



Republic of the Philippines
Department of Agriculture
Western Visayas
Iloilo City

TECHNICAL SPECIFICATION OF ESTABLISHMENT OF POULTRY HOUSE

Region VI

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SPL1

PROJECT MARKER SIGNBOARD AND COA BILLBOARD

The project signboard design layout and dimension shall be on standard billboard measuring 1200 mm x 2400 mm (4ft x 8ft.) using 12 mm (1/2 inch) thick marine plywood or tarpaulin posted on 5 mm (3/16 inch) marine plywood. The billboard shall be installed in front of the project site. Framing support shall be 2" x 2" x 8' good lumber.

COA Billboard layout shall be 2400 mm x 2400 mm (8 ft x 8 ft) tarpaulin posted with 12 mm (1/2 inch) marine plywood and framed with 2" x 2" x 8' good lumber support. Resolution used shall be 70 dpi with Helvetica font name and black color as font design.

The project marker shall conform to the detailed engineering design as per plan. All slopes and dimensions must follow base on the prescribed detailed in plan. All text letters are engraved on a granite plate.

SPL2

MOBILIZATION AND DEMOBILIZATION

The Contractor shall mobilize and move into the Project Site the required construction equipment needed for the successful completion of the Contract Work.

Demobilization shall include dismantling and removal from the site of Contractor's, materials, equipment and all temporary facilities with the exception of some facilities, which the Project Engineer shall consider remaining, and shall be handed over to DA. The time of demobilization shall also include clean-up of the site after completion of the Contract Works.

ITEM 800

CLEARING, GRUBBING AND LAYOUTING

(Refers to Item 100, Part C of Volume II-Blue Book)

100.1 Description

This item shall consist of clearing, grubbing, removing and disposing all vegetation and debris as designated in the Contract, except those objects that are designated to remain in place or are to be removed in consonance with other provisions of this Specification. The work shall also include the preservation from injury or defacement of all objects designated to remain.

100.2 Construction Requirements

100.2.1 General

The Engineer will establish the limits of work and designate all trees, shrubs, plants and other things to remain. The Contractor shall preserve all objects designated to remain.

Clearing shall extend one (1) meter beyond the toe of the fill slopes or beyond rounding of cut slopes as the case maybe for the entire length of the project unless otherwise shown on the plans or as directed by the Engineer and provided it is within the right of way limits of the project, with the exception of trees under the jurisdiction of the Forest Management Bureau (FMB).

100.2.2 Clearing and Grubbing

All surface objects and all trees, stumps, roots and other protruding obstructions, not designated to remain, shall be cleared and/or grubbed, including mowing as required, except as provided below:

- 1) Removal of undisturbed stumps and roots and nonperishable solid objects with a minimum depth of one (1) meter below subgrade or slope of embankment will not be required.
- 2) In areas outside of the grading limits of cut and embankment areas, stumps and nonperishable solid objects shall be cut off not more than 150 mm (6 inches) above the ground line or low water level.
- 3) In areas to be rounded at the top of cut slopes, stumps shall be cut off flush with or below the surface of the final slope line.

- 4) Grubbing of pits, channel changes and ditches will be required only to the depth necessitated by the proposed excavation within such areas.
- 5) In areas covered by cogon/talahib, wild grass and other vegetation, top soil shall be cut to a maximum depth of 150 mm below the original ground surface or as designated by the Engineer, and disposed outside the clearing and grubbing limits as indicated in the typical roadway section.

If perishable material is burned, it shall be burned under the constant care of component watchmen at such times and in such a manner that the surrounding vegetation, other adjacent property, or anything designated to remain on the right of way will not be jeopardized. If permitted, burning shall be done in accordance with applicable laws, ordinances, and regulation.

Materials and debris which cannot be burned and perishable materials may be disposed off by methods and at locations approved by the Engineer, on or off the project. If disposal is by burying, the debris shall be placed in layers with the material so disturbed to avoid nesting. Each layer shall be covered or mixed with earth material by the land-fill method to fill all voids. The top layer of material buried shall be covered with at least 300 mm (12 inches) of earth or other approved material and shall be graded, shaped and compacted to present a pleasing appearance. If the disposal location is off the project, the Contractor shall make all necessary arrangements with property owners in writing for obtaining suitable disposal locations which are outside the limits of view from the project. The cost involved shall be included in the unit bid price. A copy of such agreement shall be furnished to the Engineer. The disposal areas shall be seeded, fertilized and mulched at the Contractor's expense.

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be trimmed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 6 m (20 feet) above the roadbed surface. All trimming shall be done by skilled workmen and in accordance with good tree surgery practices.

100.3 Method of Measurement

Measurement will be by one or more of the following alternate methods:

- 1) Area Basis. The work to be paid for shall be the number of hectares and fractions thereof acceptably cleared and grubbed within the limits indicated on the Plans or as may be adjusted in field staking by the Engineer. Areas not within the clearing and grubbing limits shown on the Plans or not staked for clearing and grubbing will not be measured for payment.

100.4 Basis of Payment

The accepted quantities, measured as prescribed in Section 100.3, shall be paid for at the Contract unit price for each of the Pay Items listed below that is included in the Bill of Quantities, which price and payment shall be full compensation for furnishing all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
100 (1)	Clearing and Grubbing	Square meters

ITEM 803 STRUCTURE EXCAVATION (Refers to Item 103, Part C of Volume II-Blue Book)

103.1 Description

This Item shall consist of the necessary excavation for foundation of bridges, culverts, underdrains, and **other structures (wall footings and column footings)** not otherwise provided for in the Specifications. Except as otherwise provided for pipe culverts, the backfilling of completed structures and the disposal of all excavated surplus materials, shall be in accordance with these Specifications and in reasonably close conformity with the Plans or as established by the Engineer.

It shall also include the furnishing and placing of approved foundation fill material to replace unsuitable material encountered below the foundation elevation of structures.

103.2 Construction Requirements

103.2.1 Excavation

(1) General, all structures. The Contractor shall notify the Engineer sufficiently in advance of the beginning of any excavation so that cross-sectional elevations and measurements may be taken on the undisturbed ground. The natural ground adjacent to the structure shall not be disturbed without permission of the Engineer.

Trenches or foundation pits for structures or structure footings shall be excavated to the lines and grades or elevations shown on the Plans or as staked by the Engineer. They shall be of sufficient size to permit the placing of structures or structure footings of the full width and length shown. The elevations of the bottoms of footings, as shown on the Plans, shall be considered as approximate only and the Engineer may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary, to secure a satisfactory foundation.

Boulders, logs, and other objectionable materials encountered in excavation shall be removed.

After each excavation is completed, the Contractor shall notify the Engineer to that effect and no footing, bedding material shall be placed until the Engineer has approved the depth of excavation and the character of the foundation material.

(2) Structures other than pipe culverts. All rock or other hard foundation materials shall be cleaned all loose materials, and cut to a firm surface, either level, stepped, or serrated as directed by the Engineer. All seams or crevices shall be cleaned and grouted. All loose and disintegrated rocks and thin strata shall be removed.

103.2.2 Utilization of Excavated Materials

All excavated materials, so far as suitable, shall be utilized as backfill or embankment. The surplus materials shall be disposed off in such manner as not to obstruct the stream or otherwise impair the efficiency or appearance of the structure. No excavated materials shall be deposited at any time so as to endanger the partly finished structure.

103.2.3 Backfill and Embankment for Structures Other Than Pipe Culverts

Excavated areas around structures shall be backfilled with free draining granular material approved by the Engineer and placed in horizontal layers not over 150 mm (6 inches) in thickness, to the level of the original ground surface. Each layer shall be moistened or dried as required and thoroughly compacted.

103.3 Method of Measurement

103.3.1 Structure Excavation

The volume of excavation to be paid for will be the number of cubic meters measured in original position of material acceptably excavated in conformity with the Plans or as directed by the Engineer, but in no case, except as noted, will any of the following volumes be included in the measurement for payment:

(1) The volume of any excavation performed prior to the taking of elevations and measurements of the undisturbed ground.

(2) The volume of excavation for footings ordered at a depth more than 1.5 m (60 inches) below the lowest elevation for such footings shown on the original Contract Plans, unless the Bill of Quantities contains a pay item for excavation ordered below the elevations shown on the Plans for individual footings.

103.4 Basis of Payment

The accepted quantities, measured as prescribed in Section 103.3, shall be paid for at the contract unit price for each of the particular pay items listed below that is included in the Bill of Quantities. The payment shall constitute full compensation for the removal and disposal of excavated materials including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
103 (1)	Structure Excavation	Cubic meters

ITEM 1601 STRUCTURAL BACKFILL

1601.1 Description

This item shall consist of all operations required to replace excavated and unsuitable materials to fill up to grade in accordance with the approved Plans and Specifications.

1601.2 Material Requirements

The selected materials shall be free from grass, roots, brush, or other vegetation, or rocks having maximum dimension larger than 150 mm.

1601.3 Construction Requirements

Backfill materials shall be laid in horizontal layers, not more than 200 mm in thickness and compacted to 100 percent of maximum density and to be carried to the level of the surrounding ground or to the lines and grades as shown on the drawings.

1601.4 Method of Measurement

The quantity of backfill and fill materials to be paid for under this item shall be the volume which were actually placed and accepted and computed by the average end-area multiplied by total length.

1601.5 Basis of Payment

The accepted quantities, measured as prescribed in Section 1601.4, shall be paid for at the Contract unit price for each of the Pay Items listed below that is included in the Bill of Quantities. The payment shall continue full compensation for placing and compacting all materials including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
1601	Backfill and Fill	Cubic Meter

ITEM 1707 LEVELING COURSE (Refers to Item 200, Part C Volume II-Blue Book)

200.1 Description

This item shall consist of furnishing, placing and compacting an aggregate subbase course on a prepared subgrade in accordance with this Specification and the lines, grades and cross-sections shown on the Plans, or as directed by the Engineer.

200.2 Material Requirements

Aggregate for subbase shall consist of hard, durable particles or fragments of crushed or natural gravel and filler of natural or crushed sand. The composite material shall be free from vegetable matter and lumps or balls of clay, and shall be of such nature that it can be compacted readily to form a firm, stable subbase.

The subbase material shall conform to Table 200.1, Grading Requirements

Table 200.1 – Grading Requirements

Sieve Designation		Mass Percent Passing
Standard, mm	Alternate US Standard	
50	2"	100
25	1"	55 – 85
9.5	3/8"	40 – 75
0.075	No. 200	0 - 12

The fraction passing the 0.075 mm (No. 200) sieve shall not be greater than 0.66 (two thirds) of the fraction passing the 0.425 mm (No. 40) sieve.

The fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 35 and plasticity index not greater than 12 as determined by AASHTO T 89 and T 90, respectively.

The coarse portion, retained on a 2.00 mm (No. 10) sieve, shall have a mass percent of wear not exceeding 50 by the Los Angeles Abrasion Tests as determined by AASHTO T 96.

The material shall have a soaked CBR value of not less than 25% as determined by AASHTO T 193. The CBR value shall be obtained at the maximum dry density and determined by AASHTO T 180, Method D.

200.3 Construction Requirements

200.3.1 Preparation of Existing Surface

The existing surface shall be graded and finished as provided under Item 105, Subgrade Preparation, before placing the subbase material.

200.3.2 Placing

The aggregate subbase material shall be placed at a uniform mixture on a prepared subgrade in a quantity which will provide the required compacted thickness. When more than one layer is required, each layer shall be shaped and compacted before the succeeding layer is placed.

The placing of material shall begin at the point designated by the Engineer. The layer or windrow shall be of such size that when spread and compacted the finished layer be in reasonably close conformity to the nominal thickness shown on the Plans.

203.3.3 Spreading and Compacting

When uniformly mixed, the mixture shall be spread to the plan thickness, for compaction.

Where the required thickness is 150 mm or less, the material may be spread and compacted in one layer. All subsequent layers shall be spread and compacted in a similar manner.

The moisture content of subbase material shall, if necessary, be adjusted prior to compaction by watering, as required in order to obtain the required compaction.

Immediately following final spreading and smoothing, each layer shall be compacted to the full width by means of approved compaction equipment. Any irregularities or depressions that develop shall be corrected by loosening the material at these places and adding or removing material until surface is smooth and uniform.

If the layer of subbase material, or part thereof, does not conform to the required finish, the Contractor shall, at his own expense, make the necessary corrections.

Compaction of each layer shall continue until a field density of at least 100 percent of the maximum dry density determined in accordance with AASHTO T 180, Method D has been achieved. In-place density determination shall be made in accordance with AASHTO T 191.

200.4 Method of Measurement

Aggregate Subbase Course will be measured by the cubic meter (m³). The quantity to be paid for shall be the design volume compacted in-place as shown on the Plans, and accepted in the completed course. No allowance will be given for materials placed outside the design limits shown on the cross- sections.

200.5 Basis of Payment

The accepted quantities, measured as prescribed in Section 200.4, shall be paid for at the contract unit price for Aggregate Subbase Course which price and payment shall be full compensation for furnishings and placing all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit Of Measurement
200	Aggregate Subbase Course	Cubic Meter

SUB Item 105 – SUBGRADE PREPARATION

105.1 Subgrade in Common Excavation

Unless otherwise specified, all materials below subgrade level in earth cuts to a depth 150 mm or other depth shown on the Plans or as directed by the Engineer shall be excavated. The material, if suitable, shall be set aside for future use or, if unsuitable, shall be disposed off in accordance with the requirements of Subsection 102.2.9.

ITEM 404 REINFORCING STEEL BAR

404.1 Description

This Item shall consist of furnishing, bending, fabricating and placing of steel reinforcement of the type, size, shape and grade required in accordance with this Specification and in conformity with the requirements shown on the Plans or as directed by the Engineer.

404.2 Material Requirements

Reinforcing steel shall meet the requirements of item 710, Reinforcing Steel and Wire Rope. Reinforcing steel bars shall be standard commercial, deformed steel such as steel or other locally available equivalent. Steel bars shall be free from rust and dust. Scale and splices in bars shall be made at the critical points of maximum stress.

404.3 Construction Requirements

404.3.1 Order Lists

Before materials are ordered, all order lists and bending diagrams shall be furnished by the Contractor, for approval of the Engineer. The approval of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams. Any expense incident to the revisions of materials furnished in accordance with such lists and diagrams to make them comply with the Plans shall be borne by the Contractor.

404.4 Protection of Material

Steel reinforcement shall be stored above the surface of the ground upon platforms, skids, or other supports and shall be protected as far as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the work, reinforcement shall be free from dirt, detrimental rust, loose scale, paint, grease, oil, or other foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross sectional area and tensile properties of a hand wire brushed specimen meets the physical requirements for the size and grade of steel specified.

404.4.1 Bending

All reinforcing bars requiring bending shall be cold-bent to the shapes shown on the Plans or required by the Engineer. Bars shall be bent around a circular pin having the following diameters (D) in relation to the diameter of the bar (d):

Nominal diameter, d, mm	Pin diameter (D)
10 to 20	6d

Bends and hooks in stirrups or ties may be bent to the diameter of the principal bar enclosed therein.

404.4.2 Placing and Fastening

All steel reinforcement shall be accurately placed in the position shown on the Plans or required by the Engineer and firmly held there during the placing and setting of the concrete. Bars shall be tied at all intersections except where spacing is less than 300mm in each directions, in which case, alternate intersections shall be tied. Ties shall be fastened on the inside.

Distance from the forms shall be maintained by means of stays, blocks, ties, hangers, or other approved supports, so that it does not vary from the position indicated on the Plans by more than 6mm. Blocks for holding reinforcement from contact with the forms shall be precast mortar blocks of approved shapes and dimensions. Layers of bars shall be separated by precast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks shall not be permitted. Unless otherwise shown on the Plans or required by the Engineer, the minimum distance between bars shall be 40mm. Reinforcement in any member shall be placed and then inspected and approved by the Engineer before the placing of concrete begins. Concrete placed in violation of this provision may be rejected and removal may be required. If fabric reinforcement is shipped in rolls, it shall be straightened before being placed. Bundled bars shall be tied together at not more than 1.8m intervals.

404.4.3 Splicing

All reinforcement shall be furnished in the full lengths indicated on the Plans. Splicing of bars, except where shown on the Plans, will not be permitted without the written approval of the Engineer. Splices shall be staggered as far as possible and with a minimum separation of not less than 40 bar diameters. Not more than one-third of the bars may be spliced in the same cross-section, except where shown on the Plans.

Unless otherwise shown on the Plans, bars shall be lapped a minimum distance of:

Splice Type	Grade 40 min. lap	Grade 60 min. lap	But not less than
Tension	24 bar dia	36 bar dia	300 mm
Compression	20 bar dia	24 bar dia	300 mm

In lapped splices, the bars shall be placed in contact and wired together. Lapped splices will not be permitted at locations where the concrete section is insufficient to provide minimum clear distance of one and one-third the maximum size of coarse aggregate between the splice and the nearest adjacent bar. Welding of reinforcing steel shall be done only if detailed on the Plans or if authorized by the Engineer in writing. Spiral reinforcement shall be spliced by lapping at least one and a half turns or by butt welding unless otherwise shown on the Plans.

404.4.4 Lapping of Bar Mat

Sheets of mesh or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges. The overlap shall not be less than one mesh in width.

404.5 Method of Measurement

The quantity of reinforcing steel to be paid for will be the final quantity placed and accepted in the completed structure.

No allowance will be made for tie-wires, separators, wire chairs and other material used in fastening the reinforcing steel in place. If bars are substituted upon the Contractor's request and approved by the Engineer and as a result thereof more steel is used than specified, only the mass specified shall be measured for payment.

No measurement or payment will be made for splices added by the Contractor unless directed or approved by the Engineer.

When there is no item for reinforcing steel in the Bill of Quantities, costs will be considered as incidental to the other items in the Bill of Quantities.

404.6 Basis of Payment

The accepted quantity, measured as prescribed in Section 404.4, shall be paid for at the contract unit price for Reinforcing Steel which price and payment shall be full compensation for furnishing and placing all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
404	Reinforcing Steel	Kilogram

ITEM 414 FORMWORKS

414.1 Description

This item shall consist of designing, constructing and removing forms to temporarily support concrete, girders and other structural elements until the structure is completed to the point it can support itself.

414.2 Material Requirements

414.2.1 Formwork

The materials used for smooth form finish shall be plywood, lumber or other acceptable materials capable of producing the desired finish for form-facing materials. Form-facing materials with raised grain, torn surfaces, worn edges, patches, dents, or other defect that will impair the texture of concrete surfaces shall not be permitted. No form-facing material shall be specified for rough form finish.

414.2.1.1 Formwork accessories

Formwork accessories that are partially or wholly embedded in concrete, including ties and hangers shall be commercially manufactured. The use of non-fabricated wire form ties shall not be permitted. Where indicated in the Contract, use form ties with integral water barrier plates in walls.

414.3 Construction Requirements

414.3.1 Forms

The forms construction shall be in accordance whenever applicable, with Item 407 Concrete Structure subsection 407.3.13 Formwork Construction.

Form panels to be used shall be in good condition free of defects on exposed surfaces. If form panel material other than plywood is used, it shall have flexural strength, modulus of elasticity and other physical properties equal to or greater than the physical properties for the type of plywood specified.

Furnish and place form panels for exposed surfaces in uniform widths of not less than 1 meter and in uniform lengths of not less than 2 meters except where the width of the member formed is less than 1 meter.

Arrange panels in symmetrical patterns conforming to the general lines of the structure. Place panels for vertical surfaces with the long dimension horizontal and with horizontal joints level and continuous. For walls with sloping footings which do not abut other walls, panels may be placed with the long dimension parallel to the footing.

Use form ties and anchors that can be removed without damaging the concrete surface. Construct metal ties or anchorages within the forms to permit their removal to a depth of at least 25 millimeters from the face without damage to the concrete. Fill cavities with cement mortar and finish to a sound, smooth, uniform colored surface.

414.3.2 Removal of Forms

The removal of forms and falsework shall be in accordance whenever applicable with Item 407 Concrete Structure subsection 407.3.14 Removal of forms.

414.4 Method of Measurement

When the Contract stipulates that payment will be made for forms on square meter basis, the pay item will include all materials and accessories needed in the work.

Whenever the Bill of Quantities does not contain an item for form, the work will not be paid directly but will be considered as a subsidiary obligation of the contractor under other Contract Items.

414.5 Basis of Payment

The accepted quantities measured as prescribed in subsection 414.4, shall be paid for at the Contract square meter price for Forms which price and payment shall be full compensation for designing, constructing and removing forms, all materials and accessories needed and for furnishing all labor equipment tools and incidentals necessary to complete the item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
414	Formworks and Falseworks	Square Meter

ITEM 405 STRUCTURAL CONCRETE

405.1 Description

405.1.1 Scope

This Item shall consist of furnishing, bending, placing and finishing concrete in all structures except pavements in accordance with this Specification and conforming to the lines, grades, and dimensions shown on the Plans. Concrete shall consist of a mixture of Portland Cement, fine aggregate, coarse aggregate, admixture when specified, and water mixed in the proportions specified or approved by the Engineer.

405.1.2 Classes and Uses of Concrete

Class A and B of concrete mixture will be used in the construction.

The classes of concrete will generally be used as follows:

Class A – mixture to be used for footings and columns.

Class B – mixture to be used for the slab.

405.2 Material Requirements

405.2.1 Portland Cement

It shall conform to all the requirements of Subsection 311.2.1.

405.2.2 Fine Aggregate

It shall conform to all the requirements of Subsection 311.2.2.

405.2.3 Coarse Aggregate

It shall conform all the requirements of Subsection 311.2.3 except that gradation shall conform to Table 405.1.

Table 405.1 – Grading Requirements for Coarse Aggregate

Sieve Standard Mm	Designation Alternate US Standard	Mass Percent Passing	
		Class A	Class B
63	2-1/2"		100
50	2"	100	95 – 100
37.5	1-1/2"	95 – 100	-
25	1"	-	35 – 70
19.0	3/4"	35 – 70	-
12.5	1/2"	-	10 – 30

9.5	3/8"	10 – 30	-
4.75	No.4	0 - 5	0 - 5

* The measured cement content shall be within plus (+) or minus (-) 2 mass percent of the design cement content.

405.2.4 Water

It shall conform to the requirements of Subsection 311.2.4

405.2.5 Reinforcing Steel

It shall conform to the requirements of Item 710, Reinforcing Steel and Wire Rope.

405.2.6 Admixtures

Admixtures shall conform to the requirements of Subsection 311.2.7

405.2.7 Curing Materials

Curing materials shall conform to the requirements of Subsection 311.2.8.

405.3 Sampling and Testing of Structural Concrete

As work progresses, at least one (1) sample consisting of three (3) concrete cylinder test specimens, 150 x 300mm (6 x 12 inches), shall be taken from each seventy five (75) cubic meters of each class of concrete or fraction thereof placed each day.

Compliance with the requirements of this Section shall be determined in accordance with the following standard methods of AASHTO:

Sampling of fresh concrete	T 141
Weight per cubic metre and air content (gravimetric) of concrete	T 121
Sieve analysis of fine and coarse aggregates	T 27
Slump of Portland Cement Concrete	T 119
Specific gravity and absorption of fine aggregate	T 84

Tests for strength shall be made in accordance with the following:

Making and curing concrete compressive and flexural tests specimens in the field	T 23
Compressive strength of molded concrete Cylinders	T 22

405.4 Production Requirements

405.4.1 Proportioning and Strength of Structural Concrete

The concrete materials shall be proportioned in accordance with the requirements for each class of concrete as specified in Table 405.2, using the absolute volume method as outlined in the American Concrete Institute (ACI) Standard 211.1. "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete". Other methods of proportioning may be employed in the mix design with prior approval of the Engineer. The mix shall either be 213 designed or approved by the Engineer. A change in the source of materials during the progress of work may necessitate a new mix design.

The strength requirements for each class of concrete shall be as specified in Table 405.2.

Table 405.2 - Composition and Strength of Concrete for Use in Structures

Class Of Concrete	Minimum Cement Content Per m3 kg (bag**)	Maximum Water/ Cement Ratio kg/kg	Consistency Range in Slump mm (inch)	Designated Size of Coarse Aggregate Square Opening Std. mm	Minimum Compressive Strength of 150x300mm Concrete Cylinder Specimen at 28 days, MN/m2 (psi)
A	360	0.53	50 – 100	37.5 – 4.75	20.7
	(9 bags)		(2 – 4)	(1-1/2" – No. 4)	(3000)

B	320	0.58	50 – 100	50 – 4.75	16.5
	(8 bags)		(2 – 4)	(2" – No. 4)	(2400)

* The measured cement content shall be within plus or minus 2 mass percent of the design cement content.

** Based on 40 kg/bag

405.4.2 Consistency

Concrete shall have a consistency such that it will be workable in the required position. It shall be of such a consistency that it will flow around reinforcing steel but individual particles of the coarse aggregate when isolated shall show a coating of mortar containing its proportionate amount of sand. The consistency of concrete shall be gauged by the ability of the equipment to properly place it and not by the difficulty in mixing and transporting. The quantity 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.

405.4.3 Mixing and Delivery

Portland cement, coarse and fine aggregates and water are mixed manually with the used of shovel and other tools used for mixing the materials needed. Materials shall be mixed until the required mixture is obtained. The mixture must be free from grass, roots and other unsuitable materials.

405.5 Method of Measurement

The quantity of structural concrete to be paid for will be the final quantity placed and accepted in the completed structure. No deduction will be made for the volume occupied by pipe less than 100mm (4 inches) in diameter or by reinforcing steel, anchors, conduits, weep holes or expansion joint materials.

405.6 Basis of Payment

The accepted quantities, measured as prescribed in Section 405.5, shall be paid for at the contract unit price for each of the Pay Item listed below that is included in the Bill of Quantities.

Payment shall constitute full compensation for furnishing, placing and finishing concrete including all labor, equipment, tools and incidentals necessary to complete the work prescribed in the item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
405 (1)	Structural Concrete, Class A	Cubic Meter
405 (2)	Structural Concrete, Class B	Cubic Meter

SUBTOPIC REFERENCES FOR ITEM 405

ITEM 311 – PORTLAND CEMENT CONCRETE PAVEMENT

311.1 Description

This Item shall consist of pavement of Portland Cement Concrete, with or without reinforcement, constructed on the prepared base in accordance with this Specification and in conformity with lines, grades, thickness and typical cross- section shown on the Plans.

311.2 Material Requirements

Portland Cement

It shall conform to the applicable requirements of Item 700, Hydraulic Cement. Only Type I Portland Cement shall be used unless otherwise provided for in the Special Provisions. Different brands or the same brands from different mills shall not be mixed nor shall they be used alternately unless the mix is approved by the Engineer.

Cement which for any reason, has become partially set or which contains lumps of caked cement will be rejected.

Cement salvaged from discarded or used bags shall not be used.

Samples of Cement shall be obtained in accordance with AASHTO T 127.

ITEM 311.2.2 FINE AGGREGATE

It shall consist of natural sand, stone screenings or other inert materials with similar characteristics, or combinations thereof, having hard, strong and durable particles. Fine aggregate from different sources of supply shall not be mixed or stored in the same pile nor used alternately in the same class of concrete without the approval of the Engineer.

It shall not contain more than three (3) mass percent of material passing the 0.075 mm (No. 200 sieve) by washing nor more than one (1) mass percent each of clay lumps or shale. The use of beach sand will not be allowed without the approval of the Engineer.

The fine aggregate shall be free from injurious amounts of organic impurities.

ITEM 311.2.3 COARSE AGGREGATE

It shall consist of crushed stone, gravel, blast furnace slag, or other approved inert materials of similar characteristics, or combinations thereof, having hard, strong, durable pieces and free from any adherent coatings.

It shall not contain more than one (1) mass percent of material passing the 0.075 mm (No. 200) sieve, not more than 0.25 mass percent of clay lumps, nor more than 3.5 mass percent of soft fragments.

ITEM 700 – HYDRAULIC CEMENT

700.1 Portland Cement

Cement shall conform to the requirements of the following cited Specifications for the type specified or permitted.

Type Specifications

Portland Cement AASHTO M 85 (ASTM C 150)

When Types IV and V (AASHTO M 85), P and PA (AASHTO M 150) cements are used, proper recognition shall be given to the effects of slower strength gain on concrete proportioning and construction practices. Types S and SA cements will be permitted only when blended with Portland Cement in proportions approved by the Engineer.

Unless otherwise permitted by the Engineer, the product of only one mill of any one brand and type of Portland Cement shall be used on the project.

The Contractor shall provide suitable means of storing and protecting the cement against dampness. Cement which, for any reason, has become partially set or which contains lumps of caked cement will be rejected. Cement salvaged from discarded or used bags shall not be used.

ITEM 1046 MASONRY WORKS

1046.1 Description

This item shall consist of furnishing of all necessary materials, tools, equipment and labor necessary to complete the execution of the masonry works using Concrete Hollow Blocks and Louver Blocks as shown on plans and herein specified.

1046.2 Material Requirements

1046.2.1 Hydraulic Cement

Hydraulic cement shall conform to the applicable requirements of Item 700, Hydraulic Cement.

1046.2.2 Aggregates

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

1046.2.3 Water

Water shall conform to the applicable requirements of Item 714, Water.

1046.2.4 Reinforcing Steel

Reinforcing steel shall conform to the applicable requirements of Item 404 Reinforcing Steel.

1046.2.5 Mortar

Mortar shall consist of sand, cement and water conforming to the requirements of item 405, Structural Concrete, mixture must be Class B. Mixture must have sufficient water to obtain the required consistency.

1046.2.6 Concrete Hollow Blocks

Width, height and length of concrete hollow blocks is shown on detailed engineering plans.

1046.2.6.1 Load-Bearing Concrete Hollow Blocks

Load bearing concrete hollow blocks shall conform to the physical requirements as prescribed on the ASTM C 90, Standard Specification for Load-bearing Concrete Masonry Unit.

1046.3 Construction Requirements

1046.3.1 Mixing

Concrete shall be mixed well using the proportion specified by the Engineer. Hand mixing shall be done, using shovels, on a level concrete slab or steel plate. Mix aggregate and cement until the color is uniform. Spread the mixture out, sprinkle water over the surface and mix. Continue with this process until the right amount of water has been mixed in. Mixture shall be free from impurities such as dirt and grass.

1046.3.2 Installation

All masonry shall be laid true to line, level and neat in accordance with the Plans. Units shall be cut accurately to fit all openings and all holes shall be neatly patched. Masonry unit shall be sound, dry, clean and free from cracks when placed in the structure. Where masonry units cutting is necessary, all cuts shall be neat and true to line.

Units shall be placed while the mortar is soft and plastic. Any unit disturbed to the extent that the initial bond is broken after initial positioning shall be removed and re-laid in fresh mortar.

Mortar should not be spread too far ahead of units, as it will stiffen and lose plasticity, especially in hot weather. Mortar that has stiffened should not be used. ASTM C 270 requires that mortar to be used within 2 ½ hours of initial mixing.

1046.3.3 Reinforcement for Concrete Hollow Blocks

Reinforcement shall be done in accordance with the structural plans as to size, spacing and other requirements of Item 404, Reinforcing Steel.

1046.3.4 Finish and Appearance

All units shall be sound and free from cracks or other defects that interfere with the proper placement of the unit or significantly impair the strength or permanence of the construction.

Where units are to be used in exposed wall construction, the face or faces that are to be exposed shall not show chips or cracks, not otherwise permitted, other imperfections when viewed from a distance of not less than 6.1m under diffused lighting.

1046.3.4 Storage and Handling of Masonry Works

The blocks shall be stored in such a way as to avoid contact with moisture at site. They shall be stock-piled on planks or other supports free from contact with ground and covered to protect against wetting. The block shall be handled with care and damaged units shall be rejected.

1046.4 Method of Measurement

The work to be paid for under this Item shall be the number of square meters of masonry units that are satisfactorily accepted and completed.

1046.5 Basis of Payment

The accepted quantity, measured as prescribed in Section 1046.4, Method of Measurement shall be paid for at the contract unit price for masonry works which price and payment shall include the cost of furnishing all labor, materials and equipment necessary to complete the work.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
1046	Masonry Works	Square Meter

ITEM 1027 CEMENT PLASTER FINISH

1027.1 Description

This Item shall consist of furnishing all cement plaster materials, labor, tools and equipment required in undertaking cement plaster finish as shown on the Plans and in accordance with this Specification. Thickness of plaster is 16mm.

1027.2 Material Requirements

1027.2.1 Cement

Portland cement shall conform with the requirements as defined in Item 700, Hydraulic Cement.

1027.2.3 Fine Aggregates

Fine aggregates shall be clean, washed sharp river sand and free from dirt, clay, organic matter or other deleterious substances. Sand derived from crushed gravel or stone may be used with the Engineer's approval but in no case shall such sand be derived from stone unsuitable for use as coarse aggregates.

1027.3 Construction Requirements

1027.3.1 Mixture

Finish coat shall be pure Portland Cement properly graded conforming to the requirements of Item 700, Hydraulic Cement and mixed with water to approved consistency and plasticity.

1027.3.2 Surface Preparation

Surfaces to receive cement plaster shall be cleaned of all projections, dust, loose particles, grease and bond breakers. Before any application of brown coat is commenced all surfaces that are to be plastered shall be wetted thoroughly with clean water to produce a uniformly moist condition.

1027.3.3 Application

Brown coat mortar mix shall be applied with sufficient pressure starting from the lower portion of the surface to fill the grooved and to prevent air pockets in the reinforced concrete/masonry work and avoid mortar mix drooping. The brown coat shall be lightly broomed/ or scratch before surface had properly set and allowed to cure.

Finish coat shall not be applied until after the brown coat has seasoned for seven days and corrective measures had been done by the Contractor on surfaces that are defective. Just before the application of the finish coat, the brown coat surface shall be evenly moistened with potable water. Finish coat shall be floated first to a true and even surface, troweled in a manner that will force the mixture to penetrate into the brown coat. Surfaces applied with finish coat shall then be smooth with paper in a circular motion to remove trowel marks, checks and blemishes. All cement plaster finish shall be 10 mm thick minimum on vertical concrete and/or masonry walls.

1027.4 Method of Measurement

All cement plaster finish shall be measured in square meters or part thereof for work actually completed in the building.

1027.5 Basis of Payment

The work quantified and determined as provided in the Bill of Quantities shall be paid for at the Contract Unit Price which price constitutes full compensation including labor, materials, tools and equipment and incidentals necessary to complete this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
1027	Cement Plaster Finish	Square Meter

ITEM 403 METAL STRUCTURES (DOORS, WALLS, POST, BEAMS AND OTHER ACCESSORIES; TRUSSES, PURLINS, SAG RODS, CROSS BRACING WITH TURNBUCKLE AND OTHER ACCEESORIES)

403.1 Description

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

The work will include the furnishing, 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 steels, steel forgings and castings and iron castings. This work will also include any incidental metal construction not otherwise provided for, all in accordance with these Specifications, Plans and Special Provisions.

403.2 Material Requirements

Materials shall meet the requirements of Item 712, Structural Metal; Item 409, Welded Structural Steel, and Item 409, Welded Structural Steel; and Item 709, Paints. All materials shall be brand new and free from fractures/defects

(1) Doors, Walls, Posts, Beams and Other Accessories

a) Doors

Doors shall conform to the applicable requirements of Item 1006, Steel Doors and Frames.

b) Walls

Walls above the concrete hollow blocks up to the bottom frame of roof beams shall be made off 50.8mm x 50.8mm x 4.5 mm thick steel matting. Wall frame shall be made of 40mm x 40mm x 4mm thick angle bar and placed as shown on the Plans.

c) Posts

Posts shall be made of 101.6 mm - Schedule 40 Galvanize Iron Pipe, embedded into the pedestal as shown on Plans.

d) Roof Beams

Top and Bottom chord of the beams shall be made of 50mm x 50mm x 5mm thick angle bar. For the web member it shall be made of 40mm x 40mm x 4 mm thick angle bar, all in accordance with the plans and specification or as ordered by the Engineer. Both side of the roof beam along the overhang shall be covered by 25mmx 25mm Aperture Polynet/Chicken Net/Poultry net

(2) Trusses, Purlins, Sag Rods, Cross Bracing with Turnbuckle

a) Trusses

The top chord, bottom chord and king post shall be made of 50mm x 100mm x 1.5mm thick Tubular bar. For web members it shall be made of 50mm x 75mm x 1.5mm thick Tubular bar, all in accordance with the plans and specification or as ordered by the Engineer.

Truss that are exposed to the environment (Front and Back Cable End) shall be covered by 25.4mmx 25.4mm Aperture Polynet/Chicken Net/Poultry net

b) Purlins

Shall be made of 50mm x 75mm x 1.2mm C-channels, all in accordance with the plans and specification or as ordered by the Engineer.

c) Other Support

10 mm Ø Plain Bar shall be used for Sag rod with standard nuts & washers and Cross Bracing with Turn buckle, all in accordance with the plans and specification or as ordered by the Engineer.

(3) Painting

All exposed steel materials must be painted with epoxy primer.

403.3 Construction Requirements

403.3.1 Fabrication

These Specifications apply to riveted, bolted and welded construction.

Workmanship and finish shall be in accordance with the best general practice. Portions of the work exposed to view shall be finished neatly.

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.

403.3.2 Bolted Connections, Unfurnished, Turned and Ribbed Bolts

(1) General

Bolts under this Subsection shall conform to "Specifications for Carbon Steel Externally and Internally Threaded Standard Fasteners", ASTM A 307. Specifications for high strength bolts are covered under Subsection 403.3.10.

Bolts shall be unfinished, turned or an approved form of ribbed bolts with hexagonal nuts and heads except that ribbed bolts shall have button heads. Bolted connections shall be used only as indicated by the Plans or Special Provisions. Bolts not tightened to the proof loads shall have single self-locking nuts or double nuts. Bevel washers shall be used where bearing faces have a slope or more than 1:20 with respect to a plane normal to the bolt axis. Bolts shall be of such length that will extend entirely through their nuts but not more than 6.3 mm beyond them.

Bolts shall be driven accurately into the holes without damage to the threads. A snap shall be used to prevent damage to the heads. The heads and nuts shall be drawn tight against the work with the full effort of a man using

a suitable wrench, not less than 381 mm long for bolts of nominal diameter 19 mm and over. Heads of bolts shall be tapped with a hammer while the nuts are being tightened.

(2) Unfinished Bolts

Unfinished bolts shall be furnished unless other types are specified. The number of bolts furnished shall be 5 percent more than the actual number shown on the Plans for each size and length.

(3) Turned Bolts

The surface of the body of turned bolts shall meet the ANSI roughness rating value of 125. Heads and nuts shall be hexagonal with standard dimensions for bolts of the nominal size specified or the next larger nominal size. Diameter of threads shall be equal to the body of the bolt or the nominal diameter of the bolt specified. Holes for turned bolts shall be carefully reamed with bolts furnished to provide for a light driving fit. Threads shall be entirely outside of the holes. A washer shall be provided under the nut.

(4) Ribbed Bolts

The body of ribbed shall be of an approved form with continuous longitudinal ribs. The diameter of the body measured on a circle through the points of the ribs shall be 1.98 mm greater than the nominal diameter specified for the bolts.

Ribbed bolts shall be furnished with round heads conforming to ANSI B 18.5 unless otherwise specified. Nuts shall be hexagonal, either recessed or with a washer of suitable thickness. Ribbed bolts shall make a driving fit with the holes. The hardness of the ribs shall be such that the ribs do not mash down enough to permit the bolts to turn in the holes during tightening. If for any reason the bolt twists before drawing tight, the holes shall be carefully reamed and an oversized bolt used as a replacement. The Contractor shall provide and supply himself with oversize bolts and nuts for this replacement in an amount not less than ten percent (10%) of the number of ribbed bolts specified.

403.3.3 Welding

Shall conform to the applicable requirements of Item 409, Welded Structural Steel.

403.3.4 Erection

1. General

The Contractor shall provide the falsework and all tools, machinery and appliances, necessary for the expeditious handling of the work and shall erect the metal work, remove the temporary construction, and do all work necessary to complete the structure as required by the Contract and in accordance with the Plans and these Specifications.

403.3.5 Handling and Storing Materials

Materials to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. Girders and beams shall be placed upright and shored. Long members, such as columns and chords, shall be supported on skids placed near enough together to prevent injury from deflection. If the Contract is for erection only, the Contractor shall check the material turned over to him against the shipping lists and report promptly in writing any shortage or damage discovered. He shall be responsible for the loss of any material while in his care, or for any damage caused to it after being received by him.

403.3.6 Falsework

The false work shall be properly designed and substantially constructed and maintained for the loads which will come upon it.

403.3.7 Method and Equipment

Before starting the work of erection, the Contractor shall inform the Engineer fully as to the method of erection he proposes to follow, and the amount and character of equipment he proposes to use, which shall be subject to the approval of the Engineer. The approval of the Engineer shall not be considered as relieving the Contractor of the responsibility for the safety of his method or equipment or from carrying out the work in full accordance with the Plans and Specifications. No work shall be done until such approval by the Engineer has been obtained

403.3.8 Assembling Steel

The parts shall be accurately assembled as shown on the working drawings and any matchmarks shall be followed. The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

403.3.9 Painting

All surfaces of new structural steel shall be cleaned before applying Epoxy Primer.

403.4 Basis of Payment

403.4.1 Structural Steel

Lump Sum/ lot/ square meters

When the Bill of Quantities calls for lump sum/lot/square meters price for "Structural Steel, furnished, fabricated and erected", the Item will be paid for at the contract lump sum price and payment shall be full compensation for furnishing, fabricating and erecting material and for all work herein before prescribed in connection therewith, including all labor, equipment, tools and incidentals necessary to complete the work.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
403 (1)	Doors, Walls, Posts, Beams and Other Accessories	lot
403 (2)	Trusses, Purlins, Sag Rods, Cross Bracing with Turnbuckle and Others Accessories	square meters

SUBTOPIC

ITEM 409 STRUCTURAL STEEL

409.1 Description

This work shall consist of the joining of structural steel members with welds of the type, dimensions, and design shown on the Plans and in accordance with the Specifications. In case of dispute or for situations not adequately provided for in this Specification, those designated Standard Specifications shall be considered as the final authority and shall govern except as amended by the Special Provisions. Welding of Structural Steel shall be done only when shown on the Plans.

409.2 Materials Requirements

Materials to be welded shall be open-hearth or electric furnace steel conforming to AASHTO M 183. All arc-welding electrodes shall conform to the requirements of American Welding Society Specifications. All structural steel shall be painted by Epoxy Primer as shown on the Plans.

409.3 Construction Requirements

409.3.1 Equipment

409.3.1.1 General

All items of equipment for welding and gas cutting shall be so designed and manufactured and, in such condition, as to enable qualified welders to follow the procedures and attain the results prescribed in this Specification.

409.3.1.2 Protective Equipment

All personnel protective equipment shall conform to the American Standard Association Code for such equipment.

The Contractor shall enforce the use of approved accessories necessary for the protection and convenience of the welders and for the proper and efficient execution of the work.

409.3.2 Welding

409.3.2.1 General

Welding shall be performed by the metal-arc process, using the electrodes with either direct or alternating current.

Surfaces to be welded shall be smooth, uniform and free from fins, tears, and other defects which would adversely affect the quality of the weld. Edges of material shall be trimmed by machining, chipping, grinding, or machine gas-cutting to produce a satisfactory welding edge wherever such edge is thicker than: 13 mm for sheared edge of material; 16 mm for toes of angles or rolled shapes (other than wide flange sections); 25 mm for universal mill plate or edges of flange sections.

Surfaces to be welded shall be free from loose scale, slag, rust, grease or other material that will prevent proper welding. Surfaces within 50 mm of any weld location shall be free of any paint or other material that would prevent proper welding or produce objectionable fumes while welding.

409.3.2.2 Welders

All welding shall be done by approved competent and experienced and fully qualified welders.

409.3.2.3 Preparation of Materials for Welding

Structural steel which is to be welded shall preferably not be painted until all welding is completed.

409.4 Measurement and Payment

Unless otherwise provided in the Special Provisions, welded structural steel structures shall not be measured and paid for separately, but the cost thereof shall be considered as included in the contract price for other items.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
409	Structural Steel	Lump Sum/lot

ITEM 712 – STRUCTURAL METAL

712.1 Structural Steels

712.1 General

Steel shall be furnished according to the following Specifications. Unless otherwise specified, structural carbon rivet steel shall be furnished.

712.1.1 Structural Steel

- a) Carbon Steel. Unless otherwise specified, structural carbon steel for riveted, bolted or welded construction shall conform to Structural Steel, AASHTO M 183.
- b) Eyebars. Steel for eyebars shall be of a weldable grade. This grade includes structural steel conforming to: Structural Steel, AASHTO M 183; Highway Strength Low Alloy Structural Steel with 344.5 MPa (50,000 psi) Minimum Yield Point to 100 mm (4 inches) thick, AASHTO M 222 (ASTM A 588 with Supplementary Requirement S1 of AASHTO M 222 mandatory).

712.1.2 High-Strength Low Alloy Structural Steel

It shall conform to: High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality, AASHTO M 223, High-Strength Low Alloy Structural Steel with 344.5 MPa (50,000 psi) Minimum Yield Point to 100 mm (4 inches) thick, AASHTO M 222.

712.1.3 High-Strength Low Alloy Structural Steel for Welding

It shall conform to:

- a) 712.1.2 High-Strength Low Columbium-Vanadium Steels of Structural Quality, Grade 50, AASHTO M 223 (ASTM A 572 with supplementary requirements S2 of AASHTO M 223 mandatory).
- b) 712.1.2 High-Strength Low Alloy Structural Steel with 344.5 MPa (50,000 psi) Minimum Yield Point to 100 mm (4 inches) thick, AASHTO M 222 (ASTM A 588 in Supplementary Requirement S1 of AASHTO M 222 mandatory).

712.1.4 High-Strength Structural Steel for Riveted or Bolted Construction

It shall conform to:

- a) High-Strength Low Alloy Columbium – Vanadium Steel of Structural Quality, and AASHTO M 223
- b) High-Strength Low Alloy Structural Steel with 344.5 MPa (50,000 psi) Minimum Yield Point to 100mm (4 inches) thick, AASHTO M 222.

712.1.5 High-Yield Strength, Quenched and Tempered Alloy Steel Plate

It shall conform to:

- a) High-Yield Strength, Quenched and Tempered Alloy Steel Plate, suitable for welding, ASTM A 514.
- b) High-Strength Alloy Steel Plates, Quenched and Tempered for pressure vessels, ASTM A 517.
- c) Quenched and tempered alloy steel structural shapes and seamless mechanical tubing meeting all the mechanical and chemical requirements of A 514/A 517 steel, except that the specified maximum tensile strength may be 964.6 MPa (140,000 psi) for structural shapes and 999.05 MPa (145,000 psi) for seamless mechanical tubing shall be considered as A 514/A 517 steel.

712.2 Steel Pipe

It shall conform to the requirements of ASTM A 53, ASTM A 120, AASHTO M 222 and ASTM A 618, as shown on the Plans or in the Special Provisions. Standard weight pipe shall be furnished unless otherwise shown on the Plans or in the Special Provisions.

712.3 Galvanized Metal

When galvanized structural steel shapes, plates, bars and their products are specified, they shall be galvanized in accordance with the requirements of AASHTO M 111.

712.4. Sheet Lead

It shall conform to the requirements of ASTM B 29 for common desilverized lead.
The sheets shall be of uniform thickness and shall be free from cracks, seams, slivers, scale and other defects.
Unless otherwise specified, lead sheets shall be 3.8 mm (1/8 inch) in thickness with a permissible tolerance of 0.75 mm (0.03 inch) plus or minus.

Table 712.1 – Nominal Bolt and Nut Dimensions

Nominal Bolt Size (Diameter) mm (inch)	Heavy Hexagon Structural Bolts			Heavy Hexagon Structural Bolts	
	Dimensions in mm (inches)				Dimensions in
	Width of Head Across Flats	Height of Head	Thread Length	Width Across Flats	
12 (1/2)	21 (7/8)	7 (5/16)	25 (1)	21 (7/8)	
15 (5/8)	26 (1-1/16)	9 (25/64)	31 (1-1/4)	26 (1-1/16)	
18 (3/4)	31 (1-1/4)	11 (15/32)	34 (1-3/8)	31 (1-1/4)	
21 (7/8)	35 (1-7/16)	13 (35/64)	37 (1-1/2)	35 (1-7/16)	
25 (1)	40 (1-5/8)	15 (39/64)	43 (1-3/4)	40 (1-5/8)	
28 (1-1/8)	45 (1-13/16)	17 (11/16)	50 (2)	45 (1-13/16)	

Table 712.2 – Nominal Washer Dimensions^a

Circular Washer					Square or Rectangular Washers for American and Canadian Standards	
Bolt Size Diameter mm (inch)	Nominal Outside Diameter ^b mm (inch)	Nominal Diameter of Hole	Thickness		Minimum Side Dimension	Maximum Thickness
			Minimum	Maximum		
12 (1/2)	26 (1-1/16)	13 (17/32)	2 (0.177)	4 (0.177)	43 (1-3/4)	7 (5/16)
15 (5/8)	32 (1-5/16)	16 (21/32)	3 (0.122)	4 (0.177)	43 (1-3/4)	7 (5/16)
19 (3/4)	36 (1-15/32)	20 (13/16)	3 (0.122)	4 (0.177)	43 (1-3/4)	7 (5/16)
22 (7/8)	43 (1-3/4)	23 (15/16)	3 (0.136)	4 (0.177)	43 (1-3/4)	7 (5/16)
25 (1)	50 (2)	26 (1-1/16)	3 (0.136)	4 (0.177)	43 (1-3/4)	7 (5/16)
28 (1-1/8)	56 (2-1/4)	31 (1-1/4)	3 (0.136)	4 (0.177)	43 (2-1/4)	7 (5/16)
31 (1-1/4)	62 (2-1/2)	34 (1-3/8)	3 (0.136)	4 (0.177)	43 (2-1/4)	7 (5/16)
34 (1-3/8)	68 (2-3/4)	37 (1-1/2)	3 (0.136)	4 (0.177)	43 (2-1/4)	7 (5/16)
37 (1-1/2)	75 (3)	40 (1-5/8)	3 (0.136)	4 (0.177)	43 (2-1/4)	7 (5/16)
43 (1-3/4)	84 (3-3/8)	46 (1-7/8)	^c 4 (0.178)	^c 7 (0.28)	-	-
50 (2)	93 (3-3/4)	53 (2-1/8)	4 (0.178)	7 (0.28)	-	-
Over 50 to 100 (2 to 4) incl.	2D-12 (1/2)	D+3 (1/8)	^d 6 (0.24)	^d 8 (0.34)	-	-

ITEM 1006 STEEL DOORS AND FRAME

1006.1 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.

1006.2 Material Requirements

All door cladding plates or panels shall be formed from gauge 24 Plain Galvanized iron Sheet. Frames shall be formed from 32mm x 32mm x 4mm thick angle bar with 40mm x 4mm thick flat bar for horizontal support and 40mm x 40mm x 4mm thick angle bar for jamb, as shown on the detailed engineering drawing.

1006.3 Construction Requirements

1006.3.1 Shop Finish

All steel doors and frames shall be cleaned thoroughly.

1006.3.2 Fabrication and Installation

Door cladding shall be fully weld to the frame with horizontal supports spaced as shown on the plan Door Frame shall be connected to jamb by a hinged.

1006.3.3 Wall Anchors

Both side of the jamb and the upper portion shall be weld to the wall.

1006.3.4 Hardware

Shall include S.S. Lock Door Latch as shown on the detailed engineering drawing.

ITEM 1100, 1101, 1102 ELECTRICAL WORKS

ITEM 1100 CONDUITS, BOXES & FITTINGS

1100.1 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.

1100.2 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.

(1) Conduits

Switch line and other exposed circuit line shall be of liquid tight flexible conduit. The diameter of PVC to be used shall not be smaller than 25mm

(2) Conduit Boxes

PVC Conduit Boxes shall be used. In general, outlet boxes shall be at least 100 mm square or octagonal, 53 mm deep and 16 mm minimum gauge or

(3) Conduit Fittings

All conduit fittings such as locknuts and bushings shall be PVC of standard size.

1100.3 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.

(1) Conduits

Conduits should be cut square with a hacksaw and reamed. Bends shall be made with the required radius. 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.

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.

(2) Conduit Boxes & Fittings

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

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.

1100.4 Method of Measurement

The work under this Item shall be measured lump sum manner.

1100.5 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
1100	Conduit, Boxes & Fitting	Lump Sum

1100.6 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 done by other fields. All works shall be done in accordance with the rules and regulations and with the specifications.

1100.7 1 Specifications on:

(1) Lighting fixtures

For LED lamp, it shall be 10 watts cool white. All LED ballast shall be 240 volts high power factor, of good quality materials and approved by the Bureau of Product Standards (BPS).

1100.7.2Material Requirements

All materials to be used shall be brand new and shall conform to the BPS specification.

1100.7.3 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 tap as shown in the approved design.

1100.8 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.

1100.90 Test and guarantee

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.

ITEM 1101 - WIRES AND WIRING DEVICES

1101.1 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 receptacles and other devices shown on the approved Plans but not mentioned in these specifications.

1101.2 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.

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, 240 volts and shall be spring operated, flush, tumbler type. Duplex convenience receptacles shall be rated at least 15A, 240 volts, flush, parallel slots.

1101.3 Construction Requirements

Conductors or wires shall not be drawn in conduits 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 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.

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.

1101.4 Method of Measurement

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

1101.5 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
1100	Wires, pipes, fittings, fixtures & other accessories	Lot
	One Gang Switch	Set
	Two Gang Switch	Set
	Two Gang Outlet	Set
	10 WATTS LED Bulb	Set

ITEM 1102 - POWER LOAD CENTER, SWITCHGEAR AND PANELBOARDS

1102.1 Description

This Item shall consist of the furnishing and installation of distribution panel boards at the location shown or the approved Plans complete with circuit breakers, and all accessories, completely wired and ready for service.

1102.2 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. 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

1102.3 Construction Requirements

The Contractor shall install the circuit breaker at the locations shown on the approved Plans. Standard panels

1102.4 Method of Measurement

The work under this Item shall be measured lump sum, actually placed and installed as shown on the approved Plans.

1102.5 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
1102	Panel Board and Circuit Breakers	Lump Sum

ITEM 1013 METAL SHEETS AND OTHER BENDED ACCESSORIES

1013.1 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 and fascia , when called for on Plans all in conformity with his Specifications.

1013.2 Material Requirements

1013.2.1 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/m² (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 0.551 mm thick and provided in long span sizes to minimize end laps. Sheets shall weigh not less than 3.74 kg/m² 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.

1013.2.2 Metal Roofing Accessories

(1) Ridge/hip rolls, shall be made from a 0.551 mm thick plain G.I. sheets, as shown in the detailed engineering designed.

(2) Fascia Cover shall be made from 0.551 mm thick plain G.I. sheets. Frame shall be made from 32mm x 32 mm x 4mm angle bar and 25mm x 4mm Flat bars. All exposed steel materials must be painted with epoxy primer

(3) Overhang shall be covered by 25mm x 25mm Aperture Polynet/Chicken Net/Poultry net as shown on Detailed Engineering Drawing.

1013.3 Construction Requirements

1013.3.1 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.

1013.3.2 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 direction of monsoon wind with side laps of two-and-a-half (2-1/2) corrugations. End laps shall be 250 mm minimum.

Succeeding upper rows of corrugated G.I. sheets shall be installed in the same manner until the entire roof area is covered.

Ridge/hip rolls when required, shall be installed before fastening the roofing sheets with roofing nails.

1013.3.3 Installation of Roofing Accessories

(1) Ridge and Hip Rolls

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

(2) Fascia Frame and Cover

Frame shall be fully weld and painted by Epoxy Primer. Cover shall be riveted to the frame1013.3.5 Roof Installation on Metal Purlins

1013.3.4 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 roof nails.

1013.3.5 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.

1013.6 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 and Fascia in linear meter of completed and accepter work such measurement shall include necessary straps and fixings required for complete installation

Pay Item Number	Description	Unit of Measurement
1013.2.1	Corrugated roofing, 0.551mm thick	Square meter
1013.2.2	Fabricated metal roofing accessories:	
	a) Ridged/hip rolls, Fascia Cover	Linear meter

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.

ITEM 1 ROOST AND NESTING BOX

1.1 Description

This Item shall consist of furnishing and fabricating of roost and nesting box with the required fixing accessories in accordance with the approved engineering plans.

1.2 Material Requirements

Materials to be used must be free from any defects. The nesting box shall be made of 12.7mm Marine Plywood, 100mm by 25mm good lumber and 50mm by 50mm good lumber for support frames and stands. Roost shall be made of 50mm by 50mm good lumber.

Method of Measurement

The work under this Item shall be measured lump sum as shown on the approved Plans.

1102.5 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, and tools necessary to complete this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
1	Roost and Nesting Box	Lot

References:

DPWH – Standard Specifications for Public Works Structures Volume III
(Buildings, Ports and Harbors, Flood Control and Drainage Structures and Water Supply Systems)

DPWH – Standard Specifications for Public Works and Highways
Volume II

(Highways, Bridges and Airports)

