Section VI. Specifications

PROJECT HIGHLIGHTS

PH-1.0 GENERAL

The Purpose of Construction of Concrete Firewall between Agus 6 Units 1 and 2 Power Transformers is to isolate affected transformer in case of fire or explosions preventing fire propagation to neighboring transformers or equipment.

PH-2.0 LOCATION

The project is located at Agus 6 & 7 HEP Complex, Fuentes, Maria Cristina, Iligan City.

PH-3.0 SCOPE OF WORK

The major activities shall include but not limited to the following:

Part I. Mobilization

Part II. General Requirements

a. Occupational Safety and Health Program

Part III. Earthworks

a. Site Clearing, Grubbing and Hauling of Materials
b. Removal of Obstructions and Disposal
c. Common and Rock Excavation Works
d. Embankment from Excavation
e. Gravel Fill

Part IV. Construction of Firewall between Agus 6 Unit 1 and 2 Transformer

a. Installation of Steel Bars
b. Concrete Works

Part V. Fabrication and Installation of Structural Posts, Framing and Cover for Firewall

Part VI. Electrical Works

Part VII. Painting Works

Part VIII. Clean-Up Works and Demobilization

PH-4.0 CONTRACT PERIOD

The work duration of the entire project is Seventy (70) Calendar Days reckoned from receipt of the Notice to Proceed.

The total contract period is inclusive of five (5) rainy/unworkable days considered unfavourable for the execution of works at site. The contract period shall be reckoned from the date of contract effectively as specified in the Notice to Proceed.

PH-5.0 CONTRACTOR'S CLASSIFICATION

The contractor must have a valid Philippine Contractor's Accreditation Board (PCAB) license of at least **Category C or D – General Building** with inter-agency registration of at least **Small B – Building or Industrial Plant.**

TECHNICAL SPECIFICATIONS

In accordance with the specifications provided in the plans, the contractor shall furnish all materials, labor, tools, equipment and other incidentals, matters necessary to complete the works in accordance with the contracts and approved detailed engineering activities, and other existing laws, rules and regulations relative thereto at Fuentes, Maria Cristina, Iligan City.

All materials to be used shall conform to applicable standard. If upon visual inspection the materials appear to be of poor quality or fail to meet the standard, the NPC inspector has the authority to reject the same out rightly.

The Contractor shall perform all activities necessary for the completion of the project satisfactory to NPC and in accordance with the approved plans and these specifications.

Upon Project implementation/execution it requires shutdown or De-Energization of Agus 6 Units 1 and 2 Power transformers.

The Contractor must coordinate to the End-User/NPC Representative before execution of the project.

The Contractor may request to borrow equipment from Agus 6 Maintenance for the purpose to raise or lower heavy load materials used in the project.

Scope

This section covers the construction and/or maintenance of access roads, drainage system and other appurtenant structures, moving-in of the Contractor's construction equipment, setting up of the Contractor's camp and the disposition of the Contractor's various facilities at the end of the Contract.

Moving-in

The contractor shall bring to the site all his necessary construction equipment and plant and install all stationary construction equipment and plant at location and in the manner approved by the NPC. The Contractor shall submit sufficient detailed plans showing the proposed location of such stationary equipment and plant and other pertinent data. No installation of such stationary equipment shall be undertaken unless the corresponding plans have been approved by the NPC.

Contractor's Camp Facilities

The Contractor shall provide and grade his camp site, construct his camp, employee housing, warehouse, machine and repair shops, fuel storage tanks and provide such related facilities and sanitary conveniences that the Contractor deems necessary for maintaining health, peace and order in the camp and work areas. The areas that may be used by the Contractor within the plant site shall be designated by the NPC.

The Contractor shall provide, maintain and operate, under competent direction, such camps and facilities as are necessary for the housing, feeding and accommodation of his employees.

Water Supply

The Contractor shall, at his own expense, be responsible for the supply, installation, operation and maintenance of a safe and adequate supply of drinking and domestic water.

Sewerage Disposal and Sanitation

The Contractor shall, at his own expense, be responsible for the installation, operation and maintenance of an adequate sewerage disposal and sanitation system and shall provide adequate toilet and wash-up facilities for his employees at his camp and in the areas where work is being carried out.

The Contractor shall execute the work with due regard to adequate sanitary provisions and applicable codes and shall take all necessary steps to prevent the pollution of water in any spring, river or other sources of water supply. All toilets or wash-up facilities shall be subject to the prior and continuing approval of the NPC.

Fire Protection

The Contractor shall observe all necessary precautions against fire, shall provide and maintain at his own expense, portable fire-fighting equipment he may deem necessary, and shall comply with all applicable laws of the Philippines relating thereto.

In the event of an uncontrollable fire occurring in the area of the Contractor's operation, the Contractor shall have to extinguish the fire immediately at his own expense, to the full extent of the manpower and equipment employed under the contract at the time of the fire.

The Contractor shall indemnify NPC against all liabilities, claims, damages and/or lawsuits arising thereto.

Construction Power

The Contractor shall be responsible for providing his own electric power supply required for construction and erection/installation. If power is available from NPC and should the Contractor elect to utilize the NPC's power supply, he shall make an arrangement with

NPC concerned group as to the billing rates and other requirements needed for direct connection to NPC

Camp Security

The Contractor shall provide his own security force to the extent that he deems necessary for maintaining peace and order in the camp and work areas and to safeguard materials and equipment. Nothing under the provisions of this paragraph shall relieve the Contractor from full responsibility for the maintenance of peace and order and protection of life and property in all areas where he operates.

Construction Material Storage

The Contractor is required to put up warehouse(s) with capacities sufficient to store the construction materials required in the work. The warehouse(s) shall be specifically for this contract notwithstanding his other facilities in the site that may serve the purpose.

Removal of Camp and Construction Facilities

After the completion of the work covered by the contract and prior to acceptance of the completed work, the entire camp facilities of the Contractor, including its water supply system, electric distribution system, quarters, warehouses, shops, dining halls, commissaries, temporary shed and other facilities therein, shall be removed by the Contractor. The site shall be cleared and cleaned as directed by the NPC.

MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for the Contractor's Construction Facilities. The entire cost thereof shall be included in the various pay items in the Bill of Quantities.

CARE OF WATER DURING CONSTRUCTION

Scope

In accordance with the specifications contained in this section or otherwise directed, the Contractor shall construct and maintain all necessary temporary drainage ditches and other temporary protective works and he shall also furnish, install, maintain and operate necessary pumping equipment and other devices to protect construction operation free from water coming from any source, including rain.

Drainage and Dewatering

The Contractor shall be responsible for dewatering foundation areas so that work can be carried out on a suitably dry condition. The Contractor shall construct drainage ditches, holes, culverts, furnish, maintain and operate at his own expense all necessary pumps and other dewatering devices to keep all work area free from water.

After the work is completed and before it is accepted by the NPC, the Contractor shall remove all pumping equipment and shall remove, fill or plug all temporary drainage structures as directed, all at his expense.

MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for the Care of Water during Construction operations. The cost of furnishing, constructing, maintaining, operating and removing of temporary drainage structure, pumping system and other dewatering devices necessary to keep construction operations free from water, shall be included in the various pay items in the Bill of Quantities for structures where such care of water is required.

TS - 01 ENVIRONMENTAL AND CONSTRUCTION SAFETY AND HEALTH PROGRAM

Scope

This Section pertains to the environmental and safety provisions, requirements and conditions that shall govern during the execution of all civil works under this project.

General Conditions

The Contractor shall ensure compliance with the applicable environmental and safety regulations, as well as ECC conditions, during installation/construction of this project through the implementation of measures that include, but not limited to the following:

a. Designate a Safety Officer and a Pollution Control Officer who shall respectively handle all safety and environmental concerns of the project.

b. Prepare and submit Construction Safety Health Plan (CSHP).

c. Properly manage debris and various waste generated during installation/construction, such as the following:

- Dispose of demolition and construction debris in a designated or NPC approved disposal area(s).
- Stockpile (and cover if possible) or haul to the designated and/or pre developed dump sites (spoil disposal areas) that shall be provided with suitable drainage-equipped with sediments traps, stripped top soil, spoils from quarry/borrow sites and excavated materials.
- Segregate solid wastes, such as empty cement sacks, scraps of tin or wood, used wires and other domestic garbage, for recycling or storage in NPC-approved temporary storage areas and further disposal to LGU-designated disposal sites.

- Properly handle, store and dispose off, through DENR-accredited transporter/treater, hazardous wastes, i.e. used oils, paints, thinner, Etc.

d. Limit construction activities that generate excessive noise to daytime works only to prevent nuisance to nearby residents during rest hours.

e. As far as practicable, undertake site stripping, grading and excavation during dry weather.

f. Construction/Installation shall be carried-out in a manner where landslides and erosions are minimized.

g. Avoid unnecessary opening/clearing of areas outside construction sites or destruction of vegetable cover, especially cutting of existing trees, and to revegetate disturbed areas.

h. Spray water whenever and wherever necessary, to minimize dust generation.

i. Provide PPE's and other safety provisions required by DOLE for its project/site works.

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract unit price or lot price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools, equipment and other incidentals necessary for the satisfactory implementation of these requirements.

TS - 02 EARTHWORKS

a. Site Clearing, Grubbing and Hauling of Materials

All surface objects and all trees, stumps, roots and other protruding obstructions, notdesignated to remain, shall be cleared and/or grubbed, including mowed as required, except as provided below.

1. Removal of undisturbed stumps and roots and nonperishable solid objects with a minimum depth of 1 meter below subgrade or slope of embankment will not be permitted

2. In areas outside of the grading limits of cut and embankment areas, stumps and nonperishable solid objects shall be cut not more than 150 mm above the ground line or low water level

3. Grubbing of pits, channel changes and ditches will be required only to the depth necessitated by the proposed excavation within such areas

Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable material and compacted to the required density

In areas where hand clearing as directed by NPC Engineer or Representative, no requirement of wheels or trucks shall be used. Care shall be taken to ensure that the grass, moss cover or the natural ground is not disturbed. The materials shall be properly disposed. Materials and debris maybe disposed of by the methods and at locations approved by NPC Engineer or Representative 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 300mm 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 NPC Engineer or Representative. The disposal areas shall be seeded, fertilized and mulched at the Contractor's expense

Woody material may be disposed of by chipping. The wood chips may be used for mulch, slope erosion control or may be uniformly spread over selected areas as directed by NPC Engineer or Representative. Wood ships used a s mulch for slope erosion control shall have a maximum thickness of 12 mm and faces not exceeding 3,900 mm2 on any individual surface area. Wood chips not designated for use under other sections shall be spread over the designated areas in layers not to exceed 75mm loose thickness. Diseased trees shall be buried or disposed of as directed by NPC Engineer or Representative. Timber cut inside the area staked for clearing shall be felled within the area to be cleared

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract unit price or lot price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools equipment and other incidentals necessary for the satisfactory implementation of these requirements.

b. Removal of Obstructions and Disposal

Description

This Item shall consist of the removal wholly or in part, and satisfactory disposal of (all buildings, fences, structures) old pavements/slabs (abandoned pipe lines) and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the Contract. (It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes and pits)

Construction Requirements

General

The Contractor shall perform the work described above, within and adjacent to the construction site, on Government land or easement, as shown on the Plans or as directed by NPC Engineer. All designated salvable material shall be removed, without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored by the Contractor at specified places on the project or as otherwise shown in the Special Provisions. Salvaged material which are damaged thru negligence shall be replaced or restored at the Contractor's expense. Waste material may be disposed of by the Contractor in NPC-owned sites as shown in the Special Provision or permitted by NPC Engineer. Otherwise, the Contractor shall arrange disposal of waste at no expense to NPC and shall be in accordance with the requirements for disposal site selection and hauling activity stipulated in the Contract. Perishable material shall be handled as designated inClearing and Grubbing. Nonperishable material may be disposed of outside the limits of view from the project with written permission of NPC, the property owner on whose property the material is placed. Copies of all agreements with property owners are to be furnished to the Engineer. Basements or cavities left by the structure removal shall be filled with acceptable material to the level of

the surrounding ground and if within prism of construction shall be compacted to the required density

Removal of Existing Culverts, and other Drainage Structures

All existing culverts and other drainage structures in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic. The removal of existing culverts within embankment areas will be required only as necessary for the installation of new structures. Abandoned culverts shall be broken down, crushed and sealed or plugged. All retrieved culvert for future use as determined by the Engineer shall be carefully removed and all precautions shall be employed to avoid breakage or structural damage to any of its part. All sections of structures removed which are not designated for stockpiling or re-laying shall become the property of NPC and be removed from the project or disposed of in a manner approved by NPC Engineer. Where such portions of existing structures lie wholly or in part within the limits for a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

Structures designated to become the property of the Contractor shall be removed from the right-of-way. Blasting shall not be allowed, but other operations necessary for the removal of an existing structure or obstruction, which may damage new construction, shall be completed prior to placing the new work, unless otherwise provided in the Special Provisions. When removing manholes, catch basins or drop inlets, any functioning sewer lines connected to it shall be restored and properly connected. Satisfactory by-pass service shall be maintained during the construction operations.

Removal of Portions of Existing Structure

Removal of portions of pavement, slabs, sidewalks, curbs, gutters, and similar structures shall be undertaken with sufficient care to avoid breakage or damage to the portion of the structures designated to remain. The portion of the structure shall be removed from an existing joint, or sawed and chipped to a true line with a vertical face. Before concrete removal begins, a saw cut, 19 mm deep when steel reinforcement is to remain and deeper when steel reinforcement is to be removed with concrete, shall be made into the surface of the concrete at the perimeter of the removal limits. Concrete shall be completely removed (exposing the

deformed surface of the bar) from existing steel reinforcing bars which extend from the existing members and are specified to remain. Steel reinforcement that are to be removed shall be cut to a minimum of 25.4 mm behind the final surface. where void resulted to the removal thereof shall be filled with epoxy mortar and finished to a sound, smooth, uniform colored surface. The retained concrete surface at which fresh concrete surface will be placed shall be roughened, cleaned, and saturated. When a portion of existing concrete is removed without replacement, the concrete surface of the remaining portion shall be cleaned to a smooth surface of less than 1.6 mm profile. In case of damage to the remaining structure, it shall be repaired or replaced at the Contractor's expense. For structures with an asphalt wearing course, the wearing course shall be removed separately before removing the portion designated to be removed.

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract cubic meter (cu.m.) price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools, equipment and other incidentals necessary for the satisfactory implementation of these requirements.

c. Common and Rock Excavation Works

Rock excavation shall consist of excavation of igneous, sedimentary and metamorphic rocks matrixes with soil or sandy silt, and all boulders or other detached stones each having a volume of one cubic meter or more as determined by physical measurements or visually by the field engineer, which can be excavated using jackhammer, hydraulic excavator backhoe or hydraulic vibratory breaker/hammer.

To protect workers from injuries and fatalities, preventive measures should be implemented when workers begin excavating. General Safety measures: inspect trenches daily before work begins; don't go near an unprotected trench; check weather conditions before work; be mindful of rain and storms; keep heavy equipment away from trench edges; be mindful of the location of utilities underground. Always wear proper protective equipment; don't work beneath raised loads. Planning and implementation of safety measures must be done by a competent person.

All excavation shall conformed to the line and grade. It shall be finished to reasonably smooth and uniform surfaces and no material shall be wasted without authority of the NPC Engineer. All excavation shall be in accordance with the standard engineering practice. The above mention project shall be furnish only with the approved drawing.

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract unit price or lot price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools equipment and other incidentals necessary for the satisfactory implementation of these requirements.

d. Embankment from Excavation

All excavated materials, so far as suitable, shall be utilized as backfill or embankment. The surplus materials shall be disposed of in such manner as not to obstruct, 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.

The excavation shall conform to the lines, grades, cross sections and dimensions shown on the Plans. NPC Engineer shall order the removal of any soft spots, debris or organic material exposed when excavated areas shall be trimmed cut to than even surface free of loose material and compact as specified by NPC Engineer to the density prescribed on the Plans.

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract cubic meter (cu.m.) price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools equipment and other incidentals necessary for the satisfactory implementation of these requirements.

e. Gravel Fill

This Item shall consist of furnishing, placing and compacting an aggregate base course on a prepared subgrade/subbase in accordance with this

Specification and the lines, grades, thickness and typical cross-sections shown on the Plans, or as established by NPC Engineer.

Aggregate for base course shall consist of hard, durable particles or fragments of crushed stone, crushed slag or crushed or natural gravel and filler of natural or crushed sand or other finely divided mineral matter. 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 base.

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract cubic meter (cu.m.) price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools, equipment and other incidentals necessary for the satisfactory implementation of these requirements.

TS - 3 CONSTRUCTION OF FIREWALL BETWEEN AGUS 6 UNIT 1 AND 2 TRANSFORMER

GENERAL

The work to be undertaken under this Section shall include all labor, materials, equipment, plant and other facilities and the satisfactory performance of all work necessary to complete all reinforced concrete work shown on the drawings and specified herein.

MATERIALS

a) Cement

Except as maybe otherwise provided in these specifications, cement shall conform to the "Specification for Portland Cement" (ASTM C 150 - Latest Revision) and shall be Type I.

b) Concrete Aggregates

1.) Concrete aggregates shall be well graded, clean, hard particles of gravel

or crushed rock conforming with the "Standard Specifications for Concrete Aggregates (ASTM C - 33 Latest Revision)

2) The maximum size of the aggregates shall not be larger than one-fifth (1/5) of the narrowest dimension between form and not larger than three fourth (3/4) of the minimum clear spacing between individual reinforcing bars or bundles of bars and in no case larger 5 1 cm (2 in) in diameter except that larger diameter may be allowed in massive concreting with written permission from the Engineer

c) Water

Water used in mixing concrete shall be clean and free from injuring amounts of oils acids alkali organic materials or other substances that may be deleterious to concrete or steel

d) Reinforcing Steel

All reinforcing steel bars used shall be new and freefrom rust oil defects greases or kinks They shall conform to the latest edition of ASTM "SPECIFICATIONS FOR DEFORMED STEEL BARS FOR CONCRETE REINFORCEMENT" Grade 40 as shown or latest equivalent Philippine Bureau of Standard Specifications Deformed Steel Bars shall have the following unit weights

SIZE (mm)	Kg/m	SIZE (mm)	Kg/m
6	0 222	20	2 466
8	0 395	25	3 854
10	0 616	28	4 833
12	0 888	32	6 313
16	1 579	36	7 991

e) Admixture:

To increase concrete workability and to control the set of concrete the engineer can request that an admixture maybe added subject to his approval and it shall be borne by the Contractor

Water – reducing admixtures retarding admixtures accelerating admixtures, water-reducing and retarding admixtures, and water reducing and accelerating admixtures shall conform to Specification for Chemical Admixtures for Concrete (ASTM C494)

Other admixtures required for specific construction conditions and conforming to ASTM (C494) Standard Specification for Chemical

Admixtures for Concrete maybe incorporated in separate concrete design mixes and submitted to the responsible engineer for approval prior to their use.

STORAGE OF MATERIALS

Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion by foreign matter. Any material which has deteriorated or which has been damaged shall not be used for concrete. Steel shall be stored under cover or otherwise prevented from rusting.

TESTING OF MATERIALS

Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion by foreign matter. Any material which has deteriorated or which has been damaged shall not be used for concrete. Steel shall be stored under cover or otherwise prevented from rusting.

The ownerorhisduly authorized representative or the Engineer shall periodically order the test of any material supplied by the Contractor entering into concrete or reinforced concrete to determine its suitability for the intended purpose. Such tests shall be in accordance with the standards of the American Society for Testing and Materials as noted elsewhere in these specifications. Samples shall be provided by the Contractor without cost to the Owner. Expenses for thetesting and cost of transporting samples to testinglaboratory shall be borne by the Contractor. Copies ofresults of tests shallbe furnished to the Owner promptly. Compressive strength specimens for tests ofconcrete during constructionshallbe according to "Making and Curing of Concrete Compression and Flexural Strength Test Specimens in the field" (ASTM C-31).

CONTROLLED STRENGTHS OF CONCRETE

1.0.1 Concrete for structural elements shall develop a minimum**28-day compressive cylinder strength of 20.68 MPa (3,000 psi),** unless otherwise specified in the plans.

1.0.2 Concrete for non-structural elements such as cradles, unreinforced encasements, thrust blocks and partition walls shall develop a minimum **28-day compressive cylinder strength of 17.25 mega Pascal (2,500 psi)** unless otherwise specified in the plans.

METHOD OF DETERMINING STRENGTH TRIAL BATCH

The Contractor shall submit design mixed and test results of samples made in accordance with "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory" (ASTM C-192 Latest Revision) and "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM Designation C-39) for each strength required stating the proposed slump and the proportional weights of cement saturated surface dry aggregates and water These mixes shall be proved by the preliminary tests thirty (30) days before concreting and shall show a 28 day strength of fifteen percent (15%) higher than the ultimate strength required No substitution shall be made in the materials or mixed without additional tests to show that quality of concrete is satisfactory

CONCRETE PROPORTION AND CONSISTENCY

a The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed on the work but without permitting the materials to segregate or excess free water to collect on the surface The combined aggregates shall be of such composition of sizes that when separated on the No 4 standard sieve the weight passing the sieve (fine aggregate) shall not be less than thirty percent (30%) of the total except that these proportions do not necessarily apply to lightweight aggregates

b The methods of measuring concrete materials shall be such that proportions can be accurately controlled and easily checked at any time during the work Measurement of materials for ready-mixed concrete shall conform with the "Standard Specifications for Ready mixed Concrete" (ASTM C-94 Latest Revision) where applicable

c Aggregates shall be measured out by weight and to within one percent (1%) Cement shall conform to 40 kg (88 lb) per bag and this is to be verified from time to time Water shall be measured by weight or volume to within one and one half (1-1/2 %)

d The water shall in no case exceed 21 24 liters and 25 67 liters (5 62 and 6 79 US gallons) per bag of cement for all concrete with specified strength of f c respectively Slumps shall be within the following limits

Portion of Structure	Slump Millimeters	Inches
Columns and end supported beams girders	50-100	2-4
Walls and thin Vertical sections	75-125	3-5
Footings slabs on Grade and cantileveredbeams and slabs	50-80	2-3

Slumps shall be according to "Test of Slump for Portland Cement Concrete" (ASTM C-143).

e **Classification and Design Mixture.** The mixtures forall classes of concrete shall be designed by the Contractor and approved by ICWS to obtain the compressive strength at the age of twenty eight (28) days as specified below

Class	Size of Maximum Dia of Aggregate	Minimum Compressive Strength	Designated Size of aggregate
Y	1/2" (12.5mm)	3,000 psi	12.5mm to 4.75mm
AA	3/4" (19mm)	3,000 psi	19mm to 4.75mm
A	1-1/2" (37.5mm)	3,000 psi	37.5mm to 4.75mm
B	2" (50mm)	2,400 psi	50mm to 4.75mm
C	3" (75mm)	2,400 psi	75mm to 4.75mm

f **Cement Content.** The minimum cement content per cubic meter of concrete for the different classes or gradation of aggregates shall be in accordance with the following

Class and Gradation of Aggregates	Minimum Cement Content
Y with 1/2"	400 kgs/cu.m

AA with 3/4"	400 kgs/cu m
A with 1-1/2"	360 kgs/cu m
B with 2"	600 kgs/cu m
C with 3"	270 kgs/cu m
Z with 3"	340 kgs/cu m

g Job mix adjustments on water content shall be allowed only with Engineer's permission and provided that cement is also added to maintain the original water cement ratio of the design mix.

EXCLUSION OF WATER

No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes or other means, and carried out of the forms clear of the work. No concrete shall be deposited under water without the explicit permission of the Engineer, and then only in strict accordance with his directions, nor shall the Contractor without explicit permission allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the approval of the Engineer.

MIXING CONCRETE

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

The mixer shall be of approved size and type which will insure a uniform distribution of material throughout the mass, it shall be equipped with a device for accurately measuring and controlling amount of water in each batch.

Placing of material in mixer shall be done in such a way that first batch of concrete materials placed in the mixer shall contain sufficient excess of cement sand and water to coat the inside of the drum without reducing the cement content of the mix to be discharged. Retempering i.e. remixing with the addition of water to concrete that has been partially hardened shall not be permitted.

PREPARATION OF SURFACES FOR CONCRETING

Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that in the opinion of the Engineer, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be leveled with a wooden float to provide a reasonably smooth surface. A surface consisting largely of coarse aggregate shall be avoided. Except where the drawings call for joint surfaces to be painted, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accompanied by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed. After the surfaces have been prepared to the satisfaction of the Engineer, all approximately horizontal construction joints shall be covered with a layer of mortar approximately 25mm (1") thick. The mortar shall have the same proportion of cement and sand as the regular concrete mixture, unless otherwise directed by the Engineer. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed upon it, and the consistency of the mortar shall be suitable for placing and working in a manner hereinafter specified. The mortar shall be spread uniformly and shall be worked thoroughly into all irregularities of the surface, and wire brooms shall be used where possible to scrub the mortar into the surface. Concrete shall be placed immediately upon the fresh mortar.

When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means that will secure proper union with subsequent work, provided that construction joints shall be made only where approved by the Engineer.

PLACING OF CONCRETE

Concrete which upon or before placing is found not to conform with the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these specifications, or which is of inferior quality as determined by the engineer, shall be removed and replaced by and at the expense of the Contractor. No concrete shall be placed except in a present of duly authorized representative of the Engineer. Concrete shall not be placed when unsuitable heat or wind will prevent proper placement and curing as determined by the Engineer, prior to placing any concrete, the Contractor shall give the Engineer twenty four (24) hours written notice.

Concrete shall be deposited in its final position without segregation, re-handling or flowing. Placing shall be done preferably with buggies, buckets, or wheelborrows. No chutes will be allowed except to transfer concrete from hoppers to buggies, wheelborrows, or buckets in which case, they shall not exceed six (6) meters (20') in aggregate length.

Placing of concrete with a free drop or fall more than 1.20m (4') shall not be allowed, except when approved by the Engineer and when approved sheet metal conduits, pipes or "elephant trunks" are employed. When employed, these conveyors shall be kept full of concrete and the ends kept buried in the newly placed concrete as pouring progresses.

Concrete in forms shall be deposited in uniform horizontal layers not deeper than 450mm (18") and care shall be taken to avoid inclined layers or inclined construction joints except where such care required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 1.5 meters (5') of vertical rise per hour.

FORMS

General

The Contractor shall provide forms to confine the concrete and shape it to the required lines. Plastering in general, shall not be allowed. The Contractor shall assume full responsibility for the adequate design of all forms and shall be smooth surface. However, forms which in the opinion of the Engineer are unsafe or inadequate in any respect may at any time be condemned by the Engineer, and the Contractor shall

promptly remove the condemned forms from the work and replace them at his own expense. A sufficient number of forms of each kind shall be provided to permit the rate of progress to be maintained. Whenever in the opinion of the Engineer, additional forms are necessary to maintain theprogressschedulesuchadditionalforms shall be provided by the Contractor at his own expense. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable safety regulations and as may be specified in the General Conditions of these specifications.

Materials

a. Except as otherwise expressly approved by the Engineer, all lumber brought at the job site for use as forms, shoring, or bracing shall be new material.

b. All forms shall be smooth surface forms and shall be of the following materials:

Walls	-	Steel or plywood panels
Columns	-	Steel, plywood or surfaces lumber
Roof	-	Plywood
All other work	-	Steel panels, plywood or surfaced lumber

Plywood shall be manufactured especially for concrete form work and shall be oiled with an approved form oil and edge sealed.

c. Column forms shall be checked for plumbness before concrete is deposited. Hand holes shall be provided in column forms at lowest points of pour lifts to render this space accessible for cleaning.

d. All girder, beam and slab centerlines shall be crowned at least 6.3mm (1/4in) in all directions for every 4.57 meters (15ft) span. However, cambers from all cantilevers shall be as indicated on the plans or obtained from the Engineer by the Contractor.

e. The following are the tolerance limits for formwork:

1. Variation from plumb

In line and surfaces of columns, piers, walls and risers

In 3.05m (10ft)	6.3mm (1/4")
6.10m (20ft)	9.5mm (3/8")
12.20m (40ft) or more	19.0mm (3/4")

For exposed corner columns and/or piers, control joint groves and other conspicuous lines

In any bay 6.10m (20ft) max	6.3mm (1/4")
In 12.20m (40ft) or more	13.00mm (1/2")

2 Variation in cross-sectional dimensions of columns and piers, beams, and thickness of walls and slabs

Minus	6.3mm (1/4")
Plus	13.00mm (1/2")

3 Footings

Variations in dimensions on drawings (applied to concrete only and not to reinforcing bars or dowels)

Minus	13.00mm (1/2")
Plus	50.00mm (2")

Misplacement of eccentricity: two percent (2%) of the footings width in the direction of misplacement but not to exceed 50.0mm (2").

Reduction in thickness	Five percent (5%) at specified thickness

4 Variation in steps

a) In a flight of steps

Rise	3.2mm (1/8")
Tread	6.3mm (1/4")

b) In consecutive steps

Rise	1.6mm (1/16")
Tread	3.2mm (1/9")

When required for another work or when requested by the Owner or his Engineer the Contractor shall remove or relocate shoring but existing shoring shall not be disturbed until new shores are set in position

f. Design

1 All forms shall be true in every respect to the required shape and size shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges fins or offsets or similar surface defects in the finished concrete Plywood 16 0mm (5/8") and greater in thickness may be fastened directly to studding if the studs are close enough to prevent visible deflection marks in concrete The forms shall be tight so as to prevent the loss of water cement and fines during placing and vibrating of the concrete Adequate clean-out holes shall be provided at the bottom of each lift of forms The size, number and location of such cleanouts shall be subject to the approval of the Engineer

2 Concrete construction joints will not be permitted on locations other than those shown or specified except as may be approved by the Engineer When a second lift is placed on hardened concrete special precaution shall not be taken in the way of the number location and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete Pipe stubs and anchor bolts shall be set in the form where required

3 Unless otherwise shown exterior corners in concrete members shall be provided with 19 0mm (3/4") chamfers Re-entrant corners in concrete members shall not have fillets unless otherwise shown

4 Reservoir forms and falseworks supporting the roof slab shall be designed for a minimum additional live load of 0 90 Kpa (20psf)

g. Form Ties

Form ties with integral water stops shall be provided with a cork or other suitable means for forming a conical hole to insure that the form-tie may be broken off back of the face of the concrete. The maximum diameter or removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 38mm (1-1/2") and all such fasteners shall be such as to leave holes of regular shape reaming. Holes left by the removal of fasteners from the ends of snap-ties or form-ties shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough before being filled with mortar as provided in Section 17.20. Wire ties for holding forms will not be permitted. No form tying device or part thereof, other than metal, shall be left embedded in the concrete, nor shall any tie be removed in such manner as to leave a hole extending through the interior of the concrete member. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 25mm (1in) back from the formed face or faces of the concrete. Form ties or metal rods left embedded in concrete of water retaining tanks shall be equipped with an integral metal waterstop not less than 38mm(1-1/2") in diameter.

h. Vertical Surfaces

All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is called for on the drawings or explicitly authorized by the Engineer. Not less than 25mm (1") of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until concrete has been placed.

i. Maintenance of Forms

Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness, and

smoothness of surface. Forms when in place shall conform to the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a non-staining mineral oil or other lubricant approved by the Engineer. Any excess lubricant shall be satisfactorily removed before placing the concrete. In addition, all forms shall be given a preliminary oil treatment by the manufacturer or shall be oiled by the Contractor at least two (2) weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embodied in concrete. Forms maybe reused if in good condition and if approved by the Engineer. Light sanding between uses will be required wherever necessary in the opinion of the Engineer to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surface are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic structures, unused tie rod holes shall be covered with metal caps or shall be filled by other methods approved by the Engineer.

j. Removal of Forms

Directions of the Engineer concerning the removal offorms shall be strictly followed. Forms and shoring shall not be removed until concrete is adequately set and strong enough to withstand anticipated loading and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 15.52 MPa (2,250 psi) provided that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained a strength of 15.52 MPA (2,250 psi) and has been in place for a minimum of even (7) days. The time required to establish said strength will be determined by the Engineer who will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the seven-day minimum, then it shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least three (3) days after the concrete has been placed. Forms for all parts of the work not specifically mentioned herein shall remain in place for prods of time as ordered by the Engineer.

TAMPING AND VIBRATING

As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement.

Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are used, the concrete shall be worked under the waterstops are used, the concrete shall be worked under the waterstops by hand making sure that all air and rock pockets have been eliminated.

Concrete in wall shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers previously placed have been worked thoroughly as specified. Except in special cases where their use is deemed impracticable by the Engineer, the Contractor shall use internally vibrated, high speed power vibrators not less than 8000 rpm of an approved immersion type in sufficient numbers, with standby units as required, to accomplish the results herein specified within fifteen (15) minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its face.

CARE AND REPAIR OF CONCRETE

The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, over stress, or any other cause until final acceptance by the Owner. Particular care shall be taken to the drying of concrete and to avoid roughening orotherwise damaging the surface. Any concrete found to be damaged or which may have been originally defective at any time prior to the final acceptance of the complete work, or which departs from the established line or grade, or which for any other reason does not conform with the specifications

shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

FINISH OF CONCRETE SURFACE

All finished orformed surfaces shall conformaccurately with the shape alignment, grades and sections as indicated on the plans or as prescribed by the Engineer. Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing or roughness of any kind and shall present a finished, smooth, continuous hard surface.

Except as otherwise provided herein, unformed top surfaces of concrete shall be brought to uniform surfaces and worked with suitable tools to a reasonably smooth woodfloat finish. Excessive floating of surfaces while the concrete is plastic will not be permitted. All surfaces shall be placed monothically with the base slab. Dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floor slabs and exposed tops of walls and curbsshallbe given a steel trowel finish. At the Contractor's option, the above mentioned floor slabs may be finished with a power float after screeding. Subsequent to the aforementioned finish, all sloping surfaces of floor slabs shall be lightly boomed to provide a skid resistant surface.

TREATMENT OF SURFACE DEFECTS

As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner, in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall bemade until after inspection by the Engineer, and then only in strict accordance with his directions. Concrete containing voids, holes, honeycombing, similar depression defects shall be completely removed and replaced, provided that where required or approved by the Engineer, defects shall be repaired with gunite, or with cement mortar placed by an approved compressed air mortar gun. In no case will extensive patching ofhoneycombed concrete be permitted. All repairs and replacements herein specified shall be promptly executed by the Contractor at his own expense.

DEPOSITING CONCRETE

Depositing:

Depositing shall be done without segregation remanding or flowing of concrete. It shall be done with the use of buggies buckets or wheelbarrows. Use of chutes will not be allowed except to transfer concrete from hoppers to buggies wheelbarrows or buckets in which case shall not exceed 20 feet in aggregate length placing of concrete with a free drop of fall of more than 5 feet are not allowed. Conveyors when used shall be kept full of concrete and ends shall be kept buried in the newly placed concrete as pouring progresses.

Vibrations:

No placing of concrete will be allowed without vibrators. Segregation due to over vibration shall be avoided.

Construction Joints:

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

All concrete works shall be done in accordance ACI-318-95 building code. All reinforced concrete and all structural steel works shall be done in accordance with the AISC specifications as it does not conflict with the national structural code of the Philippines (NSCP – 1) requirements.

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract for Installation of Steel Bars kilogram (kg) and for Concrete Works, cubic meter (cu.m.) price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools equipment and other incidentals necessary for the satisfactory implementation of these requirements.

TS - 4 FABRICATION AND INSTALLATION OF STRUCTURAL POSTS, FRAMING AND COVER FOR FIREWALL

GENERAL

This specification covers the furnishing and supply of materials including equipment and performing labor necessary to complete the Fabrication and Installation of Structural Posts Framing and Cover for Firewall or as shown on drawings and as specified herein

MATERIALS

1. All materials shall be A36 steel unless otherwise noted in the Plans

2. All arc-welding electrodes shall conform to the requirements of the American Welding Society "SPECIFICATIONS FOR IRON AND STEEL ARC- WELDING ELECTRODES" latest edition

3. All steel related products must be hot rolled

4. Materials for Firewall Cover will be FRP Solid Panel as specified on the drawing

Hot Rolled Wide Flange I Beam

Hot rolled steel wide flange I beams are the most common of all beams and are an excellent candidate for most processing techniques. They are often characterized by a textured blue-grey finish non-tapered flanges and a thicker center web for increased strength. Commonly used in the construction industry, steel wide flange beams are a standard structural material primarily used to carry loads transverse to its longitudinal axis (web)

Dimension – 152mm x 152mm x 25#(tf=11.6mm, tw=8.1mm)- for main steel column post

Dimension – 152mm x 100mm x 16#(tf=10.2mm, tw=6.6mm) - for main horizontal steel support

Galvanized Steel L-Corner Gusset Plate
Dimension – 50mm x 50mm x 3mm thk

Is used in joint bend or otherwise disjointed structural locations that require additional support to withstand stresses They typically occur as flat dish-like triangular or rectangular units and are fastened to beams with the use of bolts or welds

Galvanized Tubular Bar (2" x 4" x 1.2mm thk.Sched40) – for studs framing support

Fiberglass Reinforced Plastic (FRP) Solid Surface Checkered – 40mm thickness Shall be used as wall Cover of the proposed project

WORKMANSHIP

a. Connections

1 Shed connections shall be welded unless otherwise indicated in the Plans All connections shall develop full strength of members

2 Horizontal and diagonal brace shall be connected to Angle Bars to support the frame

3 Unless otherwise specified or shown on Plans roofing sheets shall be 1mm thick x 1200mm x 2440mm provided in long span sizes to minimize end lapping

4 Sheets shall weigh not less than 0 888kg/m and shall be marked or stamped showing the thickness size amount of zinc coating brand and name of manufacturer

5 Test specimens shall stand being bent through 180 degrees flat on itself without fracture of the base metal and without flaking of the zinc coatings

6 Beam to Beam Connection and Beam to Column Connection

b. Workmanship and Fabrication

1 Workmanship and fabrication shall be in accordance with AISC "Specification for Fabrication and Erection of Structural steel for Buildings" and with the following outline

2 Bearing surfaces shall be planned to true beds. Abutting surfaces shall be closely fitted

3 All columns and bearing stiffeners shall be milled to give full bearing over the cross section. It shall not be necessary to plane bottom surfaces of plate on grout beds

4 Assembled parts shall be brought into close contact and drift pin shall be used only for bringing members into position, not to enlarge or distort holes

c. Welding

1 Welding in shop and field shall be done by operators having been previously qualified by test prescribed in the American Welding society "Standard Qualification Procedure" to perform the type of work required

2 Equipment shall be of the type which produce proper current so that operator may produce satisfactory welds. The welding machine shall be of 200 - 400 amperes, 200 -240 volts capacity

3 Unless otherwise shown on the Plans, the following low hydrogen electrodes shall be used and shall be suitable for positions and other conditions of intended use in accordance with the instruction with each container

Welding	Electrode	Submerged Arc Process
A-7 to A-7	E - 60 Series	Grade SAW-2
A-7 to A-36	E - 70 Series	Grade SAW-2
A-36 to A-36	E - 70 Series	Grade SAW-2

1. The technique of welding employed, the appearance and quality of welds made, and the methods of correcting defective work shall conform to the American Welding society code for arc welding in Building Construction "Section 4" and Workmanship.
2. Surfaces to be welded shall be free from loose scale, rust, grease, paint and other foreign material except that mill scale, which withstands vigorous wire brushing, may remain.
3. Finish members shall be true to line and free from twists, bends and open joints.

d. Installation of FRP Solid Surface Checkered

A type of industrial flooring used across a broad range of industries. Typically it is found in walkways and overhead platforms.

FRP grating has a number of benefits, some of which we covered in the previous section. Here are the main reasons it is chosen over metal and other grating alternatives.

1. Durable: FRP grating is able to withstand harsh environments for extended periods of time without being damaged or degraded. It is low maintenance and easy to clean. And the moulded-through colour means it won't need to be repainted.
2. Fire resistant: while specific fire ratings will depend on the individual product, generally speaking FRP grating offers a high level of resistance to heat and fire.
3. Flexible: it is easily cut to fit particular flooring layouts and can be adjusted as layouts change, which reduces waste and saves on extra costs.
4. Lightweight: FRP grating is easier to transport and store than other grating alternatives, which reduces costs and avoids stoppages and delays to projects.
5. Non-conductive: it doesn't conduct electricity, so it is safer in electrically hazardous environments.

6 Non-corrosive FRP grating doesn't corrode so it can be used around dangerous chemicals where spills and leaks are a potential risk

7 Non-magnetic unlike steel and some other grating alternatives, FRP grating is non-magnetic which makes it is safer in situations that are sensitive to magnetic fields

8 Non-slip a grit-top surface can be added to FRP grating that helps reduce the chances of slipping

9 Non-sparking it doesn't spark so it reduces the risk of fire when working with or around highly flammable liquids or gases

10 Strong FRP grating has a good strength to weight ratio meaning it can handle substantial loads. Again, precise load ratings vary from product to product

MEASUREMENT AND PAYMENT

Measurement and payment shall be made at the contract per lot price as specified in the Bid Price Schedule. Payment shall include all cost in furnishing labor, materials, tools equipment and other incidentals necessary for the satisfactory implementation of these requirements

TS - 5. ELECTRICAL WORKS

GENERAL

This Item shall consist of the furnishing and installation of Electrical Wirings, Lighting Fixture and other Electrical Connection at the location shown or the approved Plans complete with circuit breakers, cabinets and all accessories, completely wired and ready for service

MATERIALS

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

WORKMANSHIP

a. Panel boards and Cabinets

Panel boards shall conform to the schedule of panel boards as shown on the approved Plans with respect to supply characteristics, rating of main lugs or main circuit breaker, number and ratings and capacities of branch circuit breakers.

Panel boards shall consist of a factory completed dead front assembly mounted in an enclosing flush type cabinet consisting of code gauge galvanized sheet steel box with trim and door. Each door shall be provided with catch lock and two(2) keys. Panel boards shall be provided with directories and shall be printed to indicate load served by each circuit.

Panel board cabinets and trims shall be suitable for the type of mounting shown on the approved Plans. The inside and outside of panel board cabinets and trims shall be factory painted with one rust proofing primer coat and two finish shop coats of pearl gray enamel paint.

Main and branch circuit breakers for panel boards shall have the rating, capacity and number of poles as shown on the approved Plans.Breakers shall be thermal magnetic type. Multiple breaker shall be of the common trip type having a single operating handle. For 50-ampere breaker or less, it may consist of single-pole breaker permanently assembled at the factory into a multi-pole unit.

b. Wirings

Wirings shall be THWN stranded wire and shall be the size indicated in the approved drawing including its enclosure.

All wiring installation shall be of the concealed knob and tube variety except that wires passing through concrete or masonry works shall be by rigid metal conduits of flexible pipes. Service shall be single-phase installation passing through rigid metal conduits and shall conform to the National Electrical Codeand Regulations.

MEASUREMENT AND PAYMENT

Measurement and payment for Electrical Works shall be based on the inspected and accepted by the NPC Representative. Payment will be made at the corresponding unit price per lot or as appeared in the items in the Bill of Quantities.

TS - 6. PAINTING WORKS

GENERAL

The work to be executed under this section shall provide all labor, materials and equipment and perform all operations necessary for all painting works specified in the drawing.

Inspection of Surfaces

Before starting the work, the Contractor shall inspect all surfaces to be painted. If the surfaces cannot be put in proper condition to receive paint by customary cleaning methods or sanding or sparkling, the Contractor shall notify the NPC representative in writing. The commencing of the work by the Contractor indicates his acceptance of the surfaces to be painted and assumes responsibility for the rectification of any unsatisfactory finishing, resulting from his negligence.

MATERIALS

All paint materials shall meet the requirements of the Philippine National Standard Specifications for Paintings. Paint to be used shall be **odorless**.

Paints shall be brought to the Site in tightly closeable, convenient, original containers, if nothing to the contrary is stipulated in the Specifications. The containers shall be marked in a durable manner with the following particulars:

- Maker
- Paint and relevant thinner
- Gross and net weights

- Date of supply by the maker's factory

Only thinners supplied by makers of the paint or those described by them as suitable shall be used for adjusting paints to working consistency. The instructions of the maker shall be followed in this respect.

With the exception of ready-mixed materials in original containers, all mixing shall be done at the job site. No materials are to be reduced or changed except as specified by the Manufacturer of said materials.

All paints shall be liquid tile or approved equivalent and should be environment friendly and **odorless. Sample of paint to be used shall be brought to end-user's office for approval before it will be used at site.**

COLORS AND SAMPLES

All colors shall be subject to the approval of the NPC representative. Tinting of matching colors shall be done under the supervision of the NPC representative. In all cases, a sample shall be applied on the job and the NPC Representative must give his approval before work is commenced. If required, three panels, 200mm x 250mm (8" x 10") of each color and finish shall be prepared in advance, for the approval of the NPC Representative.

WORKMANSHIP

All work shall be done by skilled painters in a workmanlike manner. All paints shall be evenly applied so as to be free from sags, runs, crawls or other defects. All painting materials shall be meet the requirements of stress and shall be in accordance with the relevant standards. All coatings shall be of proper consistency and well brushed out so as to show the minimum of brush marks, except varnish and enamel which shall be uniformly flowed on. All brushes shall be clean and in good condition, with heavy brushes preferred. Light brushes shall not be permitted.

a. Paint Application

1. Materials which are subject to working instructions, shall be treated according to these instructions, unless stipulated differently by the relevant paint manufacturer.

2. Paint gloss and coating may be worked manually or by machines, unless a particular execution has been stipulated in the Specifications.

3. Paint gloss and coat shall be bond firmly and be of even surface without scars and strips.

4. The surface shall be smooth if not otherwise stipulated in the Specifications, such as finely or coarsely granulated.

5. Any paint gloss or coating shall be applied without filling to create a uniform surface or when gloss is being applied, a flowing surface with the required materials according to instructions manuals, of white or light shade, unless otherwise stated in the Specifications.

6. Top finish shall be high-gloss, unless otherwise stated in the Specifications.

7. If flat levels are to be formed, the prime coated surfaces shall be completely being covered with suitable undercoat filler ribbed and smoothed.

8. Primer protective coating shall be applied on woodwork according to manufacturer's instruction. If several coats are requested, the preceding coat shall be dried before applying the subsequent one. This does not apply for wet-on-wet techniques.

9. Drying periods prescribed by the manufacturer shall be observed for open surfaces, as well as for edges or irregular surfaces. All edges at doors, windows, skirting, sockets, etc. shall be of sharp and straight line.

10. New concrete and masonry surfaces must be thoroughly neutralized either by brush or spray with a solution of 2kg of zinc sulfate to each gallon of water.

11. When applying paints by spray-gun, the object to be sprayed shall not be contaminated by water or oil in the compressed air.

12 In paint systems involving coats, the various coats of paints shall be distinguishable from each other by their shade

13 All coats of paint shall be applied only to clean, dry and non-greasy surfaces. In multi-coat paint systems, the coat last applied shall always be sufficient dry, free from any superficial moisture and from dust and dirt before applying the next coat, only when using the moist oil type of paints may it be necessary for the previous coat to be hard dry

14 The Contractor shall inform the NPC representative in good time before starting to apply the next coat so that the NPC representative shall have the opportunity of approving the previous coat

15 Painting work shall not be carried out at a temperature below +5 °C and above 50 °C. In addition, painting work shall not be carried out on surface affected by the action of rain, for and moisture or water of condensation, work started on such surfaces may not be continued until the surfaces to be painted are completely dry

MEASUREMENT AND PAYMENT

Painting Works shall be measured in square meter (sq.m.) of painting completed in place and accepted. Measurement will be of the actual number of square meter within the neatlines of the structure as shown in the plans or revised by authority of the Engineer.

TS-07 CLEARING AND DEMOBILIZATION

Before moving out, the contractor shall restore the orderly state of worksite by clearing all temporary structures. Remove all excess/waste materials and store in designated areas.

Before the Contractor will demobilize its construction equipment/ tools, materials and crew, he shall secure approval from NPC security office for the release of the contractor's equipment and to surrender the workers Identification (I.D.) cards. A joint inspection with the NPC inspector and Contractor will be conducted to make sure that all his accomplishment / work that needs remedial attention or correction shall be done prior to the issuance of the Certificate of Completion. The Certificate of Completion will serve as basis for the processing of payments.