow for contraction or expansion and insure that the panels remain in place without warping, splitting and opening of joints.

Exposed edges of plywood or plywood for cabinets shall be provided with select garde hardwood strips, rabbetted as necessary, glued in place and secured with finishing nails. To prevent splitting, hardwood for trims shall be drilled before fastening with nails or screws.
Fabricated woodwork shall be done preferably at the shop. It shall be done true to details and profiles indicated on the Plans. Where set against concrete or masonry, woodwork shall be installed when curing is completed
Exposed wood surfaces shall be free from disfiguring defects such as raised grains, stains, uneven planning, sanding, tool marks and scratches. Exposed surfaces shall be machine or hand sanded to an even smooth surface, ready for finish.

Doors

Description

This Item shall consist of Furnishing all materials, hardware, plant, tools, labor and services necessary for complete fabrication and installation of wooden doors and window of the type and size as shown on the Plans and in accordance with the following specifications and applicable specifications under Item 1003 on Carpentry and Joinery Works.
Material Requirements

Lumber of doors, window and jambs, and panels when required, shall be kiln-dried with moisture content of not more than 14% and shall be of the specie indicated on the Plans and/ or specified under Item 1003 on Carpentry and Joinery Works.
Plywood
Plywood for veneer of solid core and hollow core flush doors shall be 3-ply, rotary cut, 6 mm. thick ordinary plywood, Class B grade. Marine or waterproof plywood, rotary cut, 3-ply, 6 mm. thick shall be used for flush doors at toilets and bathrooms or at places where these are exposed to moisture.

Adhesive
Adhesive shall be water resistant resins and shall be non-staining.
Construction Requirements

Fabrication
Wooden doors and windows, including frames, shall be fabricated in accordance with the designs and size shown on the Plans. The fabricated products shall be finished square, smooth sanded and free from damage or warping.
Panel Doors
Stiles and rails of panel doors shall have a minimum thickness of 44 mm. and width of 140 mm. Rails minimum thickness of 44 mm and width of 140 mm. Rails shall be framed to stiles by mortise and tenon joints. Rabbets or grooves of stiles and rails to receive panels shall be 6.5 mm. wide and 20 mm. deep. Integral mouldings formed on both faces of stiles and rails framing the panels shall be true to shape and well defined. Intersections of mouldings shall be mitered and closely fitted.
Panels of the same specie and having a minimum thickness of 20 mm. shall be beveled around its edges up to a minimum width of 50 mm. both faces. The beveled edges shall closely fit into the groove of stiles and rails, but free to move to prevent splitting when shrinkage occurs.
Installation
.Frames
Shall be set plumb and square in concrete/ masonry work or framework of walls or partitions. Frames set in concrete or masonry shall be painted with hot asphalt at its contact surface and provided with two rows of common wire nails 100 mm. long for anchorage. The nails shall be staggered and spaced at 300 mm. on center along each row. Frame set in concrete shall be installed in place prior to concrete work. Frames set in masonry work may be installed after laying of hollow concrete blocks, bricks or adobe. Space between frames and masonry shall be fully filled with cement mortar proportioned 1:3.

Hinged Doors
Hinged doors, whether panel or flush type with standard height of 2100 mm. and width of not more than 900 mm. shall be hung with four loose-pin butt hinges, 100 mm. x 100 mm. Swing out exterior doors shall be hung with four fast-pin butt hinges. Two hinges shall be fitted 150 mm. from top and bottom edge of door. The other two hinges shall be fitted at third points between top and bottom hinges. Care should be taken to ensure that the hinges are fitted such that their pins are aligned for ease of pin insertion and smoothness of operation. For added smoothness pins should be lightly greased. Hammering of hinges to attain proper alignment shall not be allowed.
For wider and heavier doors such as narra panel doors, an additional hinge shall be fitted 100 mm. below the top hinge to counteract the door tilting action.

Mounting screws shall be screwed in place in their entire length, not forced into place by hammering. Hammering of screw into place shall not be permitted.

Lock Installation

Locks of doors shall be fitted at the same height, centered 1000 mm. above the finished floor level. Locks shall be installed in conformity with the templates and instructions supplied with locksets. Holes for mounting locks shall be properly formed to provide snug fit and rigid attachment of the locks to the doors. Strike plates shall be fitted on the door frame in true alignment with the lock latch.

Painting, Varnishing and Other Related Works

Description

This item covers all paint materials including Vehicles, Pigment, Pastes, Driers, Thinners, and Mixed Paints for steel, wooden and concrete structures. The Contractor shall take the necessary precautions to protect the work during application and shall be responsible for any and all damage to the work until completion.
Proportion of Mixing

It is the intent of this Specification to provide a paint of proper brushing consistency, which will not run, steak or sag and which will have satisfactory drying qualities.

Painting

The Contractor shall examine carefully all surfaces to be painted and before beginning any of his work, shall see that the work of other trades has been left or installed in workmanlike condition to receive paint. Each coat of paint shall be applied at proper consistency and brushed evenly, free of brush marks, sags, runs, and with no evidence of poor workmanship. Care shall be exercised to avoid lapping of paint on glass or hardware. Paint shall be sharply cut to lines and finished paint surfaces shall be free from defects or blemishes. Protective covering shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent paint from being spattered onto surfaces, which are not to be painted. Surfaces from which such paint cannot be removed satisfactorily shall be painted or repainted, as required, to produce a finish satisfactory to the Engineer. No painting shall be done under conditions of weather, moisture, or temperature unsuited to good work, nor until previous coat is hard and dry. All painting materials shall be used in strict accordance with manufacturer's directions, spread or flowed on smoothly with proper film thickness and without runs, sags, or other defects.

Storage of Materials

The Contractor shall store all painting materials and equipment not in immediate use in a room approved by the Engineer for that purpose. The receiving and opening of all paint materials and mixing shall be done in this room. Necessary precautions shall be taken to prevent fire. Rags, waste, etc., soiled with paint shall be removed from the premises at the end of each day's work, or stored in metal containers with metal covers.

Preparation of Paint

Paint containers shall be delivered to the job site in the manufacturer's unopened containers and shall be opened only when required for use. Paint shall be mixed only in the designated room or space in the presence of owner's representative. Paint shall be thoroughly stirred or agitated to a uniformly smooth consistency suitable for proper application. Unless otherwise specified or approved, no materials shall be reduced, changed, or used except in accordance with manufacturer's label or tag on the container. In all cases, paint shall be prepared and handled in a manner to prevent deterioration and inclusion of foreign matter.

Clean Up

Upon completion of his work, the Contractor shall remove all surplus materials. All paint spills shall be removed and the entire premises shall be free from rubbish, debris, etc., caused by his work. He shall present the work clean and free from blemish so that it is acceptable in every way. All glass shall be cleaned of paint spots and polished, and the job made ready for occupancy by the Owner.

Colors and Samples

All finish colors shall be as selected by the Owner. In multicoated work using color pigmented paints, each coat shall have sufficient variation of color to easily distinguish it from preceding coat. Using specified or approved materials, three (3) sample panels of each finish, including all coats thereof shall be prepared and submitted for the Owner's approval. Completed work shall match approved colors and samples.

Preparation of Surfaces

Except as otherwise specified, surfaces to be painted shall be clean, smooth, and dry. The Contractor shall report to the Engineer in writing any surface, which cannot be properly prepared for painting. If work is commenced before defects have been reported and corrected, any unsatisfactory finish shall be rectified by the Contractor at no cost to the Owner.

Painting Concrete and Masonry

All concrete and masonry surface shall cure thirty (30) days prior to painting. Dirt, dust, oil, grease, efflorescence, and other deleterious matter shall be removed and surface roughened when necessary to insure good paint adhesion. The method of surface preparation shall be left to the discretion of the Contractor, provided results obtained are satisfactory to the Engineer. Before application of resin emulsion paint, surfaces shall be prepared in accordance with manufacturer's direction. Before application of oil base or latex paints, surfaces shall be tested for presence of alkali. If alkali is present, surface shall be neutralized as recommended by the manufacturer of the paint materials to be applied. Dirt, dust, loose plaster, and other deleterious matter, which would prevent good paint adhesion, shall be removed. All holes, cracks, and depressions shall be neatly filled with patching plaster mixed and applied to match the existing plaster. Patches shall be sanded flush and smooth and properly sealed before applying prime coat. After priming surfaces, suction spots shall be touched up with additional prime coat material until surfaces evidence a uniform coating. Enamel undercoats on smooth plaster

shall be sandpapered by hand (with No. 00 sandpaper) and dusted clean before applying the succeeding coat.

Painting Woodwork
Unless already properly sanded, woodwork shall be sandpapered smooth by hand. Before priming surfaces, knots pitch pocket and sap streaks shall be thoroughly cleaned of residue and touched up with shellac varnish coating. After priming surface, nail holes, cracks, and depressions shall be neatly filled with putty or other approved filler, colored to match required finish. Enamel undercoats shall be sanded by hand (with No. 00 sandpaper) and dusted clean before applying succeeding coat.

Application of Paint
All painting and finishing shall be performed by skilled craftsman. Each coat of paint shall be applied at proper consistency, evenly, and free of laps, sags, and runs and cut sharply to require lines. Except as otherwise specified or required, paint shall be applied only under dry and dust-free conditions that will insure properly finished surfaces, free of defects and blemishes. Paint shall not be applied when temperature is likely to be above 32□C (90□F). Sufficient time shall be allowed between coats to insure proper drying. All primer and intermediate coats shall be unscarred and completely integral at time of application of each succeeding coat. The Engineer shall be notified when each coat has been applied and is ready for inspection. Until each coat is inspected and approved by Engineer, no succeeding coats shall be applied. Whenever two coats of a dark colored paint are specified, the first coat shall contain sufficient powdered aluminum to act as an indicator for proper coverage when applying the second coat.
Methods of Application
Except as otherwise specified or when, in the opinion of the Engineer, a particular method would produce unsatisfactory results, paint may be applied by brush, spray, or other application method at the option of the Contractor.
Priming and Back Painting
1. Priming
Before installation, all surfaces of millwork, which are to be painted, shall be primed, giving particular attention to sealing of cross-grained surfaces. In all cases, all work shall be primed as soon as possible after delivery to buildings, before or after installation, as required, or, in case of prefabricated items, at fabricator's shop or mill before shipment, if practicable. Except as otherwise specified, priming shall consist of first coat hereinafter specified under Section 14.10, Painting Systems.
2. Back Painting
Woodwork millwork, and casework to be installed against concrete, masonry, or plaster shall be back painted with one coat of exterior oil paint.

Structural Steel

Description

This work shall consist of steel structures and the steel structure portions of composite structures, in reasonably close conformity with the lines, grades and dimensions shown on the Plans.

The work will include the fabricating, hauling, erecting, welding and painting of structural metals called for in the Special Provision or shown on the Plans. Structural metals will include structural steel, rivet, welding, special and alloy steel, steel forging and castings, and iron castings. This work will also include furnishings of all plant, tools, equipment, materials and labor in the installation of metal framing, roof framing and roofing, including miscellaneous sheet metal works as required in accordance with these Specifications, Plans and Special Provisions.

Materials Requirements

Materials shall meet the requirements of Item 712, Structural Metal; Item 409, Welded Structural Steel and Welded Structural Steel; and Item 709, Paints.
1047.3Construction Requirements

Inspection

The Contractor shall give the Engineer at least fifteen (15) days notice prior to the beginning of work at the mill or shop, so that the mill, shop or foundry where material for the work is to be manufactured or fabricated. No material shall be rolled or fabricated until said inspection has been provided.

The Contractor shall furnish the Engineer with copies of the certified mill reports of the structural steel, preferably before but not later than the delivery of the steel to the job site.

The Contractor shall furnish all facilities for inspection and the Engineer shall be allowed free access to the mill or shop and premises at all times. The Contractor shall furnish, without charge, all labor, machinery, material and tools necessary to prepare test specimens.

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

Stock Material Control

When so specified in the Contract, stock material shall be segregated into classes designated as "identified" or "unidentified". Identified material is material which can be positively identified as having been rolled from a given heat for which certified mill test can be produced. Unidentified material shall include all other general stock materials. When it is proposed to use unidentified material, the Engineer shall be notified of such intention at least fifteen (15) days in advance of commencing fabrication to permit sampling and testing. When so indicated or directed, the Contractor shall select such material as he wishes to use from stock, and place it in such position that it will be accessible for inspection and sampling. The Contractor shall select identified material from as few heat numbers as possible, and furnish the certified mill test reports on each of such heat numbers. Two samples shall be taken from each heat number as directed, one for a tension test and one for a bend test.

In case of unidentified stock, the Engineer may, at his discretion, select any number of random test specimens.

Structural material, either plain or fabricated, shall be stored above the ground upon platforms, skids, or other supports. It shall be kept free from dirt, grease or other foreign matter, and shall be protected as far as practicable from corrosion.

Fabrication

These Specifications apply to welded construction. The Contractor may, however, with the approval of the Engineer, substitute high tensile strength steel bolts equivalent to the welds in any connection.

Workmanship and finish shall be in accordance with the best general practice in modern shops. Portions of the work exposed to view shall be finished neatly. Shearing, flame cutting, and chipping shall be done carefully and accurately.

Structural material, either plain or fabricated, shall be stored above the ground upon platforms, skids or other supports. Rolled material before being laid off or worked must be straight. If straightening is necessary, it shall be done by methods that will not injure the metal. Sharp kinks and bends will be cause for rejection of the material.

Preparation of material shall be in accordance with AWS D 1.1, paragraph 3.2 as modified by AASHTO Standard Specification for Welding of Structural Steel Highway Bridges.

Steel Slabs ANSI 2,000
Heavy plates in contact in shoes to be welded ANSI 1,000
Milled ends of compression members, stiffeners and fillers ANSI 500
Bridge rollers and rockers ANSI 250
Pins and pin holes ANSI 125

Sliding bearings ANSI 125

3. Abutting Joints

Abutting joints in compression members and girders flanges, and in tension members where so specified on the drawings, shall be faced and brought to an even bearing. Where joints are not faced, the opening shall not exceed 6.3 mm.

4. End Connection Angles

Floor beams, stringers and girders having end connection angles shall be built to plan length back to back of connection angles with a permissible tolerance of 0 mm. to minus 1.6 mm. If end connections are faced, the finished thickness of the angles shall not be less than shown on the detail drawings, but in no case less than 9.5 mm.

5. Lacing bars

The ends of lacing bars shall be neatly rounded unless another form is required.

6. Fabrication of Members

Unless otherwise shown on the Plans, steel plates for main members and splice plates for flanges and main tension members, not secondary members, shall be cut and fabricated so that the primary direction of rolling is parallel to the direction of the main tensile and/or compressive stresses.

Fabricated members shall be true to line and free from twists, bends and open joints.

Shop Assembly

The field connections of main members of trusses, arches, continuous beam spans, bents, towers (each face), plate girders and rigid frames shall be assembled in the shop with milled ends of compression members in full bearing, and then shall have their sub-size holes reamed to specified size while the connections are assembled. Assembly shall be "Full Truss or Girders Assembly" unless "Progressive Chord Assembly" or "Special Complete Structure Assembly" is specified in the Special Provisions or on the Plans.

Check assemblies with Numerically-Controlled Drilled Fields Connections shall be in accordance with the provision of 2 (f) of this Subsection.

Truss, Purlins and Tank Structures

(1) Structural Steel Shapes, Plates and Bars

Unless otherwise shown or specified on the drawings, structural steel shapes plates and bars shall conform to ASTM specification A36/A36M.

(2) Hot-Formed Steel Sheet and Strip

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

(3) Bolts, Nuts, and Washer

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

(4) Screw and Expansion Bolts

Screws and expansion bolts shall be of standard commercial grade, and of the sizes and types indicated as approved by the Consultant.

(5) Electrodes

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

(6) Pipe Columns and Hand Rails

Pipe Columns and Hand rails shall be zinc-coated steel pipe of standard weight conforming to ASTM A53.

(7) Galvanizing

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

(8) Miscellaneous Metals

Miscellaneous metal including fastenings, anchorages and incidentals not specifically mentioned herein or in other sections of this specifications but are required to complete the work, for which there are no detailed drawings, shall be provided and installed in accordance with standard practice of the traders as approved by the Engineer.

(9) Delivery, Storage and Handling

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

Structural Steel

Furnished, fabricated and Erected

The quantity, determined as provided above, shall be paid for at the contract unit price per kilogram for "Structural Steel, furnished, fabricated and erected", which price and payment shall constitute full compensation for furnishing, galvanizing, fabricating, radiographing, magnetic particle inspection, delivering, erecting ready for use, and painting all steel and other metal including all labor, equipment, tools and incidentals necessary to complete the work, except as provided in Subsections 403.5.2, 403.5.3 and 403.5.4

Material Considered as Structural Steel

For the purpose of subsection 403.5.1 and unless otherwise shown on the Plans, castings, forgings, special alloy steels and steel plates, wrought iron, and structural shapes of expansion joints and pier protection shall be considered as structural steel except that when quantities and unit price for certain alloy steels, forgings, castings or other specific categories of metal are called for in the Bill of Quantities, the mass of such selected material, determined as provided above, shall be paid for at the respective contract unit price per kilogram for "Structural Steel (Alloy steel, forgings, castings, and/or other category), furnished and fabricated, and erected" or " Structural Steel (Subsection 403.4.1), furnished and fabricated" as named in the Bill of Quantities.

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, utility boxes, octagonal and square boxes; conduit fittings such as couplings, locknuts and bushing and other electrical materials needed to complete the conduit roughing-in works.

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. The electrical materials to be used shall be of the standard products of the manufacturers regularly engaged in the production of equipment and materials required for this project and shall be the manufacturer's latest standard design that complies with the specification requirements. The Contractor shall submit for approval a complete description of all materials and equipment to be used before commencing the work. The descriptions shall include catalogue numbers, illustrations, diagrams, dimensional data, etc., as required to describe fully the materials

Conduits

(a) Rigid Steel Conduit shall be electrical metal tubing (EMT) conduit, hot dip galvanized, conforming to ANSI Standard C80.1, or "American Standard Specifications for Steel Conduit, zinc coated" unless shown otherwise in the drawings. The conduit fittings and covers shall be galvanized, threaded, or cadmium plated, grey iron or malleable iron castings. Composite rubber gasket shall be provided in all openings requiring covers. Outlets and pull boxes shall be of the sizes and types shown in the Plan.
(b) Rigid PVC Conduit shall be NEMA TC2, type EPC-PVC and shall be schedule 40. Enamel coated steel conduits and conduits with rough inner surfaces are not acceptable.

Conduit Boxes and Fittings

All conduit boxes and fittings shall be Code gauge steel and galvanized. Outlet boxes and fittings 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.

Construction Requirement

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 hacksaw and ends reamed. Running or non-tapered threads shall not be used. Each run of conduit between boxes or equipment shall be electrically continuous. Threads shall conform to the American Standard for tapered pipe threads. 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 entering slip holes in boxes shall be secured with a locknut on each side of the box wall and terminated with a bushing.

All joints between lengths of conduits and threaded connections to boxes, fittings and equipment enclosures shall be made watertight. Conduits shall be sloped towards drain points. Conduits shall be rigidly supported and braced to avoid shifting during placement of concrete. Conduits extending out of floors, walls, or beams shall be at right angles to the surfaces.

Spacing of conduits shall be such as to permit the flow of concrete between them. A minimum spacing of not less than 5 cm. shall be maintained, except where conduits enter boxes. Where conduits are placed in two or more layers or rows, the conduits in the upper or inner layers shall be placed directly over or behind the lower or outer layers, respectively.

Conduits terminating at the face of concrete for initial or future extensions as exposed runs shall be terminated with plugged couplings set flush with the floor, ceilings or wall. Galvanized iron plugs shall be provided for conduits, which are to be extended in the future. Where it is not practical to employ flush couplings, the conduit ends shall be suitably boxed or otherwise protected and plugged.

Conduits running in floors and terminating at motors or other equipment mounted on concrete bases shall be brought up to the equipment within the concrete base wherever possible. Conduit boxes shall be flush with the finished wall with covers and openings easily accessible. The Contractor shall remove and reset all boxes not properly installed or shifted out of line during concreting to the satisfaction of the Engineer.

Conduit Boxes & Fittings

Each outlet in the drawing or raceway system shall be provided with an outlet box to suit the conditions encountered. Boxes for exposed work or in wet locations shall be of the cast metal type having threaded hubs. Boxes for concealed work shall be the cadmium-plated or zinc-coated sheet metal type. Each box shall have sufficient volume to accommodate the number of conductors entering the box.. Boxes shall not be less than 50 mm deep unless shallower boxes are required by structural conditions that are specifically approved by the Engineer. Ceiling and bracket outlet boxes shall not be less than 100 mm octagonal except that smaller boxes may be used where required by the particular fixtures to be installed. Switch and receptacle boxes shall be approximately 100 mm x 50 mm x 50 mm. Telephone outlets shall be 100 mm square except that 100 mm x 54 mm x 40 mm boxes may be used where only one raceway enter the outlet. Boxes installed in concealed locations shall be set flush with the finished surfaces and shall be provided with the proper extension rings or plaster covers where required. Boxes shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction, or shall be fastened directly with wood screws on wood. Location of outlets shown on the drawings are approximates; the Contractor shall study the building plans in relation to the spaces and equipment surrounding each outlet so that the lighting fixtures are symmetrically located according to the room layout. When necessary, with the approval of the Consultant, outlets shall be relocated to avoid interference with mechanical equipment or structural features.

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 conspicuous 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 anti-rust 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.

Wires and Wiring devices

Description

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

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 conductor shall be insulated for 600 Volts. All wires shall be copper, soft drawn and annealed, smooth and cylindrical form and shall be centrally located inside the insulation. All wiring devices shall be standard product of reputable electrical manufacturers. Wall switches shall be rated at least 10A, 250 Volts and shall be spring operated, flush, tumbler type. Duplex convenience receptacles shall be rated at least 15A, 250 Volts, flush, parallel slot single heavy duty receptacles shall be rated at least 20 A, 250 Volts, wire, flush, polarize type.
Conductors in conduits shall be moisture and heat-resistant rubber or thermoplastic insulated. In dry locations, wires and cables shall be type THW for sizes 8 mm. and smaller and type THW or THHN for sizes 14 sq. mm. and larger. In damp or wet locations as defined by the Philippine Electric Code, wires and cables shall be type THW. All conductors shall have 600 volts insulation unless otherwise specified in the drawings. Wire shall be stranded copper for 5.5 mm. diameter and larger sizes. Wires for the telephone and signaling systems shall be twisted telephone wires, thermoplastic insulated. The number and sizes shall be as specified in the drawings.
Construction Requirements

Conductors of wires shall not be drawn in conduit until after the cement plaster 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 connection for fixtures, switches, receptacles and other wiring devices without the use of additional splice:
All conductors of convenience outlets and lighting branch circuit home runs shall be wired with a minimum of 3.5 mm. in size. Circuit homeruns to panel boards shall not be smaller than 3.5 mm. but a homerun 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 14 mm. and larger in size shall be connected to panel and apparatus by means of approved type lugs or connectors of the solderless type, sufficiently large enough to enclose all strands of the conductors and securely fasten. They shall not loosen under vibration of normal strain.
All joints, taps and splices on wires larger than 14 mm. shall be made of suitable solderless connectors of the approved type and size. They shall be taped with rubber and PVC tapes providing insulation no 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 (pull boxes). All joints in branch circuit wiring shall be made mechanically and electrically secured by approved splicing devices taped with rubber and PVC tapes in a manner which will make their insulation as that of the conductor.
All wall switches and receptacle shall be fitted with standard bakelite face plate covers. Device plate for flush mounting shall be installed with all four edges in continuous contract finished wall surfaces without the use of coiled wire or similar devices. Plaster fillings will not be permitted. Plate 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.
Quality Assurance Provisions
All installation shall be completed on or before final acceptance of the project including the tests and commissioning. Equipment shall be demonstrated to operate in accordance with the requirements of this specification. The Contractor shall furnish all instruments, tools and personnel required for the tests. As an exception to requirements that may be stated elsewhere in the contract agreement, the Engineer shall be given five (5) working days notice prior to each test. All defects disclosed as a result of such test that are due to the Contractor and shall be remedied to the satisfaction of the Engineer.
(a) Devices subject to Manual Operation
Each device subject to manual operation shall be tested five (5) times demonstrating satisfactory operation each time.
(b) Test on 600 Volts Wiring

Test of all 600 volts wiring to verify that no circuits or accidental grounds exist. Perform insulation resistance test on all wiring using an instrument which apply a voltage of approximately 500 volts to provide a direct reading of resistance; minimum resistance shall be 250,000 ohms that the resistance to ground is not excessive. Test each ground rod for resistance to ground before making any connections to the rod, then tie entire grounding system together and test for resistance to ground. Make resistance measurements in normally dry weather condition, not less than 48 hours after rainfall. Submit written results of each test to the Engineer and indicate the locations of the rod as well as the resistance and soil conditions at the time of the measurements were made.

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 panelboards 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 with 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 as 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:

a) 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.
b) Three (3) power fuses mounted in separate compartments within the switch housing and accessible by a hinged door.
c) One (1) set of high voltage potheads or 3-conductor cables or three single conductor cables.
d) Lighting 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 transformers shall be provided with four (4 approximately 2 ½ % rated KVA taps on the primary windings 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 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, safety type construction and shall consist of the following:

a) Switchboard Housing

The housing shall be heavy gauge steel sheet, dead front type, gray enamel finish, complete with frame supports, steel bracings, steel sheet panelboard, removable rear plates, copper busbars, and all other

necessary accessories to ensure sufficient mechanical strength and safety. It shall be provided with grounding bolts and clamps.

b) Secondary Metering Section

The secondary metering section shall consist of one (1) ammeter, AC, Indicating type; one voltmeter, AC, Indicating Type, one (1) ammeter transfer switch for 3-phase; one (1) voltmeter transfer switch for 3-phase; and current transformers of suitable rating and capacity.

The abovementioned instruments shall be installed in one compartment above the main breaker and shall be complete with all necessary accessories completely wired, ready for use.

c) Main Circuit Breaker

The main circuit breaker shall be draw-out type, manually or electrically operated, manual trip bottom, magnetic tripping devices, adjustable time overcurrent protection and instantaneous short circuit trip and all necessary accessories to ensure safe and efficient operation.

d) 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 breaker shall be drawn 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 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 a 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 busbars 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.

Panelboards and cabinets

Panelboards shall conform to the schedule of panelboards as shown on the approved Plans with respect to supply characteristics, rating of main lugs or main circuit breaker, number and ratings and capabilities of branch circuit breakers.Panelboards shall consist of a factory completed dead front assembly mounted in an inclosing flush type cabinet consisting of code gauge 14 (2.0 mm thick) galvanized sheet steel box with trim and door. Each door shall be provided with catch lock and two (2) keys. Panelboards shall be provided with directories and shall be printed to indicate load served by each circuit.

Panelboard cabinets and trims shall be suitable for the type of mounting shown on the approved Plans. The inside and outside of panelboard 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 panelboards 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 panelboards 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.

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 panelboards 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 with 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 as 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:

e) 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.

f) Three (3) power fuses mounted in separate compartments within the switch housing and accessible by a hinged door.

g) One (1) set of high voltage potheads or 3-conductor cables or three single conductor cables.

h) Lighting 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 transformers shall be provided with four (4 approximately 2 ½ % rated KVA taps on the primary windings 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 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, safety type construction and shall consist of the following:

e) Switchboard Housing

The housing shall be heavy gauge steel sheet, dead front type, gray enamel finish, complete with frame supports, steel bracings, steel sheet panelboard, removable rear plates, copper busbars, and all other necessary accessories to ensure sufficient mechanical strength and safety. It shall be provided with grounding bolts and clamps.

f) Secondary Metering Section

The secondary metering section shall consist of one (1) ammeter, AC, Indicating type; one voltmeter, AC, Indicating Type, one (1) ammeter transfer switch for 3-phase; one (1) voltmeter transfer switch for 3-phase; and current transformers of suitable rating and capacity.

The abovementioned instruments shall be installed in one compartment above the main breaker and shall be complete with all necessary accessories completely wired, ready for use.

g) Main Circuit Breaker

The main circuit breaker shall be draw-out type, manually or electrically operated, manual trip bottom, magnetic tripping devices, adjustable time overcurrent protection and instantaneous short circuit trip and all necessary accessories to ensure safe and efficient operation.

h) 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 breaker shall be drawn

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 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 a 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 busbars 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.

Panelboards and cabinets

Panelboards shall conform to the schedule of panelboards as shown on the approved Plans with respect to supply characteristics, rating of main lugs or main circuit breaker, number and ratings and capabilities of branch circuit breakers.Panelboards shall consist of a factory completed dead front assembly mounted in an inclosing flush type cabinet consisting of code gauge 14 (2.0 mm thick) galvanized sheet steel box with trim and door. Each door shall be provided with catch lock and two (2) keys. Panelboards shall be provided with directories and shall be printed to indicate load served by each circuit.

Panelboard cabinets and trims shall be suitable for the type of mounting shown on the approved Plans. The inside and outside of panelboard 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 panelboards 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 panelboards 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.

Lighting Fixtures

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, utility boxes, octagonal and square boxes; conduit fittings such as couplings, locknuts and bushing and other electrical materials needed to complete the conduit roughing-in works.

General Specifications

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

Specifications on:

Lightning Fixtures and Lamp

All lightning fixtures and lamps of type and sizes as specified and listed on the Lighting Fixture Schedule and shall be furnished and installed complete. Incandescent lamps shall be inside frosted lamp, 230 volts, and wattage as indicated. All Fluorescent lamps shall be 40 watt, pre-heat type, rapid start, cool white color characteristics and shall have complete high frequency electronic ballast, 230 volt.

Fixtures are designated by letters and illustrations shall be indicative of the general type desired and shall not restrict selection to fixtures of any particular manufacturer. Fixtures of similar design and equivalent light distribution and brightness characteristics having equal finish and quality may be acceptable but subject to the approval of the Engineer.

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/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 request for the Clearance to Proceed duly approved by the owner's representative.