ITEM 20 : UNDERGROUND ELECTRICAL WORK

GENERAL

"Electrical General Requirements," applies to this section with additions and modifications specified herein.

SUBMITTALS: Submit the following information for approval

a. Catalog Data / Or Shop Drawings:
   Conduits
   Wires/ Cables
   Cable Lubricant
   Ground Rods

PRODUCTS

MATERIALS AND EQUIPMENT: Materials and equipment shall conform to the respective specifications and standards and to the specifications herein. Electrical ratings shall be as indicated.

CONDUITS:

Intermediate Metal Conduit (UL 1242): Hot-dip galvanized, threaded type. Conduit shall be Panasonic, Smarttube or approved equal.

Rigid Plastic Conduit: UL 651, Schedule 40 PVC, Neltex, Emerald, Atlanta.

Fittings and Outlet Boxes:

Metal Fittings and Outlet Boxes: UL 514 A & B. Fittings and outlet boxes for use with steel and plastic conduit, rigid or flexible shall be cast-metal with gasketed closures.

PVC Fittings: UL 651.

Tape: UL 510. Plastic insulating tape shall be capable of performing in a continuous temperature environment of 80 degrees C.

Power Wire and Cable:

Wire and Cable Conductor Sizes: Wire and Cable conductor sizes are designated in square millimeter area unless millimeter diameter is indicated. Use 3.5 square mm minimum sized conductors, unless otherwise noted. Conductors shall be copper. Provide conductor identification within each enclosure where a tap, a splice or a termination is made. Wires shall be as manufactured by American Wire, Phelps Dodge, LS or approved equal.

Color Coding: Provide for all low voltage feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors, and white for neutrals, except where neutrals of more than one system are installed in same raceway or box, the other neutral shall be white with a colored (not green) stripe. The color of the ungrounded conductors in different voltage system shall be as follows:

400Y/230 Volts, 3-Phase - Phase A - Black
Phase B – Red
Phase C – Blue

Wire Conformation: Provide wires and conforming to UL standards.

600 Volt Wires and Cables: Provide wires and conforming to UL 83 THW and TW as indicated. Only wires with "W" in the type designation shall be used in wet or damp locations.

a. Cables:

Connector and Terminals:

a. Wire Connectors and Terminals for use with Copper Conductors: UL 486A.

High Voltage Wires and Cables: Copper, cross-linked polyethylene (XLPE) insulated, 133 percent insulation level , shielded single conductor, polyvinyl jacketed conforming to NEMA WC7, rated 13.8 kV . Cable shall be single conductor, employing concentric, Class B, compact round stranded copper conductors.

High Voltage Cable Terminations: IEEE 48 Class 1. The manufacturer shall provide all components, materials and complete instructions for installation which shall include stress relief cones.

Pull Wire: Pull wire shall be hot-dip galvanized steel or plastic having a minimum tensile strength of 200 lbs. in each empty duct. Minimum 300 mm of slack shall be left at each end of pull wires.

Grounding and Bonding Equipment: Shall conform to UL 467.

EXECUTION

Concrete: Concrete for electrical requirements shall be at least 20.68 Mpa concrete with one-inchmaximum aggregate.

Concrete: Concrete for electrical requirements shall be at least 20.68 Mpa concrete with one-inch maximum aggregate.

Underground Structures: Cast-in-place manholes. Cast-in-place concrete manholes shall have a smooth trowel finish for floors and horizontal surfaces. Manholes shall be the type noted on drawings and shall be constructed in accordance with the applicable details as indicated. Provide all necessary lugs, rivets and brackets. Set pulling-in irons and other built-in items before depositing concrete. A pulling-in iron shall be installed in the wall opposite each duct line entrance. Cable racks, including rack arms and insulators, shall be adequate to accommodate the cables in manholes and cable trenches. The words "ELECTRICAL" shall be cast in the top face of all power manhole covers.

Underground Duct with Concrete Encasement:

Construct underground duct lines of individual conduits encased in concrete. Conduit shall be Schedule 40 PVC. Do not mix the kind of conduit used in any one duct bank. Ducts size shall be as indicated. The concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 75 mm of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 50 mm,

except separate light and power conduits from control, signal, and telephone conduits by a minimum concrete thickness of 75 mm.

The top concrete envelope shall not be less than 457 mm below grade except that under roadsand pavement it shall be not less than 610 mm below grade.

Duct lines shall have a continuous slope downward toward manholes and away from buildings with a pitch of not less than 1 mm in 400 mm. Except at conduit risers, accomplish changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, by long sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 457 mm for use with conduits of less than 80 mm in diameter and a minimum radius of 914 mm for ducts of 80 mm in diameter and larger.

Terminate conduits in end-bells where duct lines enter manholes. Separators shall be of precast concrete, high impact polystyrene, steel, or any combination of these. Stagger the joints of the conduits by rows and layers so as to provide a duct line having the maximum strength. During construction, protect partially completed duct lines from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs. As each section of a duct line is completed from manhole draw a brush through having the diameter of the duct, and having stiff bristles until the conduit is clear of all particles of earth, sand, and gravel; then immediately install conduit plugs.

Cable Trench: Construct cast-in-place cable trenches in accordance with details shown on drawings. Walls and bottom shall be of monolithic concrete construction. Provide cable racks, including rack arms and insulators adequate to accommodate cables.

Ground Rods: Provide 20 mm x 3.0 m copper-clad steel ground rods where shown on drawings driven into the earth.

GENERAL INSTALLATION REQUIREMENTS: Underground cable installation shall conform to ANSI C2 and PEC.

CABLES GENERAL REQUIREMENTS: The type of installation, sizes, and number of cables shall be as indicated. Each circuit shall be identified by means of fiber, laminated plastic, or nonferrous-metal tags, or approved equal, in each manhole, and at each terminal. Manufacturer's written recommendations shall be furnished for each type of splice and high-voltage cable joint and termination, and for fireproofing application methods. High-voltage cable joints and terminations shall be the standard product of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Compounds and tapes shall be electrical grade suitable for the cable insulation provided and shall use design materials technique per manufacturer. Maximum length of cable pull and cable pulling tension shall not exceed the cable manufacturer's recommendation.

Duct Line Installations: High-voltage cables shall be installed in duct lines where indicated. Cable joints in medium-voltage cables shall be made in manholes only.

Cable Pulling: Thoroughly swab out duct lines to remove foreign materials before pulling of cables. Pull cables downgrade with the feed-in point at the manhole of the highest elevation. Use flexible cable feeds to convey cable thru the manhole opening and into the duct runs.

Cable pulling tensions shall not exceed the maximum pulling tension recommended by the cable manufacturer.

Installation of Cables in Manholes: Do not install cables utilizing the shortest route, but along those walls providing the longest route and the maximum spare cable lengths. For all cables to closely parallel walls, not to interfere with duct entrances, and support on brackets/cable insulators.

Cable Terminating: Protect terminations of insulated power and lighting cables from accidental contact, deterioration of coverings and moisture by the use of terminating devices and materials.

Splices for 600 Volt Class and High Voltage Cables: Splice in underground systems only in accessible locations such as manholes using a compression type connector on the conductor and insulate suitable for continuous submersion in water and shall be made only in accessible locations in manholes. Splices in shielded cables shall include covering the entire spliced area with metallic type, or like material, to the original cable shield and by connectingit to the cable on each side of the splice.

Terminator, Modular Molded Rubber Type: IEEE 48 Class I. Terminator shall consist of a stress control, ground clamp, non-tracking rubber skirts, crimp-on connector, rubber cap andaerial lug.

Grounding: Non-current carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid earth ground not exceeding the following values.

Grounding other metal enclosures of electrical operated equipment - 10 ohms

Grounded secondary distribution system neutral and non- current carrying metal parts associated with distribution system and grounds not otherwise covered – 10 ohms

When work in addition to that indicated or specified is directed in order to obtain the specified ground resistance, the provisions of the contract covering "Changes" shall apply.

Grounding electrodes shall be cone pointed driven ground rods driven full depth plus 150 mm, installed when indicated to provide an earth ground of the value before stated for the particular equipment being grounded.

Make grounding connections which are buried or otherwise normally inaccessible, and excepting specifically those connections for which access for periodic testing is required by exothermite type process or ground clamps. Make thermit welds strictly in accordance with the weld manufacturer's written recommendations. Welds which have "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. No mechanical connector is required at thermit weldments.

In lieu of an exothermic type process, a compression ground grid connector for a type which uses hydraulic compression tool to provide the correct circumferential pressure may be used. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

Grounding conductors shall be bare soft-drawn copper wire square mm size as indicated on plans.

Provide all empty conduits with a 2.0 mm (No. 14 AWG) zinc coated steel wire or a plastic rope having a breaking strength of at least 200 lbs. leave 610 mm of spare at each end of the pull.

FIELD TESTS: As an exception to requirements that may be stated elsewhere in the contract, the Engineer shall be given 3 working days' notice prior to each test.

Ground Rods: Test ground rods for ground resistance value before any wire is connected. Use a portable ground testing megger to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicated the ground value of the ground electrode under test. Provide one copy of the megger manufacturer's directions for use of the ground megger indicating the method to be used.

High-Voltage Cable Test: 13.8kV, and 600 volt cables shall be given high potential test (identify each cable & test result). Prior to making the test, the cables shall be isolated by opening applicable protective devices. The method, voltage, length of time and other character

ITEM 21 : PAD MOUNTED TRANSFORMER

GENERAL

a. Perform as indicated in this specification

b. Install the substation equipment as indicated on the project drawings, the approved shop drawings and as specified herein. Installation of the equipment shall be supervised by the equipment supplier representatives

c. Touch up all surfaces as required with paint and procedures approved by the manufacturer of the substation.

d. Site tests shall be carried out by the Contractor and witnessed by the Engineer and/or the Owner. Test equipment shall be complete with all current calibration certification. Test procedures shall be submitted for approval a minimum of four weeks before the planned test date. The test results shall be recorded on manufacturer's standard test certificates. Site tests shall include the following:

i Power frequency voltage test on both windings to BS 171 / IEC 76
ii Insulation resistance test prior to and after the pressure test for each winding to earth and between windings
iii Oil test to IEC 296
iv Voltage ratio test on all tap positions
v Vector group test
vi Tests on thermal trip devices

PRODUCTS

Continuous rating under site conditions	50 KVA
HV Input	13.8 KV
LV Output	400Y / 230V
Frequency	3Ø, 60 Hz.

Maximum top oil temperature rise shall be 60 degrees Centigrade

DESCRIPTION

Transformer shall be of the outdoor, oil-immersed, naturally circulated, naturally cooled, hermetically sealed pad mounted type, and shall be installed within the substation. The transformer shall be from a standard range of distribution transformer complying with the requirements of BS 171 / IEC 76, ANSI – C57, IEEE – C7.12 or similar and approved. They shall be capable of delivering full rated output under the site climatic conditions.

CONSTRUCTION

The transformer tank shall be of sheet steel construction suitably stiffened so that the transformer may be lifted and transported without permanent deformation or oil leakage. The transformer shall be fitted with lugs suitable for lifting and jacking the complete oil-filled unit and provided with a skid under-base with removable wheels to allow the transformer to be moved in any direction.

Tanks and covers shall be designed such that there are no external pockets in which water can collect and no internal pockets in which oil can remain when draining the

tank or in which air can be trapped when filling the tank. The design shall also be such that they provide easy access for painting.

Tank and terminal box joints shall prevent entry of water and leakage of oil. Gaskets shall be of a non-absorbent material. Joint faces shall fit properly and no additional thickness or jointing shall be used to make good irregularities. The top cover shall have a substantial flange and adequate number of bolts fixing the cover to a similar substantial flange on the transformer tank. The gasket provided at this joint shall be of synthetic rubber bonded cork.

The top cover seal shall be located above cold oil level, sufficient space being provided above the oil level to allow for expansion. The initial filling of oil shall be carried out at such a temperature that the pressure in the tank is at a minimum.

Instrumentation

The transformer shall be provided with a thermometer at the top of the tank, having a re-settable pointer for registering the maximum oil temperature and an oil level gauge to indicate the oil level at both 30 degrees centigrade and the level when the oil temperature has risen to the maximum permitted limit.

The transformer shall be provided with a rating and diagram plate made from stainless steel.

Earthing

The transformer shall be earthed by means of substantial connections to the tank. A terminal for this purpose shall be provided at the base of each unit for connection to the earthing system.

Cable Boxes

Cable boxes shall be provided for cable connections to the primary and secondary windings. The cable boxes shall be suitable for use outdoors and for bottom entry cabling. The boxes shall be air-insulated type, suitable for XLPE/PVC/SWA/PVC or XLPE/PVC/AWA/PVC. The cables shall be terminated using the heat shrink sleeve method.

Surface Treatment

The inside of the tank shall be grit-blasted and treated to the manufacturer's standard finish. The exterior of the tanks shall receive the surface finish suitable for a minimum of 10 years in an outdoor marine environment.

ITEM 22 : DIESEL ENGINE GENERATOR SETS STANDBY

GENERAL

Work under this Contract shall be in accordance with Diesel Engine Generator Sets of these Specifications and shall be applicable to this item, whether herein referred to or not.

SCOPE OF WORK:

The Work covered shall include but not be limited to all labor, materials, tools, equipment and incidentals necessary for the Contractor to furnish/provide diesel electric generating unit with accessories, auxiliary equipment, and associated work as specified and indicated.

APPLICABLE PUBLICATIONS:

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition or the revised version of such codes and standards current at the date twenty eight (28) days prior to date of bid submission shall apply. During contract execution, any changes in such codes and standards shall be applied after approval by the Owner.

1. American Institute of Steel Construction (AISC):
   AISC S335 Structural Steel Buildings Allowable Stress Design and Plastic Design

2. American National Standards Institute (ANSI):
   ANSI C37.16 Switchgear-Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors-Preferred Ratings, Related Requirements, and Application Recommendations
   ANSI C37.17 Trip Devices for AC and General-Purpose DC Low-Voltage Power Circuit Breakers
   ANSI C39.1 Electrical Analog Indicating Instruments

3. American Society of Mechanical Engineers (ASME):
   ASME BI.1 Unified Inch Screw Thread (UN and UNR Thread Form)
   ANSV Mechanical Power Transmission Apparatus
   ASME BI5.I
   ASME/ Cast Iron Pipe Flanges and Flanged Fittings
   ANSI B16.1
   ASME/ Pipe Flanges and Flanged Fittings
   ANSI B16.5

4. American Society For Testing and Materials (ASTM):
   ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

   ASTM A 126 Gray Iron Casting for Valves, Flanges, and Pipe Fittings

   ASTM A 181/ 181M Forgings, Carbon Steel, for General Purpose PipingA
   ASTM A 193/ A 194M Alloy -Steel and Stainless Steel Bolting Materials for High-Temperature Service

   ASTM A 194/ A 194M Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

ASTM A 234/ Piping Fittings of Wrought Carbon Steel and Alloy Steel

A 234M	for Moderate and Elevated Temperatures
ASTM A 307	Carbon steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM D 975	Diesel Fuel Oils

5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

IEEE115	Synchronous Machines
IEEE 42.1	Definitions for Excitation Systems for Synchronous Machines
IEEE C37.2	Electrical Power System Device Function Numbers
ANSVIEEE C37.13	Low Voltage AC Power Circuit Breakers Used Enclosures
ANSVIEEE	Instrument Transformer

6. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) :

NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA AB 1	Molded Case Circuit Breakers and Molded Case Switches
NEMA MG 1	Motors and Generators

7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

NFPA 30	Flammable and Combustible Liquids Code
NFPA 37	Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	National Electrical Code

8. UNDERWRITERS LABORATORIES INC. (UL):

UL 429	Electrically Operated Valves
UL 489	Molded Case Circuit Breaker and Circuit Breaker Enclosures
UL 508A	Industrial Control Equipment
UL 1236	Battery Chargers for Charging Engine Starter Batteries

DEFINITIONS:

a. Intercooling- Cooling of charged air after it leaves turbocharger compressor.

b. IEEE Device Numbers - Described in IEEE Standard IEEE C37.2.

c. Gross and Net Bkw Bhp Ratings of Engine - Gross rating shall be total rated power output before deducting power requirements of electric motor-driven equipment. Net ratings shall be equal to gross ratings minus total power requirements of electric motor driven accessories normally constituting part of "engine assembly."

SUBMITTALS:

Submit the following in accordance with section entitled "SubmittalProcedures."

Manufacturer's Catalog Data:

Engine-Generator Set Data: Submit the following data pertaining to each engine generator set.

a. Manufacturer of engine
b. Type or model of engine
c. Gross bkw, bhp rating of engine
d. Net bkw, bhp rating of engine
e. Strokes per cycle

f. Number of cylinders
g. Bore and stroke, mm inches
h. Engine speed, rpm
i. Piston speed, m/s fpm
J. BMEP at full load Pa (gage) (psig)
k. kW rating of generator set at specified voltage and temperature rise per NEMA MG 1
l. kVA rating of generator and power factor
m. Induction method (naturally aspirated, turbocharged)
n. Intercooler type (air-to-air or jacket water)
o. Governor type, make and model
p. Make and model of turbochargers
q. Motor starting kVA of generator set at 35 percent dip specified

Engine-Generator Unit Guarantees:

Submit for the following. Fractional loads shall be calculatedon basis of net ratings unless otherwise called for:

a. Fuel consumption at 0.80 power factor (Joules Btu per net kWh):
(1) 1/2 load
(2) 3/4 load
(3) Full load

b. Generator efficiency at 0.80 power factor (percent):
(1) 1/2 of net-rated load
(2) 3/4 of net-rated load
(3) Full net-rated load

c. Radiator capacity at design conditions:
(1) Coolant shall be antifreeze mixture as specified under paragraph entitled "Cooling System."
(2) Engine jacket coolant flow (Lis) (GPM)
(3) Air flow through radiator (cubic meter/minute) (CFM)
(4) kW Btu/hour of heat exchange based on 40° ambient temperature.

Diesel Engine Data:

Submit the following data certified by the engine manufacturer:
a. Approximate exhaust temperature degrees C F at full load
b. Cubic meter/minute CFM of exhaust gas at full load
c. Cubic meter/minute CFM of intake air at full load
d. Total heat rejected to cooling system and to ambient air at full load at maximum ambienttemperature (kW) (Btu per hr)
e. Maximum jacket coolant temperature from engine degrees CF at full load
f. Jacket coolant temperature from engine that will cause generator set shutdown for over-temperature, (Degrees C) (Degrees F)
g. Lubricating oil consumption in liters gallons per hour at full load (estimated)
h. Recommended grade and type of lubricating oil.
i. Maximum over speed limit

Generator and Exciter Data: Submit the following data certified by the generator manufacturer.

a. Manufacturer and model number of generator
b. Generator short circuit ratio

(1) Synchronous reactance, Xd
(2) Transient reactance, Xd'
(3) Sub transient reactance, Xd"

c. Generator over speed limit (percent)
d. Generator flywheel effect (kg-m2) (lb-ft2)
e. High Potential Test Voltage
    1. Generator Stator
    2. Generator Rotor
    3. Exciter
f. Generator and exciter efficiency data
g. Radio frequency interference data.

Drawings:

a. Engine-generator unit and auxiliary equipment
b. Engine-generator unit electrical drawings

Engine-Generator Unit and Auxiliary Equipment:

Submit drawings pertaining to the engine-generatorset and auxiliary equipment, including the following:

a. Certified outline, general arrangement (setting plan), and anchor bolt details. Show totalweight and center of gravity of assembled equipment on the steel subbase.

b. General arrangement and detail piping of exhaust and air intake piping systems
c. General arrangement, size, and location of electrical interface points, and detailed elementary, schematic wiring, and interconnection diagrams of generator, exciter, governor, and other integral devices.

d. Dimensional drawings or catalog cuts of exhaust and intake silencers, intake filters, starting equipment, and other auxiliary equipment not integral with the generator set.

e. General arrangement or assembly drawings showing location of major auxiliary equipment in relation to the engine-generator set.

f. Piping schematics for fuel oil and engine coolant showing pumps, gages, pipe sizes and valve locations.

g. Engine-generator control panel.

Engine-Generator Unit Electrical Drawings: Submit complete electrical drawings including elementary, schematic, wiring, and interconnection diagrams for the generator switchboard and automatic transfer switches/low voltage switchboard.

Design Data:

a. Torsional vibrations analysis for each unit

Statements

a. Diesel engine generator successful operation

Diesel Engine Generator Successful Operation: Submit certificates within 30 calendar days after award certifying that not less than three engines of identical number of cylinders and cylinder size, identical or higher rotative speed, up to a maximum of 1,800 rpm, and identical or higher brake mean effective pressure (BMEP), and the same basic configuration (In-line or Vee) as the engine to be provided, have each driven generators which have produced, in satisfactory operation, not less than 250 kWh of electricity for each kW of generator nameplate capability within a 2-year period. Certificates shall include:

a. A list of at least three engine-generator set installations meeting experience requirements inparagraph entitled "Experience Requirements."
b. Owner and location of each installation.
c. Date of initial operation of each installation.
d. Number of kWh produced per kW of generator net rated capability of each engine installation.
e. KW rating Horsepower rating, kW rating, and rotative speed of each set.
f. BMEP rating of each engine.
g. Design characteristics of each unit, such as bore and stroke, number of cylinders, andconfiguration (In-line or Vee).

Test Reports:

a. Switchboard bus continuous current test.

Switchboard Bus Continuous Current Test: Certify that switchboard bus meets NEMA rated continuous current design test by listing bus size, bus quantity, bus material, rated amperes used, plus measured temperature rise and ambient temperature used during the test.

Factory Test Reports:

a. Engine-generator set tests: Submit certified factory test report within 30 calendar days after completion of tests. Provide in accordance with requirements set forth in paragraph entitled "Source Quality Control."

Field Test Reports

a. Piping tests
b. Preliminary operation
c. Phase relationship tests
d. Control panel and switchboard tests
e. Engine-generator set acceptance tests
f. Auxiliary equipment test: Submit test and inspection reports for work required underparagraph, "Field Quality Control."

Records

a. Posted operating instructions for diesel engine-generator set. Provide text for each piece ofequipment according to paragraph, "POSTED OPERATING INSTRUCTIONS."

Operation and Maintenance Manuals

a. Engine-generator unit and auxiliary equipment
b. Engine speed governing system
c. Engine-generator set voltage regulator
d. Engine control panel
e. Generator switchboard
f. Automatic Transfer Switches

QUALITY ASSURANCE:

Experience Requirements:

Engines installed shall meet the following operating experiencerequirements:

a. Only electric generation service is considered equivalent experience. Engines driving pumps, compressors, or those in marine propulsion or railroad service are not acceptable.
b. Only experience on the same engine model is acceptable. Engine model is considered to be a given series or class of identical bore and stroke and of the same type of engine, such as In- line or Vee. In-line and Vee engines with identical bore and stroke are considered as two separate models.
c. Only experience at identical or higher rotative speed as that specified is acceptable.
d. Only experience at identical or higher BMEP as that specified is acceptable.
e. Only experience with diesel-fueled engines is acceptable

Regulatory Requirements:

f. Provide devices designed and installed to comply with the following requirements:

(1) Power Transmission Apparatus: Guard in accordance with ANSI/ASME B15.1.
(2) Electrical Installations: Conform to NFPA 70.
(3) Mercury: Use of mercury in instruments, contacts, and manometers is

not permitted.

DELIVERY, STORAGE AND HANDLING:

Deliver equipment on pallets or blocking with each entire unit wrapped in heavy-duty plastic wrapping, sealed to protect unit from moisture and dirt. Plug and seal shut piping, conduit, exhaust, and air intake openings. Pack generator switchboard in shipping sections which can be handled and installed at the site. Protect and prepare batteries for shipment as recommended by battery manufacturer. Store equipment at the site in covered enclosures, protected from atmospheric moisture, dirt, and ground water. Properly label each package on exterior of wrapping to identify enclosed equipment, contract number, manufacturer, and purchaser. Manufacturer's standard practice in product protection and identification, meeting above requirements, is acceptable.

POSTED OPERATING INSTRUCTIONS:

Provide operating instructions laminated between matte-surface thermoplastic sheets suitable for placement adjacent to corresponding equipment. Install operating instructions where directed.

PRODUCTS

MATERIALS:

Provide materials and equipment of manufacturers regularly engaged in production of such materials or equipment, and the manufacturer's latest standard commercial product that complies with specification requirements. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer; however, component parts of the system need not be products of the same manufacturer.

ENGINE-GENERATOR SET:

Each set shall consist of a water cooled diesel engine direct- connected to an AC generator having a brushless excitation system, and shall be provided with necessary accessories, auxiliaries, appurtenances, control equipment, and cooling systems, resulting in a complete set and, except for external service connections, ready for operation. Mount each engine-generator set on a steel subbase sized to support the engine; generator-exciter, engine- generator control panel; lubricating oil filters, heat exchangers and pump; fuel oil filters and pumps; jacket coolant heat exchangers and pumps; and interconnecting piping and wiring. Engine generator set shall include electric starters, controls, and related wiring for electric starting. Batteries, battery racks and charger assembly may be mounted on the set subbase. Provide subbase with vibration isolators suitable for loads and lateral forces involved in seismic zone applicable. Isolators shall be as recommended by engine-generator set and isolator manufacturers to suit specific equipment involved. Make electrical and mechanical field connections with flexible connectors. When standard with the manufacturer, combustion air filter/silencer units and exhaust muffler units may be mounted separately from the set, and connections made to engine with corrosion-resistant flexible connections. Factory align engines and generators on subbase and securely bolt into place in accordance with manufacturer's standard practice. Paint each set, after assembly, with manufacturer's

standard paints and colors. After tests and before shipping, thoroughly clean each set and retouch paint as necessary to provide complete protection to the set. Arrange sets for automatic unattended starting in addition to manual start-and-stop by control panel switches. Each engine generator set shall be capable of automatically starting, coming up to synchronous speed, and ready to accept full rated power within 10 seconds after receipt of start signal.

Equipment Rating and Capability:

Each engine-generator set shall have a net standby rating capacity of not less than 2000 kW at 0.8 power factor and shall be designed to supply 4160 volts 3 phase, 60-Hz ac output. Auxiliary equipment shall be designed for continuous duty at 100 percent of rated net capacity of engine-generator set. Cooling system components and auxiliaries shall be properly sized relative to engine coolant specified under cooling system.

Torsional Vibrations:

Each complete engine-generator set shall be free of torsional vibrations that might endanger satisfactory operation of the set. Satisfactory operation will be considered endangered, when torsional vibration stresses exceed 34.45 MPa 5,000 psi within 10 percent above or below rated engine speed. Analysis of torsional vibrations shall be accomplished by calculations and by tests of a complete representative prototype of the engine-generator set. Results of the analysis shall be certified by a registered professional engineer.

Parallel Operation:

Each engine-generator set shall operate satisfactorily in parallel under this contract. Consider parallel operation satisfactory, when power pulsations between a new unit and the balance of the system do not exceed plus or minus 100 kW.

GENERATOR SET DESIGN AND CONSTRUCTION:

Isolate or shield rotating or reciprocating parts, or other parts that present a potential hazard to operating personnel.

DIESEL ENGINES AND ACCESSORIES:

Engines shall be four-cycle, naturally aspirated, turbocharged or turbocharged and intercooled; vertical In-line or vertical Vee type; water cooled; designed for continuous electrical duty, stationary service. Provide each engine designed and constructed to eliminate undue heating, vibration, and wear and be efficient and trouble free in operation. Engine shall be capable of operating on diesel fuel oil conforming to ASTM D 975, Grade 2-D

Construction:

Construct engine to withstand sudden changes from no load to rated load, and to preserve alignment of integral components under all conditions of operation. Design shall incorporate pressure lubrication of bearings and wrist pins, and bearing journals shall be hardened or chromium plated to provide a hard shock-resistant surface with ductile core. Counterbalance crankshafts to reduce vibration to a minimum. Crankshaft and connecting rod bearings shall be replaceable precision sleeve type. Provide cylinders with replaceable liners. Construct piston rings of heat-resisting alloy steel or chromium plated cast-iron. Camshafts shall be gear driven, and shall be high wear-resistant, at cams and journals. Clearly indicate timing marks on crankshaft and gears. Valves shall have removable or rebuildable stem guides and seat inserts. Flywheel shall be balanced, and capable of being rotated 50 percent above the maximum rated engine rotative speed without danger of breaking or exploding. Provide flywheel housing with a drain hole at the lowest point. Provide means for turning crankshaft manually. Turbocharger lubricating oil system shall not be a separate system, but shall be a part of engine lubricating oil system.

Assembly:

Completely factory-assemble each engine. Mount turbocharger or mechanically driven supercharger and intercooler and piping integral with the engine, on the engine.

Engine Speed Governing System, IEEE Device 65:

Provide each engine with a speed governing system and an independently driven over speed limiting engine shutdown device. Provide an adjustable isochronous governor, with suitable speed sensing. Governor shall be capable of either manually or automatically dividing the load when operating in parallel with other units having similar governors, and shall maintain specified stability without hunting, cycling, or other irregularities. Governor shall include provisions for adjusting speed droop and speed while the unit is in operation. Governor characteristics shall conform to the following:

a. Minus 10 to plus 5 percent minimum range of speed changer expressed as a percent of rated speed.
b. Steady-state governing speed band shall not exceed plus or minus 0.25 percent expressed as a percent deviation from rated speed.
c. Transient speed deviation shall not exceed plus or minus 3.0 percent expressed as a percent of rated speed for any 50 percent load step, on or off.
d. Time to return to limits of observed speed band shall not exceed 3 seconds after sudden load change of transient speed deviation.
e. 0 percent to 5 percent minimum manual speed regulation range adjustment, expressed as a percent of rated speed.

Engine Protective Devices: Provide each engine with protective devices as follows:

f. Engine Shutdown: Equip each engine with shutdown devices listed. These devices shall shut down the engine by shutting off the fuel supply to fuel injectors. Shutdown devices shall be

positive, direct in action and independent of the governor. Shutdown devices shall have factory-set fixed set points and shall be equipped with either auxiliary electrical contacts, relays or equivalent device for shutdown. Auxiliary contacts shall be suitable for starting battery voltage. Shutdown shall open the generator main circuit breaker. Provide the following shutdown devices:

(1) Over speed device which operates when engine speed exceeds normal synchronous speed by 18 percent. Device shall require manual reset.
(2) Pressure switch which operates when engine and turbocharger lubricating oil pressure drops below a preset value.
(3) Temperature switch which operates when jacket coolant temperature exceeds a presetvalue.
(4) Other shutdown devices as recommended or normally provided by engine manufacturer.

Electrical Interlocks and Alarms:

Equip starting mechanism with auxiliary contactsfor interlocking with generator main breaker control circuit as determined by manufacturer. Auxiliary contacts shall be suitable for starting battery voltage.

Engine Alarm Contact Devices:

Equip each engine with alarm devices, relays, and auxiliary contacts, as required, to actuate alarm system on associated engine control panel. Auxiliary contacts shall be suitable for starting battery voltage. Alarm devices shall have factory-set fixed set points. Provide following alarm contact devices:

a. Starting mechanism contacts or equivalent device operating to energize a portion of alarm system only when engine is running and not during cranking or shutdown.
b. Pressure switch in engine and turbocharger lubricating oil system piping from engine to operate when pressure drops below a preset value due to failure of engine-driven lubricating oil pump.
In addition to alarm contacts, provide set of contacts to start an auxiliary oil pump, when such a pump is standard with engine manufacturer
c. Temperature switch in jacket coolant discharge piping from engine to operate when temperature exceeds a preset value.
d. Other alarm devices as recommended by engine manufacturer.

Engine Accessories:

Provide the following accessories for each engine-generator set as recommended by the manufacturer:

a. Piping on engine-generator set to inlet and outlet connections, including nonstandard companion flanges.
b. Foundation bolts, nuts, isolators, and sleeves for engine-generator set.
c. Leveling jack screws or shims, when applicable.

d. Chocks and shims for installation and leveling of engine-generator set subbase, when applicable.
e. Manually operated barring gear.
f. Indicating thermometer or temperature indicator in accordance with manufacturer's standard for engine coolant.

Air Intake and Exhaust Systems:

Provide air intake and exhaust systems for each engine. Install field piping in accordance with manufacturer's requirements. Include piping, fittings, and expansion joints necessary to interconnect equipment with engines. Arrangement of air intake and exhaust systems shall be similar to that indicated and modified, as required, to suit engine furnished, subject to approval of the Owner and Engineers.

a. Air intake filters: Provide heavy duty and dry type filter for each engine as standard with the engine manufacturer. Size filter to suit engine requirements at 100 percent of rated full load. Unit shall be designed to permit easy access to filter for maintenance purposes.
b. Exhaust silencers: Provide a residential type exhaust silencer for each engine to reduce the exhaust sound. Silencer shall be complete with insulation and necessary brackets for supporting purposes. Sizing of silencer shall be in accordance with engine and silencer manufacturer's recommendations. Flanged inlet and outlet connections shall be provided.
c. Expansion (flexible) joints: Provide sections of multiple corrugated stainless steel expansion joints with liners in the engine exhaust piping for each engine to absorb expansion strains and vibration in the piping. Flexible joints in exhaust piping shall be suitable for continuous operation at 93° C 200°F above the normal exhaust gas temperature at 100 percent load. Air intake expansion joints shall be as specified for exhaust piping or may be reinforced rubber type suitable for the service. Joints shall be of the same size as pipe and provided with flanged connections. Air intake expansion joints may be for plain end pipe.
d. Air intake piping: Conform to manufacturer's recommendations for size, type, and connections.
e. Exhaust piping: Provide piping for each engine complete with necessary fittings, flanges, gaskets, bolts, and nuts. Pipe shall be steel conforming to ASTM A 53. Exhaust piping shall be Schedule 40. Exhaust piping shall slope away from engine. Flanges shall be 667.5-N 150- pound slip-on forged steel welding flanges conforming to ASME/ANSI B16.5, with material in accordance with ASTM A 181/A 181M, Grade I. Fittings shall be butt-welding conforming to ASTM A 234/A 234M, with wall thickness same as adjoining piping. Built-up miter welded fittings may be used. Fittings shall be of same material as pipe. Miter angles of each individual section shall not exceed 0.393 rad 22.5 degrees total and not more than 0.196 rad 11.25 degrees relative to pipe axis at any one cut. Gaskets for piping shall be of high temperature asbestos-free material suitable for the service. Bolting material for exhaust flanges shall be alloy-steel bolt-studs conforming to ASTM A 193/A 193M, and alloy steel nuts conforming to ASTM A 194/A 194M. Bolts shall be of sufficient length to obtain full bearing on nuts and shall project not more than two full threads beyond the nut.

GENERATORS AND EXCITATION AND VOLTAGE REGULATION SYSTEM:

Generator:

Provide 0.80 power factor, synchronous, ac, brushless-excited, revolving field, air- cooled, self-ventilated unit conforming to NEMA MG 1 and rated as specified in paragraph entitled "Equipment Rating and Capability." Enclosure frame shall be drip proof. Match generator speed to that of engine. Drive generator directly from engine crankshaft in a manner approved by both engine and generator manufacturers. Generator shall be capable of carrying at rated voltage and 0.8 power-factor, a load equal to net kW rating of the engine without exceeding temperature limits specified in NEMA MG 1 for standby duty. Winding insulation shall be Class For H. An amortisseur winding shall be provided and generator and flywheel shall have sufficient flywheel effect to meet requirements of regulation and parallel operation specified. Generator field voltage shall be manufacturer's standard voltage. Ground generator enclosure at two opposite mounting legs.

Excitation and Voltage Regulation Systems Comply with IEEE 421.1.

Exciter:

Integral with generator; synchronous, rotating armature, rotating rectifier, brushless or permanent magnet brushless type. Mount rotating rectifier assembly in a manner to provide ready access for inspection and replacement of rectifier diodes. Semiconductor rectifiers shall have minimum factor of safety of 300 percent for peak inverse voltage, and forward current ratings for operating conditions, including 100 percent generator output at 40° C ambient. Provide safety devices for protection of rectifiers against overload currents and voltages unless design provides this protection inherently. Acceptable ratio of exciter ceiling voltage to exciter nominal voltage shall be not less than three to two.

Voltage Regulator, IEEE Device 90:

Provide a solid state voltage regulator that automatically controls the generator field current through action on the exciter, and provides immunity from SCR tracking. Voltage regulator shall enable manual adjustment of set output voltage, while set is operating, by potentiometer adjustment at generator control panel. Voltage regulator shall enable parallel operation with like sets. Provide cross connection of voltage regulators of sets to enable operation in parallel with minimal voltage drop.

a. Operation:

Voltage regulator shall have characteristics and sensors which enable generator to operate alone or in parallel with other generators in isochronous load sharing mode and in conjunction with common solid-state control to operate isochronously with proportional load sharing mode. Provide a contact to short out the current transformer when a generator is not connected to its output bus. Install instrument transformers and voltage regulator in the generator control panel along with a manual voltage setting control.

b. Regulation:

Voltage regulator/excitation systems shall be capable of voltage regulation within plus or minus 1 percent from no-load to full-load. A 5 percent variation in frequency and effects of field heating shall not affect units' regulation performance. System shall provide 300 percent rated generator current for at least 10 seconds to provide short-circuit current adequate to operate circuit breakers.

FUEL OIL DAY TANKS:

Provide tank with a minimum capacity of 2 hours of engine-generator set operation at full-rated load

Level Alarm Switches:

Provide tank-top mounted or external float cage, single-pole, single-throw type designed for use on fuel oil tanks. Arrange high level alarm switches to close on rise of liquid level, and low level alarm switches to close on fall of liquid level. Mount float cage units with isolating and drain valves. Contacts shall be suitable for starting battery voltage.

Tank Gages:

Provide tank gages for fuel oil day tanks. Gages for fuel oil day tanks shall be buoyant force type, with dial indicator not less than 100 mm4 inches in size and arranged for side mounting. Each dial or scale shall be calibrated for its specific tank to read from empty to full, with intermediate points of 1/4, 1/2, and 3/4.

Fuel Oil Filter: Provide manufacturer's standard.

Day Tank Makeup Control Valve: Solenoid valve shall be two-way, direct acting, normally closed, open when energized, closed when DE energized, with brass body and resilient seat material. Electrical rating shall be 230 volt, single-phase, 60-Hz. Body connections shall be same size as connecting piping.

LUBRICATING OIL SYSTEM:

Auxiliary Lubricating Oil Pumps: Where recommended by the engine manufacturer, provide one pump for each engine, each suitable for " before-and-after" lubricating and cooling service as required by the engine. Equip each pump with a bypass relief valve.

Lubricating Oil Filtration:

Provide each engine with a pressurized lubricating oil filtration system capable of filtering the full rate of oil flow from the oil pumps at maximum engine speed in accordance with standard practice of engine manufacturer. Provide means to ensure delivery of lubricating oil to vital wearing surfaces regardless of the condition of filters without removing engine from service. Filters shall provide means of automatically bypassing filter when filter becomes flow-restricting. Provide throwaway type filter elements as recommended by engine manufacturer.

COOLING SYSTEM:

Jacket Coolant Pumps:

Provide one pump for each engine driven from engine crankshaft or camshaft. Each pump shall have ample capacity to circulate required flow of coolant specified through the system to remove total heat rejected from the engine and, where provided by design, from lubricating oil and intercoolers. Heat shall be rejected to jacket coolant to maintain optimum jacket coolant temperature leaving and entering engine as recommended by the engine manufacturer.

Radiators:

Provide one radiator unit for each engine-generator set. Provide engine unit-mounted radiators of the forced draft type horizontal air discharge, as standard with manufacturer.

a. Design Conditions: Each radiator unit shall have ample capacity to remove not less than the total kW Btu per hour of heat rejected by its respective engine at 100 percent full-rated load to jacket coolant, to lubricating oil system, to air surrounding the engine on subbase-mounted radiator units and that necessary for turbocharger intercooler. Radiator capacity shall be rated at optimum temperature of coolant leaving engine and intercooler as recommended by the engine manufacturer, with a dry **bulb** air temperature of 43° C. Pressure drop through the radiator shall not exceed41.34 kPa 6 psi when circulating maximum required coolant flow. Radiator air velocity shall be a maximum of 4.57 m/s900 feet per minute. Coolant solution shall be a mixture of clean water and a commercial standard methoxy-propanol or ethylene glycol coolant. Mixture shall be to proportions recommended by the engine manufacturer to meet site conditions.

b. Engine Unit-Mounted Radiator Construction: Radiator fan shall direct air flow from the engine outward through the radiator. Fan shall be V-belt driven directly from the engine crankshaft. Radiator shall have sufficient capacity to meet design conditions against a static restriction of 12.7 mm of water as may be imposed by louvers and ductwork. Cooling section shall have a tube and fin-type core consisting of copper or copper base allow tubes with nonferrous fins. Engine-driven fans shall be the engine manufacturer's standard unit selected for quiet vibration-free operation. Provision shall be made for coolant expansion either by self-contained expansion tanks or separately mounted expansion tanks, as standard with the manufacturer. Provide suitable guards for each fan and drive.

Thermostatic Control Valves: When recommended and standard with engine manufacturer for proposed engine, provide a valve installed in the jacket coolant system for each engine to maintain a constant jacket coolant temperature from the engine. Valve shall be as specified in paragraph entitled "Thermostatic Control Valves." Valve shall be capable of passing coolant flow, as determined by the engine manufacturer.

ELECTRIC STARTING SYSTEM: Provide a 24 volt de starting battery installation for starting of each engine-generator set utilizing an electric cranking system. Electric cranking system shall be capable of rotating the engine at a speed

sufficient for rapid starting in an ambient temperature of minus 7°C 20°F. Signal for starting shall come from engine-generator set control system.

Cranking: Energize electric cranking system from negative polarity grounded starting batteries. Provide heavy-duty type cranking motors with capacity to crank the engine continuously to start the engine. Drive mechanism for engaging starting motors with engine flywheel shall be designed to inherently engage and release without binding. When engine starts, starting gearing shall automatically disengage and starting motors shall shut down. Automatic cranking panel shall crank engine as specified under paragraph entitled "Engine Cranking Relay."

Starting Battery Installation: Provide maintenance free lead acid industrial engine cranking batteries designed for diesel engine starting of sufficient size and capacity in a fully charged condition to crank engine for four consecutive cycles of 30 seconds cranking followed by 120 seconds rest. Provide battery racks or enclosures, properly ventilated for the batteries and charger. Provide necessary cabling.

Starting Battery Charger: Provide enclosed, automatic, dual-rate, solid-state, constant voltage type battery charger having ac voltage compensation, de voltage regulation, and current limiting. Charger shall employ transistor-controlled magnetic amplifier circuits to provide continuous taper charging. Charger shall have two ranges, float and equalize, with Oto 24 hour equalizer time, de cranking relay, silicon diode full-wave rectifiers, automatic surge suppressors, de ammeter, de voltmeter, and fused inputs and outputs. Charger shall have continuous rated output of not lessthan 10 amperes and conform to UL 1236.

ENGINE-GENERATOR SET CONTROLS:

Provide an engine generator control panel mounted on each engine generator set subbase and a separate generator switchboard. Manufacturer's standard electronic control panels may be provided in lieu of those specified below if they accomplish the same functions.

Engine Control Panel Provide an enclosed panel fabricated of not lighter than 14-gage sheet steel in compliance with NEMA 250, Type 1. Construct cabinet with angle iron framework, if required, for proper stiffness and support. Size cabinet to accommodate specified equipment when arranged in an orderly and approved manner. Factory-mount panel on engine unit subbase. Provide isolation mounting material between subbase and panel to isolate the panel from engine vibrations. Provide panel-mounted devices with nameplates of laminated black gloss-finished plastic with white engraved lettering. Provide connecting piping, tubing, and wiring installed in conduit where not otherwise enclosed.

Engine Control Panel Provide devices of the type standard with the manufacturer utilizing minimum 50-mm 2-inch nominal diameter gages. Provide instruments subject to rapid pressure surges with damping devices to give a steady reading. Provide the following panel-mounted devices as a minimum:

a. Engine Controls: Install engine controls on generator control panel, except provide an emergency stop switch on the engine control panel.

b. Engine Instrumentation :

(1) Fuel oil pressure gage
(2) Lube oil pressure gage
(3) Coolant temperature gage
(4) Elapsed time meter

c. Engine Safety Circuit Devices: Provide the following devices to stop engine-generator set and to simultaneously open its main circuit breaker. Stop switch may be connected to this safety circuit when recommended by the manufacturer. Source of energy for engine safety circuit devices shall be the *starting battery, separate from the starting circuit.*

(1) Over cranking
(2) Over speed
(3) Excessive coolant temperature
(4) Dangerously low lubricating oil pressure

Generator Control Panel:

Install controls in engine-generator control panel or in the generator switchboard generator panel as indicated. Provide microprocessor based communication and connection for remote monitoring of generator operation including all required interface devices and generator controls and instrumentation as follows:

a. Generator controls
   i. Voltage regulator and associated controls

b. Generator instrumentation and metering

   i. Voltmeter and control switch
   ii. Ammeter and control switch
   iii. Three current and three voltage (potential) transformers

c. Engine starting and stopping controls and protective equipment

   i. Engine starting switch
   ii. Engine cranking relay
   iii. Engine shutdown relay
   iv. Automatic transfer switch
   v. Automatic synchronizing and transfer circuitry

d. Local Alarm Panel: Provide manufacturer's standard local alarm panel suitable for operation on the starting battery voltage. Provide with shutdown alarms in accordance with NFPA 99. Panel shall be complete with interface devices and modules for connection to and monitoring, data gathering by a Building Management System. Provide the following alarms with pre- shutdown alarms only for temperature and pressure conditions and shutdown alarms for all conditions:

   i. High jacket coolant temperature
   ii. High lubricating oil temperature
   iii. Low lubricating oil pressure

iv. Low fuel oil pressure
v. Engine shutdown due to overspeed
vi. Engine starting failure
vii. Normal voltage supply failure
viii. Restoration of normal supply voltage
ix. Control battery summary alarm
x. Other engine-generator set abnormal conditions as recommended by the manufacturer

Generator Switchboard:

Free-standing, self-supporting metal-enclosed, general-purpose, indoor, with internal steel barrier, hinged that doors for access to control, transformers and breaker compartments, standard powder coated smooth finish low-voltage switchboard rated for 400-volts, three-phase, four wire and provided with full-size neutral bus and continuous ground bus. Buses shall be copper. Interrupting and continuous ampere ratings as indicated.

Operation:

a. The control switchgear shall be used for automatic operation of engine generator sets standby units.

b. Automatic programming shall be interpreted to mean automatic starting, automatic paralleling and automatic load sharing system for the engine generator sets. The design of the control system shall also permit manual starting, stopping and paralleling of the station engine generator sets. Manual control of the individual generator sets speed and voltage shall also be provided. The automatic synchronizing and automatic load sharing circuits shall remain operative in the manual mode.

c. Should an engine generator set fail to start, fail to automatic parallel or develop a critical running monitored fault, the control system shall cause the engine to automatically shut down with its circuit breaker automatically tripped open.

Generator Units:

Provide to switch and control electrical output of each engine-generator set.

Automatic Transfer Switch Tie Units:

Provide automatic tie units to switch and control each transfer switch tie.

Generator Control Panel Devices

Controls:

Provide microprocessor based generator sets power control system with functions of power load control, power metering, automatic synchronizing/paralleling, protective relaying and provide closed-loop control of real and reactive power output when units operate in parallel.

- Power control functions shall include the following:
    1. True RMS real power sensor for precise control

2. Closed-loop control of generator power level
3. Control outputs to be wired to the generator sets electronic speed control engine governormodule
4. Adjustable ramp time for soft loading and soft unloading of generator sets

- Power metering functions shall include the following:
  1. AC amperes, 3 phase
  2. AC voltage of each phase to phase
  3. AC kilowatts, 3 phase total
  4. AC kiloVARS (KVARS), 3 phase
  5. Frequency
  6. Power factor
  7. AC kilowatt hours, 3 phase total
  8. Generator set run time hours

- Automatic Synchronizing (paralleling) functions shall include the following:
  1. Automatic synchronizer, both speed (frequency) and voltage matching
  2. Synchronizing check function
  3. Failed to Parallel function

- Protective relay functions shall include the following:
  1. Over/under voltage, 3 phase, 27/59 function
  2. Over/under frequency, 81-O/U function
  3. Negative phase sequence-current, (current unbalance) 46 function
  4. Negative phase sequence-voltage, (voltage unbalance) 47 function
  5. Reverse reactive power/Loss of Excitation, 40 (32RV) function
  6. Reverse power, 32 function
- Operator Interface Module (OIM) shall include the following:

  1. 10.5" Colour Display
  2. Graphical representation of system status
  3. Analog and digital metering
  4. Alarm, shutdown, and status annunciation
  5. Access to control modes, timers, level adjustments, etc
  6. Manual Synchronizing Provisions

Generator Circuit Breaker, IEC 62271: Provide medium voltage circuit breaker using vacuum switching technology. Provide stored-energy closing mechanism for rapid and safe closing of circuit breaker against fault currents within the short-time rating of circuit breaker independent of operator's strength or effort in closing the handle. Size circuit breaker for the 100 percent full-load capacity of engine-generator set and provide lugs for indicated electrical connection.

- Circuit Breaker Type:
  1. Vacuum Circuit Breakers
     (a) IEC 62771-100, 630A 7.2kV, 60kV BIL, 25kA rated short time withstand currentdraw-out type

- Circuit Breaker Support Structure

2. Switchboard, IEC 62771-200

Instrument and Control Switches: Utilize rotary-enclosed, rear-mounted switches having positive means of maintaining contacts, which shall be silver-to-silver type, identifying escutcheon plates, and handle targets to indicate switch position. Utilize knurled handles for instrument switches, standard pistol grip handles for circuit breaker and governor control switches, and provide only two removable oval handles for synchronizing switches. Provide red and green indicating lights for circuit breaker control switches.

Indicating Lights: Provide front removable, low drain, push-to-test, indicating lights equipped with dropping resistors suitable for 120-vac service, as required and color caps as specified.

Instrument Transformers: Provide indoor, cast epoxy resin type conforming to IEC or ANSVIEEE C57.13. Coordinate mechanical and thermal ratings with circuit breakers and other apparatus in the switchboard. Provide voltage transformers as shown or as required of the non-drawout type with current-limiting primary fuses and secondary fuses.

Engine Starting Switch: Four-position rotary, enclosed rear mounting, maintained position type. Switch positions shall be "Automatic," "Off," "Test," and "Manual" and connected to provide the following operation:

- In "Automatic" position, engine-generator set shall start automatically in response to loss ofvoltage, as described in paragraph "Automatic Controls."
- In "Off' position, engine-generator set starting circuits shall not function.
- In "Test" position, engine may be started and brought up to speed, but engine-generator setcannot be put on line.
- In "Manual" position, switch shall start and bring engine-generator set up to speed and thenconnect it to line.

Engine Cranking Relay: Provide to operate as follows:

a. When actuated, device shall close contacts to actuate engine starting system.
b. Should engine fail to start at once, cranking shall continue for 30 seconds (adjustable) after which a 120-second "off' period (adjustable) shall occur. Durations of cranking and "off" periods listed above may be modified in accordance with engine manufacturer's recommendations.
c. Repeat above described cranking cycle for four starting attempts.
d. If engine still fails to start, cranking device shall lock out further starting attempts until device is manually reset. When cranking relay locks out, an alarm light shall be energized on the panel and remain lighted until relay is manually reset.

Engine Shutdown Relay Provide and actuate by engine protective devices as specified in paragraph "Engine Safety Circuit Devices." Shutdown relay shall disable engine starting circuits until manually reset. Provide reset pushbutton on switchboard.

Automatic Synchronizing and Transfer Circuitry: Provide engine-generator sets with relays, switching, and other devices and wiring necessary for fully automatic operation.

a. Automatic Starting: When normal supply voltage in phase drops below a predetermined value, adjustable from 65 to 90 percent normal for a predetermined interval, adjustable from O to oneminute, automatic operation shall begin. First, engine-generator set shall automatically start, accelerate to governed speed, and build up to regulated voltage. When engine-generator set voltage reaches approximately 90 percent normal, automatic transfer of load from normal source to engine-generator set shall occur. When load exceeds a predetermined valu e, adjustable from 50 to 100 percent of engine-generator set rating for a period of approximately 10 seconds, second engine-generator set shall automatically start, accelerate to governed speed, build up to regulated voltage, synchronize and be connected in parallel, dividing the load equally, with first set and so on for engine-generator sets provided.

b. Automatic Synchronizing: Provide each engine-generator set with an individual three-phase automatic-synchronizing relay, IEEE Device 25, having fully redundant logic and circuit breaker closure circuitry. Provide relay complete with necessary auxiliary devices arranged to close each generator circuit breaker at the correct phase angle in advance of synchronism to effect closure of a circuit breaker main contacts at approximately the instant of zero phase angle between generator and bus voltages, when generator synchronizing selector switch is operated. Automatic synchronizing relay shall not permit closing of a generator breaker with abnormal voltage nor with a slip frequency greater than one-third Hz and shall automatically adjust governed speed of selected generator to match frequency of bus prior to closing generator circuit breaker. Relay shall contain a pulsing circuit to "force" phase correction when frequencies are matched but improper phase relation exists. Ensure that dead bus logic operates so that before one generator circuit breaker can close, remaining generator circuit breakers have been locked out. Provide a 10- to-20 millisecond time delay compatible with logic and closure circuits. Relay shall be equipped with surge protection either by suitable devices or by component rating.

c. Automatic Stopping: When normal supply voltage is restored to a predetermined value, adjustable from 90 to 100 percent normal, for a predetermined time interval, adjustable from 0 to 2 minutes, load shall automatically transfer from engine-generator sets to normal supply, generator circuit breaker shall open, and engine-generator sets shall continue to run for a period of 5 minutes, adjustable, then automatically stop. Devices shall return to normal position, ready to repeat the automatic operation above. Complete facilities shall be provided for manual control, including test operation of each engine-generator set without load and manual operation of load transfer devices. When engine-generator sets are not required to supply connected load, unneeded sets shall be shut down.

d. Selector Switch: Provide one selector switch to permit selection of which engine-generator set first starts and permit selection of the sequential starting of other engine-generator sets.

Generator Switchboard Unit Equipment Details: Provide units with nameplates for front and rear identification and necessary auxiliary relays, small wiring, nameplates, control and instrument buses, fuses, terminal blocks, wire terminals, and accessories. Arrange cable compartments in switchboard for indicated entrance of power and control cables. For each free-standing section provide one set ground buses, splices, and connections. Buses shall be tin plated copper. Circuit breakers shall conform to paragraph "Generator Circuit Breakers."

MISCELLANEOUS ENGINE SYSTEM REQUIREMENTS:

Tank Construction: Construct tanks of not less than 4.76-mm 3/16-inch steel plate with welded joints and necessary stiffeners on exterior of tank. Provide a braced structural steel framework support. Weld tank top tight and provide an access opening with dustproof, removable 610-mm 24-inch cover.

Flange Connections: Where not otherwise indicated, provide piping connections in accordance with ASME/ANSI B16.1 for 556-N 125-pound flanges.

Thermostatic Control Valves: Valves shall be modulating type utilizing self-contained thermostats without the use of external bulb s, and equipped with three-way valve action. Provide valves with one or more interchangeable thermostatic elements. Thermostat shall be nonadjustable and operating temperature shall be factory-set at temperature recommended by engine manufacturer. Provide valve designed to fail-safe, permitting flow through engine.

WIRE AND CABLE: Provide wire and cable required for a complete electrical system as shown. Comply with requirements specified in Item, "Interior Distribution System."

VIBRATION ISOLATION SYSTEM: The isolation system shall reduce the vibration transmitted to the adjacent floor slab to a maximum of 0.038 mm 0.0015 inch total amplitude throughout the frequency range down to 65 CPS. The manufacturer shall certify that the vibration isolation system will reduce the vibration to the limits specified.

IDENTIFICATION OF EQUIPMENT: Each major component of equipment shall have the manufacturer's name, address, and model and serial number on a nameplate securely affixed in a conspicuous place; nameplate of the distributing agent will not be acceptable. Nameplates shall notbe painted.

SOURCE QUALITY CONTROL: Perform and report on factory tests prior to shipment. Provide certified copies of manufacturer's test data and results. Notify Owner before performing tests. Test procedures shall conform to IEC, ASME, IEEE, and ANSI Standards, and to SAE requirements on testing, as appropriate and applicable. Ensure that measuring and indicating devices are certified correct. Tests shall indicate satisfactory operation and specified performance. When satisfactory, equipment tested will be given a tentative approval. Equipment shall not be shipped before approval of factory test reports for the following tests:

Engine-Generator Set Tests: Perform customary commercial factory tests on each engine- generator set, including, but not necessarily limited to, the following:

a. Perform hydrostatic test on engine water jackets and piping to ensure that water seals and water jackets are water tight. Test report shall indicate pressure at which test was made and theresults.
b. Place engine-generator set in continuous operation without stoppage for a period of not less than 8 hours. Operate not less than one hour at each load point, that is 1/2, 3/4, and full load. When stoppage becomes necessary during this period, repeat the 8-hour run. Record the following data for sets at the start, at 15-minute intervals, and at end of each load run: Fuel consumption (correct fuel consumption results to guarantee conditions); exhaust temperatures; engine coolant temperatures; lubricating oil temperatures and pressures; and any other data of importance.

Generator Tests: Ensure that temperature tests on one generator's windings are performed by manufacturer of generator in manufacturer's own plant. Temperature tests shall be in accordance with IEEE 115. Generator tests shall include insulation resistance and dielectric resistance. Prototype tests for generators that are physically and electrically identical to those provided under the Contract are acceptable. Calculations of sub transient reactance shall be included in the test report.

EXECUTION

PREPARATION: Use cribbing and shoring as required to protect construction from moving-in damage. Protect flooring and finished surfaces with heavy planking. Obtain approval of methods and materials from the Owner or the Engineer's authorized representative before moving equipment across shored floors.

INSTALLATION Installation shall be in strict accordance with manufacturer's instructions. Unload, move, and erect equipment under direct supervision of a competent and experienced erecting engineer. Provide labor, tools, equipment, and other necessities for erection and installation of equipment. After equipment has been installed, remove shoring and repair damage to floors and other parts of the building. Furnish the services of one or more Diesel- Generator representative or technicians, experienced in installation and operation of the type of systems being provided, to supervise the installation.
Installation of Engine-Generator Sets: Install engine-generator sets on a concrete foundation as indicated. Provide vibration isolators to isolate vibrations from engine-generator set to the foundation.

Equipment Supports and Installation Provide devices to support equipment not supported on engine-generator structural steel subbase as required. Fabricate required supports of structural steel sections, plates or rods, and arrange to provide rigid and sturdy support. Provide connections and fasteners required between equipment supports and building structures.

a. Generator Switchboard: Provide floor mounting channels, suitable for mounting above cable trenches and install on concrete floor pad in accordance with switchboard manufacturer's drawings and instructions and as indicated. Splice the main bus and insulate bus joints in accordance with switchboard manufacturer's recommendations. Connect control wiring as required at shipping splits.

b. Batteries and Chargers: When batteries are to be stored during the construction period, follow manufacturer's instructions for charging and protection from environmental damage.

Instruction of Operators: After equipment is ready to be placed in service, Contractor and equipment manufacturer's representative shall fully instruct plant operators in operation and maintenance of the equipment. Posted operating instructions for diesel engine-generator set shall be provided adjacent to the unit.

Provisions for Expansion: Provide for expansion of piping subject to temperature change by using suitable flexible piping connectors, expansion joints, bends, ball joints, offsets, and loops in a manner that will prohibit development of excessive stresses between anchor points or at equipment connections. Provide bends, loops, and offsets wherever practical to prevent overstressing of piping systems due to thermal expansion and to provide adequate flexibility. A piping system may be cold sprung by an amount no greater than 50 percent of the total linear expansion to alleviate end thrusts and moments. Method of cold springing shall be as approved.

- Reducing Fittings: Provide for changes in pipe size except where taps are permitted. Use of bushings is prohibited. In horizontal mains containing liquids, provide eccentric reducers.

- Unions or Flanges: Provide where necessary to permit easy connection of piping and apparatus. Provide unions on valves with screwed ends. In long lines inside buildings, place unions or flanges not farther apart than 30 meters, except in pipe lines of welded construction where unions or flanges shall be placed as indicated.

- Valves: Install in positions accessible for operation and repair. Install stems preferably in a vertical position with hand wheels or operators on top, or install in a horizontal position. Do not install hand wheels on stop valves below the valve. Install globe valves with flow direction from below the disk.

- Connections to Equipment: Make piping connections to equipment shown and provide reducers, unions, and valves to make a complete installation. Make connections to equipment with unions or flanges. Provide valves the same size as piping in which they are installed.

Joints:

a. Flanged Joints: Face pipe flanges true to line and thoroughly clean before assembly. Gasket faces shall be free of burrs or bruises. Make up flanged joints prior to completing the last weld in connecting piping. Coat bolt threads with a mixture of equal parts of graphite and boiled linseed oil or with an approved commercial coating.

b. Screwed Joints: Provide graphite pipe-joint compound; apply to male threads only. Piping shall be free of fins and burrs. Ream pipe ends or file out to size of bore; remove chips.

Pipe Sleeves:

Provide where pipes and tubing pass through masonry or concrete walls, floors, roofs, and partitions. Sleeves in outside walls above grade, in floor, or in roof slabs shall be steel pipe. Sleeves in floor slabs shall extend 75 mm above the finished floor. Firmly pack space between pipe or tubing and sleeve with oakum and calk on both ends of sleeve with elastic cement, except for sleeves in plant operating floors which shall be free of packing and elastic cement. Where piping passes through steel grating, band the opening with 25-by 3mm steel edge bands welded to the grating bars.

Anchors, Guides, and Supports:

Anchor and support piping in a manner such that expansion and contraction will take place in the desired direction. Prevent vibration by use of vibration dampers and prevent undue strains on equipment served. Hangers used for supporting piping 50-mm and larger shall be the type permitting adequate adjustment after erection while still supporting the load. Provide supports to adequately carry weight of lines and to maintain proper alignment. Provide inserts and sleeves for supports in concrete where necessary, and in new construction place inserts and sleeves before concrete is poured.

FIELD QUALITY CONTROL:

Perform and report on field tests and trial operations, and conduct field inspections, except final field inspection. Provide labor, calibrated and approved test equipment, and incidentals required for tests. Engineers will witness field tests and trial operations and will conduct final field inspections. Give Engineers 5 days' notice of dates and times scheduled for tests, trial operations, and inspections which require the presence of the Owner/Engineers. Rectify deficiencies and retest work affected by such deficiencies.
Preliminary Operation:

Align and adjust equipment to ensure proper operation as instructed by manufacturers of equipment. Lubricate equipment prior to operation in accordance with manufacturer's instructions. Upon approval by the Owner or the Owner's authorized representative, operate engine-generator sets at varying loads throughout the load range for a sufficient time to demonstrate that operation is proper and that pressures and temperatures are normal and within specified limits. Operate engines for a period of time sufficient to ensure that units are ready to carry test loads specified in paragraph "Engine-Generator Set Acceptance Tests" without damage to engine parts. During this preliminary operation, check operation and ensure proper functioning of auxiliary equipment. Make necessary adjustments to equipment to place auxiliary equipment in operating condition.

Electrical Equipment and Materials Tests Test procedures, inspections, and sampling shall be as specified and noted below:

a. Phase Relationship Tests: Check connections to equipment for proper phase relationship. During such check, disconnect devices which could be damaged by application of voltage or reversed phase sequence.

b. Control Panel and Switchboard Tests: Test and adjust meters and relays in accordance with applicable referenced specifications.

c. Insulation Resistance Tests: Test field installed cables. Minimum acceptable

values of insulation resistance of circuits shall be as recommended by the manufacturer.

Engine-Generator Set Acceptance Tests:

When installation is complete and in operating condition, notify the Owner and Engineers in writing that engine-generator sets and auxiliary equipment are ready for final field tests. The Owner or Engineer's authorized representative will witness final acceptance tests. Perform tests as necessary to make certain that equipment is functioning properly. Tests shall include the following:

a. A test to determine generating unit speed regulation under a gradual change from zero to fullload.
b. A test to determine generating unit instantaneous speed change with 50 percent load on or off.
c. A test to ensure proper functioning of over speed trip.
d. An individual test each alarm device.

Inspect auxiliary equipment including, but not limited to, pumps, fans, radiators, instruments, and special valves to ensure proper operation. Auxiliary equipment test shall be in accordance with the latest ASME and IEEE performance test codes, when applicable. Check oil after tests for presence of metal particles and water. Provide and install temporary instrumentation, piping, and electrical wiring and make electrical connections required for engine-generator set tests.

ITEM 23 : LOW VOLTAGE SWITCHGEAR

GENERAL

Under this section of the specifications, the contractor shall supply the low voltage switchgear as described herein and as shown in the drawings.

SUBMITTAL

a. MANUFACTURER'S DATA:

1. High / Low Voltage Switchgear
2. Circuit Breakers
3. Ammeter, Voltmeter, Watthour meter with Demand Register, Watt Meter, Power Factor Meter, etc.

b. SHOP DRAWINGS:

Furnish drawings for the low voltage switchgear including, but not limited to the following:

1. Overall dimensions, front view and sectional views
2. Bus arrangements including dimensions and ampere ratings for all bus bar
3. Type and spacing of bus supports
4. Maximum short circuit bracing
5. Elementary diagrams and wiring diagram with all terminals identified and indicating prewired interconnections between items of equipment and the interconnection between the items
6. One-line diagram

c. In addition, submit the manufacturer's published time-current curves on full size logarithmic paper on main circuit breaker and branches to allow designer to provide settings which will insure that proper protection and coordination will be achieved.

d. SPARE PARTS DATA:

As soon as practical after approval of materials and equipment, furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, and source of supply.

INSTALLATION

a. Install the switchgear as indicated on the project drawings, the approved shop drawings and as specified herein in the presence of the equipment supplier representatives.

b. TOUCH-UP PAINTING

Touch-up all surfaces as required with paint and procedures approved by the manufacturer of the switchgear.

FIELD TEST AND INSPECTION

a. **ACCEPTANCE CHECKS, SETTINGS AND TEST**

Perform all tests and inspections with the presence of PPA's representative/s in accordance with the manufacturer's recommendation and the latest IEEE standards unless specified otherwise. Perform work in a careful and safe manner so as not to endanger personnel or equipment. Perform tests in such a way as to obtain information about the performance of the breakers and wiring together as a unit, as well as separately. Except where specified otherwise, give the PPA's representative/s at least five (5) working days advance notice of the dates and times for all checks, settings, inspections and tests.

b. **ACCEPTANCE CHECKS AND TESTS:** Include the following:

1. Compare actual connections and wiring diagrams. If differences are found, determine if error is in diagram or in actual wiring and correct as necessary.

2. Inspect all devices, equipment, and other materials for damage or maladjustment caused by shipment or installation.

3. Assure that tightness of bolted bus joint are in accordance with manufacturer's recommendations (use calibrated torque wrench).

4. Perform all mechanical operator and contact alignment tests in manufacturer's recommendations. Make adjustment as necessary.

5. Measure breaker contact resistance and perform minimum pick-up voltage tests on all trip and closing coils. Make adjustments as necessary to stay within manufacturer's acceptable range.

6. Remove wedges, ties, and blocks installed by the manufacturer to prevent damage during shipment.

7. Check all circuit breakers in accordance with manufacturer's instruction.

8. Verify minimum resistance to ground of all grounding systems.

9. Verify meter connections and ensure calibration.

c. **FOLLOW-UP VERIFICATION**

Upon completion of all acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that all circuits and devices performing their intended function. Circuit breakers shall be tripped by operation of each protective device. Test shall be such that each item will perform its function not less than three (3) times.

PRODUCTS

a. The low voltage switchgear shall be metal enclosed indoor assembly rated 600 volts AC and arrange for service on a 400Y/230 volts, 3Ø, with ground bus on free standing assembly.

b. CONSTRUCTION:

1. The low voltage switchgear section shall consist of completely enclosed, self-supporting vertical structures bolted together to form one sheet metal enclosure. It shall be provided with front and rear channels. The ends, top and rear shall be covered with removable, screw-on-steel plates not less than 12 gauge. Switchgear shall include all protective devices and equipment as listed with necessary interconnection, instrumentation and control wiring, terminal blocks, and mechanical type solderless connectors for terminals.

2. Protective devices shall be individual drawers or compartments, and necessary bus connection straps. Devices shall be modular sized and so arranged as to be individually removable and readily interchangeable. Each device shall be provided with cardholder and card for identification.

3. Bus bar shall be silver plated copper with ampere rating not lower than the main breaker ampere rating. It shall be mounted on insulator supports on high impact, non-tracking, high quality insulation material and adequately braced to withstand the mechanical forces exerted during short circuit conditions. Branch circuit bushing shall connect directly to bus structure. All bushings shall be arranged so as not to obstruct straight-in wiring to the protective devices. All bus work shall consist of sufficient cooper to limit temperature rise to 60 degrees C at an ambient of 40 degrees C temperature. Bus bar shall be insulated from the devices so that only exposed energized parts will be at point of connection to devices.

4. Bus bar shall be arranged to permit future. It shall be mounted on insulator supports on high impact, non-tracking, high quality insulation material and adequately braced to withstand the mechanical forces exerted during short circuit conditions up to 75,000 amperes RMS symmetrical short circuit at 480 volts. Bus bars shall be silver plated bushing shall connect directly to the bus structure. Branch circuit bushing shall connect directly to bus structure. All bushings shall be arranged so as not to obstruct straight-in wiring to the protective devices. All bus work shall consist of sufficient cooper to limit temperature to 40 degrees C ambient temperature.

5. Small wiring, necessary fuse blocks and terminal blocks within each vertical structure shall be furnished as needed. All control and

metering conductors shall be marked and color coded for proper identification.

6. All hardware's shall have suitable protective finish.

7. Metal surfaces shall be chemically cleaned and treated. Chemical treatment shall provide a bond between paint and metal surfaces and help prevent entrance of moisture and formation of rust under the paint film.

The vertical structure shall be finished in ASA No. 49 medium-light-gray, the hinged doors over the protective devices on the front in ASA No. 61 light grey.

Switchgear shall be completely assembled and wired at the factory. Rigid inspection by PPA's representative/s before and after assembly shall assure correctness of design and workmanship. All groups of control wires leaving equipment shall be provided with terminal blocks with suitable numbering strips.

8. Switchgear supports for anchoring and for providing proper alignment shall be furnished and installed on the floor or par by others.

9. A ground bus shall be furnished secured to each vertical structures and shall extend the entire length of the low voltage switchgear. Grounding terminals shall be provided.

10. Where space provisions only for future breaker is called for, all studs, copper work and provisions for mounting the breaker shall be provided so that when breaker is added, no additional parts or changes to the structure on bus work is required.

11. Switchgear outgoing feeders shall be bottom exit.

12. Engraved metal nameplates shall be provided for each device. The letters or numerals on the nameplate shall be a minimum of 5mm in height with light colored, enameled characters on a dark background. The legend on the strips shall be so composed as to clearly indicate the name of the feeder and/or equipment served by the protective devices, etc.

13. Bases, frames and channels of the switchgear which come in contact with concrete shall be corrosion resistant and shall be fabricated of in hot dipped galvanized steel.

CIRCUIT BREAKERS

1. The branch circuit breakers shall be power breaker type. Cases for molded case circuit breakers are constructed of a glass-reinforced material that provide high dielectric strength. Ratings of circuit breakers including spaces shall be as indicated in the drawings. All protective devices shall meet NEMA and Underwriter's Laboratories, Inc. specifications.

2. Circuit breakers shall consist of a quick-make, quick-break type entirely trip-free operating mechanism with contacts, ARC-interrupter, and thermal magnetic trip unit for each pole. The thermal magnetic trip shall provide time

delayed or short circuit current in any one pole. It also equipped with a Push-To-Trip button to manually trip the circuit breaker. It can be mounted and operated in any position. The thermal-magnetic trip unit shall provide time-delayed or short circuit current in any one pole.

3. Thermal-magnetic circuit breakers have a permanent trip unit that contains a factory preset thermal trip element and a magnetic trip element to each pole. The thermal trip element is rms sensing. In circuit breaker with frame sizes greater than 100A, the magnetic trip element is field adjustable. A single adjustment simultaneously adjusts the instantaneous trip point in each pole.

4. All factory installed mechanical type lugs are UL Listed to accept solid or stranded conductors and can be used with wire rated at at 60 deg °C, 75 deg °C and 90 degree °C

5. Testing of circuit breakers shall comply with UL 489 test procedures.

OWNER METERING

The low voltage switchgear (LVS) shall be equipped with an AC ammeter, an ammeter selector switch, an AV voltmeter, a voltmeter selector switch, a watt-hour meter with demand register, a wattmeter and power factor meter. All meter shall be switchboard type.

Meters, selector switches including instrument transformer shall be installed at the low voltage metering section before the main overcurrent protective devices.

ITEM 24 : AUTOMATIC TRANSFER SWITCH

GENERAL

a. Provide Automatic Transfer Switches (ATS) for generator power supply system with accessories, auxiliary equipment and associated work as specified.

b. All materials and parts of the ATS shall be new and unused. Each component shall be a current manufacture from a firm regularly engaged in the design and production of such equipment. Units and components offered under these specifications shall be covered by the manufacturer's standard warranty or guarantee on new equipment.

c. The system shall be designed, assembled, tested and shipped by one manufacturer as the generator set and automatic synchronizing panel so that there is one source of supply and responsibility on all components supplied with the system.

d. All equipment shall be designed, assembled and tested to conform with applicable standards of UL, ASA, IEEE, ASME, ASTM and NEMA or VDE and DIN.

SUBMITTALS

a. **MANUFACTURER'S DATA**

1. Automatic Transfer Switch (ATS)

b. **SHOP DRAWINGS AND CALCULATION**

1. Electrical elements, schematics and wiring diagrams, including details of the interlocking system.

c. **CERTIFIED TEST REPORTS**

1. Components shop test

2. System operation and control tests.

PRODUCTS

a. The automatic transfer switch shall be coordinated with manufacturer of the automatic synchronizing panel and standby AC power generator to maintain system compatibility and local service responsibility for the complete standby power system.

b. The Automatic Transfer Switch (ATS) shall be mounted/built-in in low voltage switchgear suitable for use on all types of load.

c. Transfer switch shall have withstand, closing and interrupting ratings sufficient for the voltage employed and the available short circuit at the point of application.

d. Automatic Transfer Switches (ATS) shall be mechanically held and electrically operated with inherent interlocked construction rated 800A, 3P, 60 Hz. 3Ø, 3 wire 65 KRMS symmetrical withstand at 600Vac.

INSTALLATION

a. Installation shall conform to the requirements of the Code.

b. Testing

1. The ATS shall receive the manufacturer's standard factory testing prior to delivery with the witness of PPA's representative/s.

2. Prior to acceptance of the installation of the installation, equipment shall be tested on-site together with the generator set and automatic synchronizing panel without any failure to show it is free of any defects, and subjected to full load test or that load which is available at the job site. Should failure occur during the testing, the Contractor shall rectify deficiencies and shall repeat testing procedure at his own expense and to the satisfaction of the Owner.

3. On completion of the installation, start-up shall be performed by a factory-trained supplier or dealer representative. Comprehensive training on the operation, principle and maintenance of the system shall be conducted to the PPA"s operating personnel.

ITEM 25 : HIGH VOLTAGE SWITCHGEAR

GENERAL

"Electrical General Requirements," applies to this section with additions and modifications specified herein.

SUBMITTALS:

Shop Drawings and Manufacturers' Data: GEAR

a. Vacuum circuit breaker
b. High voltage switchgear

Shop Drawings and Manufacturer' s Data: Submit shop drawings in compliance with the Local Power Company requirements for approval, two (2) copies to the Engineers and four (4) Copies to the Power Company.

Shop drawings for switchgear shall indicate but not be limited to the following:

a. Switchgear layout showing dimensions and clearances between equipment and walls
b. Overall dimensions, front view, and sectional views of switchgear
c. Bus arrangements including dimensions and ampere ratings of all bus bars
d. Type and spacing of bus supports
e. Maximum short circuit bracings
f. Vacuum circuit breaker, interrupting rating
g. Ratings and sizes of lugs, impedance, taps, and fans
h. Elementary diagrams and wiring having their terminals identified, and indicating theinternal wiring for each item of equipment and the interconnection between the items.

Certificates of Conformance or Compliance with IEC Standards: Before delivery of materialsand equipment, submit certificates in triplicate.

Manuals: Manuals and final wiring drawings shall be furnished with the equipment.

Factory Test Reports: Submit in triplicate certified copies of reports of all tests required forthe following:

a. Switchgear

PRODUCTS

GENERAL REQUIREMENTS, MATERIALS: All equipment and materials shall be new unless indicated or specified otherwise.

INCOMING AND DISTRIBUTION SECTION: IEC 62271-200. The switchgear shall be rated for 13.8 kV, verify amperes main bus and shall consist of metal clad switchgear sections for connecting the incoming circuit from transformers and outgoing distribution feeders.

Incoming termination shall be from transformer bus duct connection and from single conductor cable terminations to generator switchgear as shown on drawings. Outgoing conductor terminations from distribution breakers shall be single conductor entering from below as shown on drawings.

The vacuum circuit breakers shall be electrically operated, three-pole, circuit interrupting device with amperes rating as shown on drawings, 15 kV ,60 kV BIL, 60 hz. with a short circuit capacity of not less than 25 kA amperes symmetrical, 1200A /630 kA rated peak withstand current. Circuit breaker shall be drawout-mounted with position indicator, operation counter, auxiliary switches, and primary and secondary disconnect switches. Provide for manual charging of the mechanism and for slow closing of contacts for inspection or adjustment. The circuit breaker control voltage shall DC volts.

Provide metering as shown on drawings and complete protective relay system, control transformers, battery and charger for volts DC controls and earthing switch for incoming circuit breakers.

BUS BARS: Copper with silver plated contact surfaces , mounted on insulator supports of high impact, non-tracking, high quality insulating material, adequately braced to withstand the mechanical forces exerted during short circuit conditions.

ENCLOSURE: IEC 60529

Construction: Enclosure shall be constructed of structural or rolled sheet steel and welded into a solid framing. Each unit shall be adequately braced, with adequate venting to prevent conditions, which include short-circuits up to the specified rating. Metal enclosures shall be free-standing. Vent openings shall be provided with screens to prevent the entrance of rodents.

Suitable means for lifting the switchgear shall be provided.

Paint and Finish: Housing shall be chemically cleaned inside and out and then treated with a phosphoric acid to etch and clean the metal. All surfaces shall be finished in medium light grey (ANSI number 61) paint or per manufacturer's standard.

ACCESSORIES:

a. Provision for padlocking
b. Door interlock to prevent operation of vacuum circuit breaker when compartment isopen
c. Hazardous Danger Sign

NAMEPLATES: Provide laminated plastic nameplates for each switch and devices to identify its function, and where applicable, its position. Laminated plastic: 3.2 mm (1/8-inch) thick Melamine plastic white with black center core. Surface: matte finish; corners: square. Accurately align lettering and engrave into the black core. Size of nameplates:

50mm by 250 mm minimum; lettering: minimum 25 mm high normal block lettering. Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

EXECUTION

TESTS:

The manufacturer shall supply, test results, to confirm that the rigidity and bus bracing.

GUARANTEES:

The manufacturer shall guarantee the complete switchgear for workmanship, construction, and operation for a period of one (1) year after installation and acceptance.

ITEM 26 : PROJECT BILLBOARD

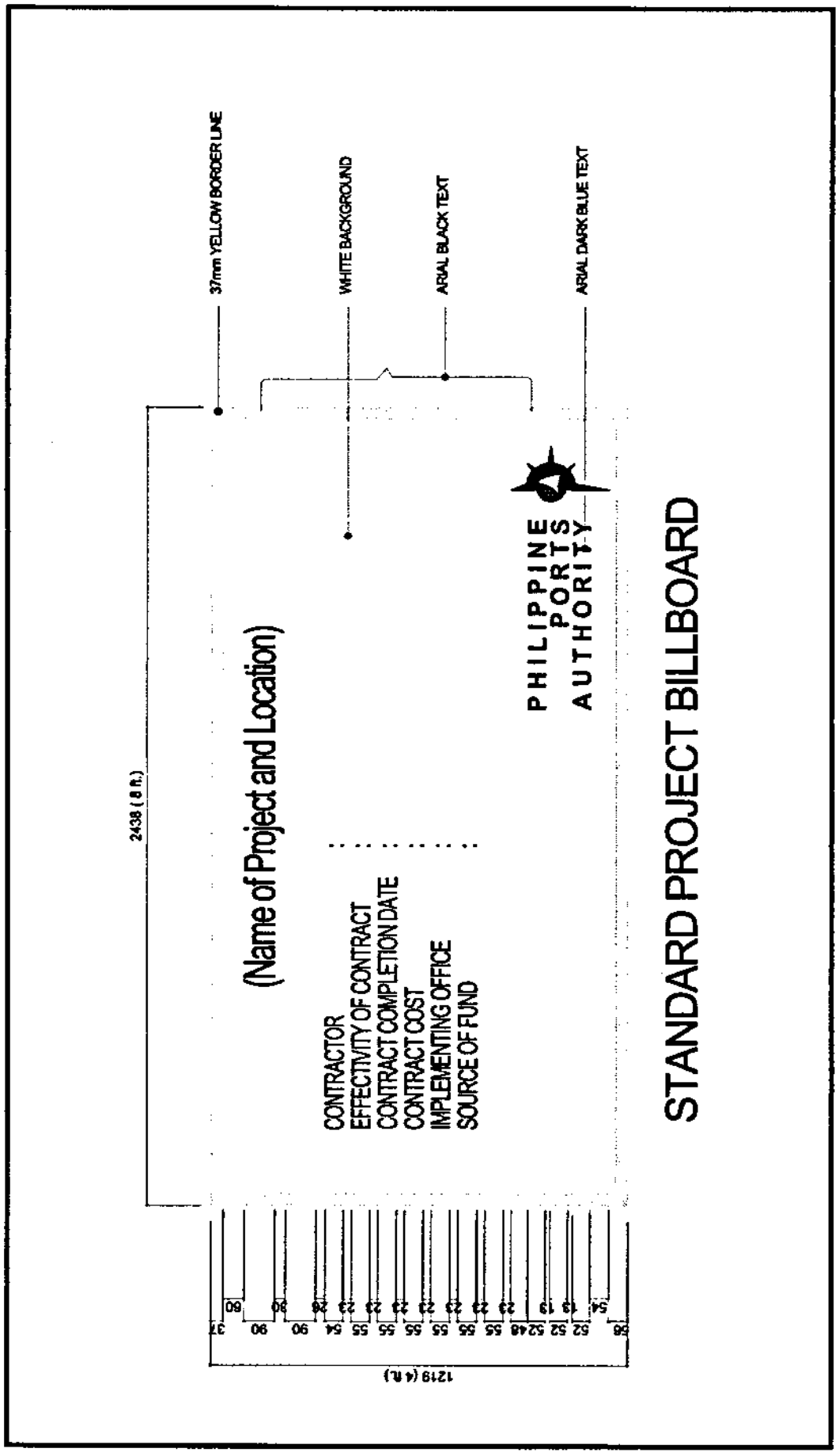
SPECIFICATION

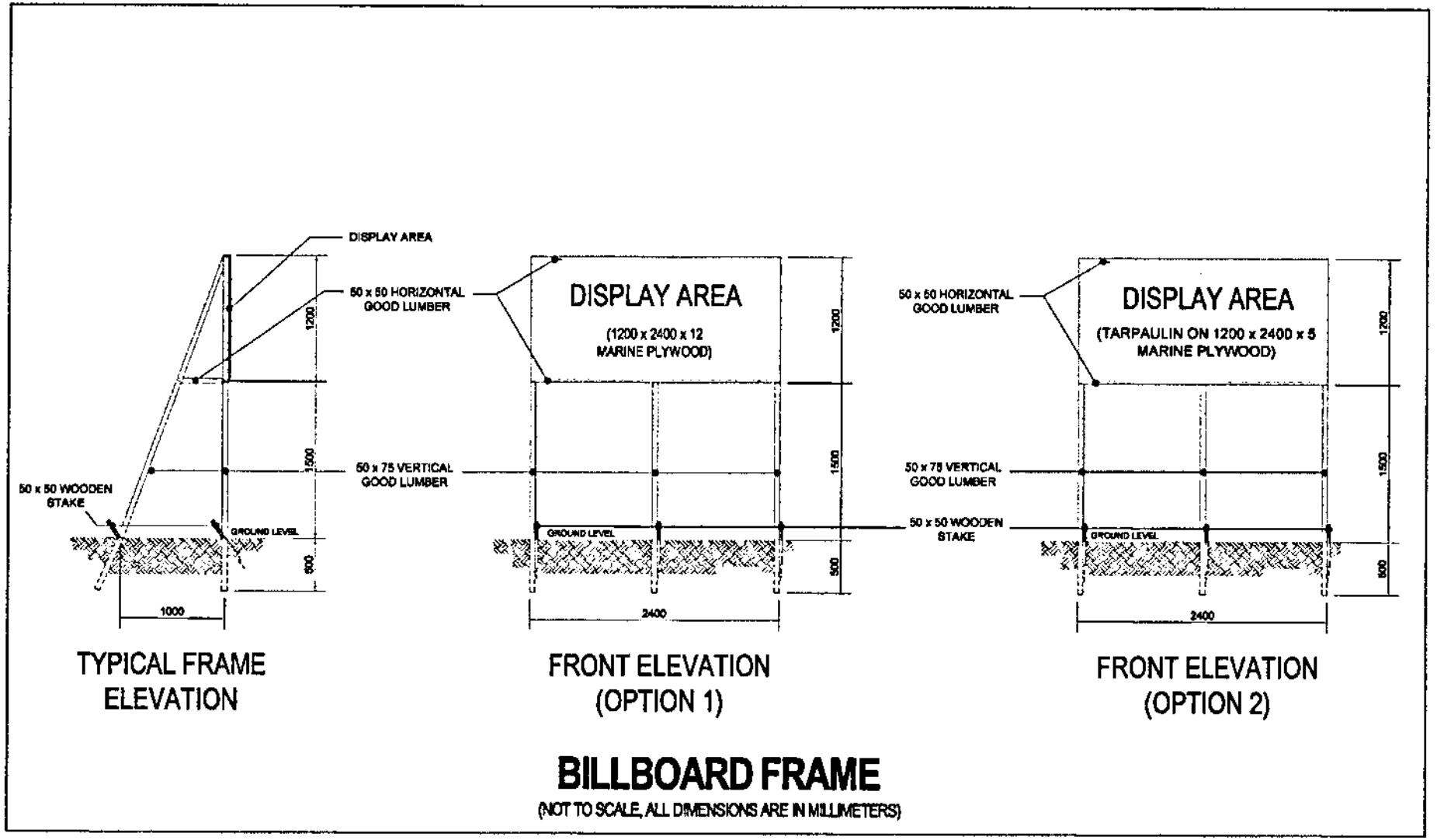
The Project Billboard shall be installed at location(s) designated by the Engineer.

The size and specifications of materials for the standard billboard shall be 4ft. x 8ft. (1,200mm x 2,400mm) using ½ inch (12mm) marine plywood or tarpaulin poster on 3/16 inch (5mm) marine plywood.

Project billboards shall not contain Name(s) and/or picture(s) of any personages.

See attached drawings for further details of the standard billboard.


37mm YELLOW BORDER LINE
WHITE BACKGROUND
ARIAL BLACK TEXT
ARIAL DARK BLUE TEXT
PHILIPPINE PORTS AUTHORITY
STANDARD PROJECT BILLBOARD
(Name of Project and Location)
CONTRACTOR
EFFECTIVITY OF CONTRACT
CONTRACT COMPLETION DATE
CONTRACT COST
IMPLEMENTING OFFICE
SOURCE OF FUND
2438 (8 ft.)
1219 (4 ft.)



TYPICAL FRAME ELEVATION

FRONT ELEVATION (OPTION 1)

FRONT ELEVATION (OPTION 2)

BILLBOARD FRAME

(NOT TO SCALE, ALL DIMENSIONS ARE IN MILLIMETERS)

ITEM 27 : SAFETY SIGNAGES AND BARRICADES

DESCRIPTION

This work includes the furnishing and installing of safety signages and barricades in accordance with the specifications and to the details shown below in the drawings, or as directed by the Engineer.

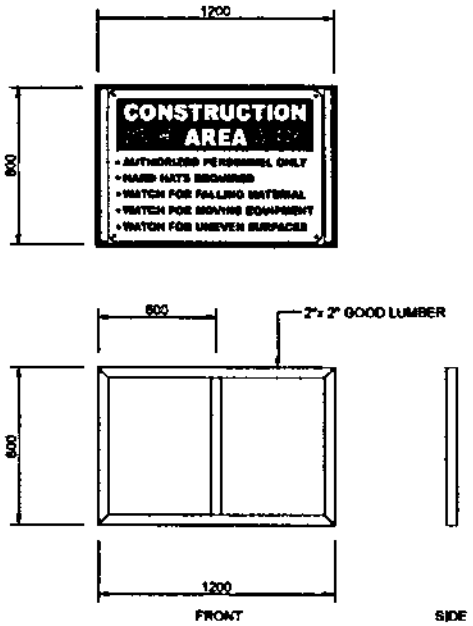
SPECIFICATION

The Signage's and Barricades shall be installed at location(s) designated by the Engineer.

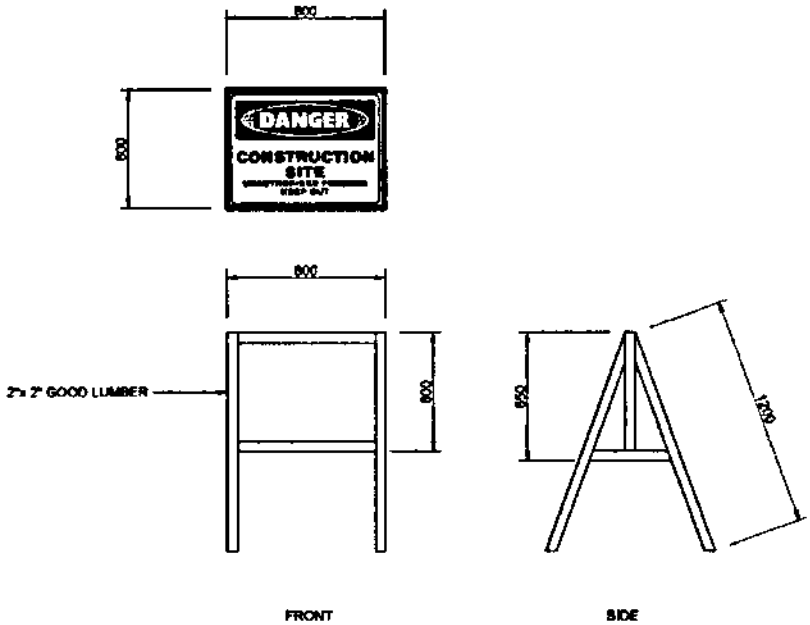
The sizes of the standard signages shall be 2-2/3ft x 4ft (800mm X 1,200mm) for fixed type and 2ft x 2–2/3ft (600mm x 800mm) for mobile type. For barricade standard 2ft x 2–2/3ft (600mm x 800mm) shall be provided.

The materials to be used for signages and barricades are ½ inch (12mm) marine plywood or tarpaulin poster on 2" x 2" (50mm x 50mm) good lumber frame (see drawing below).

The printing or painting shall be the discretion of the Engineer.



FRAMING FOR 0.80m x 1.20m SIGNAGES



FRAMING FOR 0.60m x 0.80m SIGNAGES AND BARRICADES

STANDARD PLAN FOR SIGNAGES AND BARRICADES

SECTION VII

DRAWINGS
(APPROVED PLANS)

DRAWINGS AND APPROVED PLANS
(SEE ISSUED APPROVED PLANS)

LIST OF DRAWINGS:

MARINE STRUCTURES

01 of 14	-	Vicinity Map, Development Plan, General Notes, List of Drawings
02 of 14	-	Demolition Plan.
03 of 14	-	General Plan.
04 of 14	-	Piling Plan, Schedule Of 900mmØ X 12mm Thick Steel Pipe Piles, Reinstallation of Mooring Bollard Schedule, Rubber Dock Fender Schedule
05 of 14	-	Typ. Tide Elevation of wharf
06 of 14	-	Typ. Detail of Pile Cap-1, Typ. Detail of Pile Cap-2, Typical Detail of Crane Beam, Detail of Cable Trench Beam
07 of 14	-	Detail of Mooring Fender/ Fender Block, Detail of Transverse Beam, Detail of Curtain Wall, Detail Of Construction Joint-1, Detail Of Construction Joint-2
08 of 14	-	Typical Transverse Beam Reinforcement Detail
09 of 14	-	Typical Crane Beam Reinforcement Detail (Sea Side)
10 of 14	-	Typical Crane Beam Reinforcement Detail (Land Side)
11 of 14	-	Typical Slab Reinforcement Detail
12 of 14	-	Installation Detail of Crane Rail
13 of 14	-	Detail of Super Cone Fender (1200 H)
14 of 14	-	Detail of 900Ø Steel Pipe Pile

ARCHITECTURAL

A-01 of 11	-	Perspective, Location Map, Table of Contents, Key plan
A-02 of 11	-	Site Development Plan, Blow-up site Development Plan
A-03 of 11	-	Floor Plan

A-04 of 11 - Reflected Ceiling Plan

A-05 of 11 - Roof plan

A-06 of 11 - Front Elevation, Right side Elevation, Rear Elevation

A-07 of 11 - Left Side Elevation, Section Thru X-X', Section Thru Y-Y'

A-08 of 11 - Schedule of Doors

A-09 of 11 - Schedule of Windows

A-10 of 11 - Toilet Details (Floor Plan, Section Thru A-A', Section Thru B-B', Section Thru C-C', Section Thru D-D'), and Mirror Details

A-11 of 11 - Blow-Up Site Development Plan, Typical Plan of CHB Fence, Typical Elevation of CHB Fence, Detail "A", Detail "B", Detail "C", Detail of Column/RC Curb, Detail of CHB Fence, Detail Of Entrance Gate

STRUCTURAL (SUBSTATION)

S-01 of 05 - General Notes

S-02 of 05 - Foundation Plan, Roof Framing Plan

S-03 of 05 - Detail of Column/ Column Footing, Wall Footing Detail, Detail of Reinforcement Bars, Slab on Grade Details, Typical Beam Reinforcement at Column Support, Lintel Beam Details, and Beam Details @ Roll-Up Doors

S-04 of 05 - Truss Diagram, Sag rod Detail, Ptr-1 Elevation, Purlins Connection Details Truss Beam Connection Details

S-05 of 05 - Genset Concrete Pad, Transformer Concrete Pad, Cable Trench Section, Trench Cover Details, Section Showing Reinforcement

ELECTRICAL (SUBSTATION)

E-01 of 10 - Powerhouse Lighting Layout Plan, Legend

E-02 of 10 - Powerhouse Power Layout Plan, Legend

E-03 of 10 - Schedule of Loads

E-04 of 10 - First Private Pole Detail, Primary Pedestal Detail, Cable Tray Details, Cable Trench Section, Powerhouse (T1) Pad Mounted Transformer Detail, Powerhouse and Generator Room Section, Notes

E-05 of 10 - Power Distribution Single Line Diagram, Transformer Schedule, Legend, Notes

E-06 of 10 - Roof Plan Lighting Arrester Layout

E-07 of 10 - Powerhouse Genset, Transformer and Grounding Layout Plan

E-08 of 10 - Site Development Layout Plan of Powerhouse, General Notes

E-09 of 10 - Detail of Under Deck PVC Pipe Enclosed in Concrete, PVC Support Detail

E-10 of 10 - Electrical Manhole Detail, Electrical Manhole Cover

PLUMBING

P-01 of 05 - Details of Septic Tank, Details of Catch Basin, Cleanout Details, Pipe Trench Bedding, Details of Water Meter, General Notes and Specifications, Materials Specifications, Schedule of Pipe (Sewer Line), Schedule of Pipe (Water Line)

P-02 of 05 - Site Development Plan, Blow-Up Site Dvelopment Plan

P-03 Of 05 - Sewer and Storm Drainage Layout Plan, Roof Storm Water Drainage Layout Plan, Sewer Drainage Layout Blow-Up Plan, Details of Floor Cleanout, Legends, and Schedule Of Pipe (Sewer Line)

P-04 of 05 - Water Line Layout Plan, Water Line Layout Blow-Up Plan, Fixture Mounting Detail, Urinal Connection Detail, Hose Bibb Connection Detail, Legends, Schedule of Pipe (Water Line)

P-05 Of 05 - Sewer and Storm Drainage Isometric Layout Plan, Sewer Drainage Isometric Blow-Up Plan, Water Line Isometric Layout, Water Line Isometric Layout Blow-Up Plan

SECTION VIII

BILL OF QUANTITIES and ATTACHMENTS

BID SUMMARY

CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE

Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO.	DESCRIPTION OF WORK	AMOUNT (Pesos)
BILL NO. 1	GENERAL EXPENSES	
BILL NO. 2	REMOVAL, DISPOSAL AND EXCAVATION WORKS	
BILL NO. 3	UPGRADING OF EXISTING R.C. WHARF	
BILL NO. 4	POWER HOUSE, FENCE AND GATE	
BILL NO. 5	QUAY CRANE & ELECTRICAL SYSTEM	
BILL NO. 6	REIMBURSABLE ITEMS	1,050,000.00
BID PRICE		

Name of Firm

Name of Bidder/Authorized Representative
(Signatory's Legal Capacity)

Date

BILL OF QUANTITIES

CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE

Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
BILL NO.	1 GENERAL EXPENSES				
1.01	Mobilization, demobilization and cleaning	lot	1		
1.02	Rental of temporary site office and residence for the Engineer and staff	mo.	24		
1.03	Maintain temporary site office and residence for the Engineer and staff	mo.	24		
1.04	Provide Construction Safety and Health Program in the execution of the project.	mo.	24		
	TOTAL FOR BILL NO. 1				

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
BILL NO.	**2 REMOVAL, DISPOSAL AND EXCAVATION WORKS**				
2.01	Remove and turned over to the Authority existing M-type rubber dock fender (800H x 2000L) as directed by the Engineer	no.	20		
2.02	Remove existing mooring bollard (100 tons, T-head type)	no.	20		
2.03	Remove and dispose portion of existing superstructure up to pile elevation including slab, beams, curtain wall, mooring and fender block	sq.m.	3,130		
2.04	Remove and dispose existing building structure and turn-over material with value to the authority	sq.m.	534		
2.05	Remove and dispose existing pavement for substation, cable trench, and electrical works	sq.m.	2,254		
2.06	Excavation and backfilling works for building foundations, septic vault, drainages, concrete pad, cable trench, and electrical works	cu.m.	1,246		
2.07	Cut and dispose existing steel pipe piles up to MLLW and turn-over materials to the authority	no.	24		
	TOTAL FOR BILL NO. 2				

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
BILL NO.	3 UPGRADING OF EXISTING R.C. WHARF				
3.01	Supply and deliver to site 900mm dia. tubular steel pipe piles	m.t.	1,198		
3.02	Supply and place polyurethane external coating for steel pipe pipes	sq.m.	4,795		
3.03	Supply, fabricate and install reinforcing cylinder band for steel pipe piles	no.	106		
3.04	Handle, pitch and drive 900mm dia. vertical steel pipe piles	l.m.	2,494		
3.05	Handle, pitch and drive 900mm dia. batter steel pipe piles	l.m.	2,064		
3.06	Splicing of steel pipe piles	no.	106		
3.07	Cutting of newly driven steel pipe piles and turn-over excess materials to the authority	no.	106		
3.08	Extraction of clogged materials inside the steel pipe piles	cu.m.	511		
3.09	Supply and install reinforcing steel cage for steel pipe piles	kg.	198,213		
3.10	Supply and place 3,500 psi concrete filler for steel pipe piles	cu.m.	1,150		
3.11	Supply and apply high bond concrete epoxy prior to pouring of new concrete	sq.m.	339		
3.12	Supply and place 3,500 psi concrete for superstructure	cu.m.	2,464		

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
3.13	Supply and instal steel reinforcement for superstructure	kg.	377,688		
3.14	Supply, deliver and install cable trench including accessories	l.m.	200		
3.15	Supply, deliver and install crane rail including accessories	lot	1		
3.16	Suppy and install construction joint-1 (100mm x 100mm x 10mm) angle bar, hot-dipped galvanized including dowel bars	l.m.	31		
3.17	Suppy and install construction joint-2 (BWT 100 x 12) angle bar, hot-dipped galvanized including dowel bars	l.m.	200		
3.18	Supply and deliver to site super cone fender (1200H) including accessories	set	20		
3.19	Install super cone fender and accessories	set	20		
3.20	Reinstall mooring bollards (T-head type, 100 Tons) including new accessories	set	20		
	TOTAL FOR BILL NO. 3				

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
BILL NO.	4 POWER HOUSE, FENCE AND GATE				
4.01	Subgrade preparations	sq.m.	1,764		
4.02	Supply and apply soil treatment	sq.m.	542		
4.03	Supply, place and compact gravel bedding	cu.m.	164		
4.04	Supply, spread and compact aggregate base course	cu.m.	61		
4.05	Supply, spread and compact aggregate sub-base course	cu.m.	132		
4.06	Supply & place 4,000 psi. concrete for building structure	cu.m.	337		
4.07	Supply & install steel reinforcement for building structure				
	a) Steel Reinforcement (Grade 40)	kg.	9,296		
	b) Steel Reinforcement (Grade 60)	kg.	22,186		
4.08	Construct 4,000 psi. concrete slab and ramp on-fill including reinforcement	sq.m.	566		
4.09	Supply, fabricate & install structural steel for trusses and roofing system, including base plates, stiffiners, painting and other accessories	lot	1		
4.10	Supply, fabricate & install roofing works including long span roofing, ridge roll, gutter, metal cladding and other accessories	lot	1		
4.11	Construct 150mm thick CHB wall including reinforcement	sq.m.	603		

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
4.12	Supply and place 13mm thick cement Plaster finish	sq.m.	1,238		
4.13	Supply and apply Elastomeric paint (2-coats)	sq.m.	1,238		
4.14	Supply and apply Quick Drying enamel (2-coats)	sq.m.	53		
4.15	Supply and apply Varnish Paint	sq.m.	10		
4.16	Supply and apply water proofing	sq.m.	8		
4.17	Supply and place plain cement finish	sq.m.	516		
4.18	Supply and place stair nosing	l.m.	4		
4.19	Supply and Install 0.60m x 0.60m Unglazed Ceramic Floor Tiles	sq.m.	31		
4.20	Suppy and place Non-skid / Rough Cement Floor Finish	sq.m.	23		
4.21	Supply and Install 0.30m x 0.60m Ceramic Wall Tiles	sq.m.	35		
4.22	Supply and Install Quartz countertop and splash board	sq.m.	1		
4.23	Supply and Install 0.4mm thk. Pre-formed/Pre-painted ribbed type spandrel metal ceiling Including accessories	sq.m.	91		

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
4.24	Supply and install 12mm thk. Gypsum board on 0.40mm thk galvanized steel ceiling suspension system at 0.40m O.C. (furring) carrying channel) and suspension rod (C4)	sq.m.	26		
4.25	Supply and install fabricated Windows including accessories	lot	1		
4.26	Supply and install fabricated Roll-up door and Metal door including fixed metal louver and other accessories	lot.	1		
4.27	Supply and install fabricated Solid wood door and Hollow Core flush door including door jambs, hinges and locksets and accessories	lot	1		
4.28	Supply and install Toilet Fixtures and accessories	lot	1		
4.29	Supply and install water line pipes and fittings including accessories.	lot	1		
4.30	Supply and install sewerage pipes and fittings including accessories.	lot	1		
4.31	Supply and install drainage pipes and fittings including accessories	lot	1		
4.32	Construct septic vault including water proofing fittings and accessories	no.	1		
4.33	Construct electrical manhole including accessories	no.	7		
4.34	Construct Catch basin including accessories	no.	15		
4.35	Construct cable trench including accessories	l.m.	234		

BILL OF QUANTITIES
CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE
Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
4.36	Supply, deliver and install Electrical works including wires, cables, wiring devices, grounding, lighting fixture, aircondition and other accessories	lot	1		
4.37	Supply and deliver office furnitures and accessories	lot	1		
4.38	Construct Security fence and gate including accessories	lot	1		
4.39	Supply and lay 300mm dia. reinforced concrete pipe	l.m.	84		
4.40	Supply and place gravel as surface finish for substation compound	sq.m.	1,085		
4.41	Restoration of newly removed concrete pavement	sq.m.	307		
	TOTAL FOR BILL NO. 4				

BILL OF QUANTITIES

CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE

Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
BILL NO.	**5 QUAY CRANE & ELECTRICAL SYSTEM**				
5.01	Supply, deliver and install primary cables including accessories	lot	1		
5.02	Supply, deliver and install conduit pipe including fittings of various sizes	lot	1		
5.03	Supply, deliver and install lightning protection including accessories.	lot	1		
5.04	Supply, deliver and install primary service entrance devices including accessories	lot	1		
5.05	Supply and deliver to site switchgear assembly including accessories	lot	1		
5.06	Supply and deliver to site generator sets including accessories.	lot	1		
5.07	Supply, deliver and install Powerhouse distribution panels including accecories	lot	1		
5.08	Supply, deliver and install Pad Mounted Transformer	lot	1		
5.09	*Quay Crane* Supply, deliver, Install Quay Crane including testing, commissioning, operator's training and other acessories	lot	1		
	TOTAL FOR BILL NO. 5				

BILL OF QUANTITIES

CONSTRUCTION OF CRANE RAILWAY & INSTALLATION OF QUAY CRANE

Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City

NO. (1)	DESCRIPTION OF WORK (2)	UNIT (3)	QTY. (4)	UNIT PRICE (Pesos) (5)	AMOUNT (Pesos) (4) x (5)
BILL NO.	**6 REIMBURSABLE ITEMS**				
6.01	Secure approval of environmental Compliance Certificate (ECC) Application, Clearance and other necessary documentary requirements	lot	1	1,050,000.00	1,050,000.00
	TOTAL FOR BILL NO. 6				**1,050,000.00**

BASIS OF PAYMENT FOR WORK ITEMS INCLUDED IN THE PROPOSAL

The work items included in the proposal and the basis of payments are as follows:

BILL NO. 1

GENERAL EXPENSES

Item 1.01 Mobilization, demobilization, and cleaning

The quantity to be paid for shall be the minimum equipment requirement enumerated in the bid documents mobilized, demobilized and cleaning of the site and accepted by the Engineer. The contract lump sum price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to mobilize and demobilize all the minimum equipment requirement enumerated in the bid documents including cleaning of the site. Fifty percent (50%) of the total amount shall be payable after the mobilization activity while the remaining (50%) payable after demobilization and cleaning.

Item 1.02 Rental of temporary site office and residence for the Engineer and staff

The quantity to be paid for shall be the actual rental of site office and residence for the engineer and staff and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary for the provision of temporary site office and residence for the engineer and staff.

Item 1.03 Maintain temporary site office and residence for the Engineer and staff

The quantity to be paid for shall be the actual services rendered in maintaining the site office and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the maintenance of the temporary site office and residence as well as other expenses such as provision for electric power, telephone bill, potable water supply, janitorial and security services.

Item 1.04 Provide construction safety and Health Program in the execution of the project

The quantity to be paid for shall be the actual implementation of construction safety and health program and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the implementation of the Construction Safety and Health Program, as required and approved by the Department of Labor and Employment (DOLE).

BILL NO. 2

REMOVAL, DISPOSAL AND EXCAVATION WORKS

Item 2.01 **Remove and turned over to the Authority existing M-type rubber dock fender (800H x 2000L) as directed by the Engineer**

The quantity to be paid for shall be the actual number of existing M-type rubber dock fender (800H x 2000L) to be removed and turned over to the authority as directed by the Engineer in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 2.02 **Remove existing mooring bollard (100 tons, T-head type)**

The quantity to be paid for shall be the actual number of existing mooring bollard (100 tons, T-head Type) to be removed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 2.03 **Remove and dispose portion of existing superstructure up to pile elevation including slab, beams, curtain wall, mooring and fender block**

The quantity to be paid for shall be the actual area in square meters of portion of existing superstructure to be removed up to pile elevation including slab, beams, curtain wall, mooring and fender block and disposed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 2.04 **Remove and dispose existing building structure and turn-over material with value to the authority**

The quantity to be paid for shall be the actual area in square meter of existing building structure to be removed and disposed and turn-over material with value to the authority in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 2.05 **Remove and dispose existing pavement for substation, cable trench, and electrical works**

The quantity to be paid for shall be the actual area in square meter of existing pavement for substation, cable trench, and electrical works to be removed and disposed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the work.

Item 2.06 **Excavation and backfilling works for building foundations, septic vault, drainages, concrete pad, cable trench, and electrical works**

The quantity to be paid for shall be the actual volume in cubic meter of building foundations, septic vault, drainages, concrete pad, cable trench, and electrical works to be excavated and backfilled thereafter in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full

compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 2.07 Cut and dispose existing steel pipe piles up to MLLW and turn-over materials to the authority

The quantity to be paid for shall be the actual number of existing steel pipe piles to be cut up to MLLW, disposed and turned over materials to the authority in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

BILL NO. 3

UPGRADING OF EXISTING R.C. WHARF

Item 3.01 Supply and deliver to site 900mm dia. tubular steel pipe piles

The quantity to be paid for shall be the actual weight in metric tons of 900mm dia. tubular steel pipe piles to be supplied and delivered to site in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.02 Supply and place polyurethane external coating for steel pipe pipes

The quantity to be paid for shall be the actual area in square meters of polyurethane external coating for steel pipe pipes to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.03 Supply, fabricate and install reinforcing cylinder band for steel pipe piles

The quantity to be paid for shall be the actual number of reinforcing cylinder band for steel pipe piles to be supplied, fabricated and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.04 Handle, pitch and drive 900mm dia. vertical steel pipe piles

The quantity to be paid for shall be the actual length in linear meters of 900mm dia. vertical steel pipe piles to be handled, pitched and driven in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.05 Handle, pitch and drive 900mm dia. batter steel pipe piles

The quantity to be paid for shall be the actual length in linear meter of 900mm dia. batter steel pipe piles to be handled, pitched and driven in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full

compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.06 Splicing of steel pipe piles

The quantity to be paid for shall be the actual number of steel pipe piles to be spliced in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.07 Cutting of newly driven steel pipe piles and turn-over excess materials to the authority

The quantity to be paid for shall be the actual number of newly driven steel pipe piles to be cut and turned over excess materials to the authority in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.08 Extraction of clogged materials inside the steel pipe piles

The quantity to be paid for shall be the actual volume in cubic meters of clogged materials inside the steel pipe piles to be extracted in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.09 Supply and install reinforcing steel cage for steel pipe piles

The quantity to be paid for shall be the actual weight in kilogram of reinforcing steel cage for steel pipe piles to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.10 Supply and place 3,500 psi concrete filler for steel pipe piles

The quantity to be paid for shall be the actual volume in cubic meters of 3,500 psi concrete filler for steel pipe piles to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.11 Supply and apply high bond concrete epoxy prior to pouring of new concrete

The quantity to be paid for shall be the actual area in square meter of high bond concrete epoxy to be supplied and applied prior to pouring of new concrete in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.12 Supply and place 3,500 psi concrete for superstructure

The quantity to be paid for shall be the actual volume in cubic meters of 3,500 psi concrete for superstructure to be supplied and placed in accordance with the plans

and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.13 Supply and install steel reinforcement for superstructure

The quantity to be paid for shall be the actual weight of steel reinforcement for superstructure to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.14 Supply, deliver and install cable trench including accessories

The quantity to be paid for shall be the actual length in linear meters of cable trench including accessories to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.15 Supply, deliver and install crane rail including accessories

The quantity to be paid for shall be the actual lot of crane rail including accessories to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.16 Supply and install construction joint-1 (100mm x 100mm x 10mm) angle bar, hot-dipped galvanized including dowel bars

The quantity to be paid for shall be the actual length in linear meter of construction joint-1 (100mm x 100mm x 10mm) angle bar, hot-dipped galvanized including dowel bars to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.17 Supply and install construction joint-2 (BWT 100 x 12) angle bar, hot-dipped galvanized including dowel bars

The quantity to be paid for shall be the actual length in linear meters of construction joint-2 (BWT 100 x 12) angle bar, hot-dipped galvanized including dowel bars to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.18 Supply and deliver to site super cone fender (1200H) including accessories

The quantity to be paid for shall be the actual set of super cone fender (1200H) including accessories to be supplied and delivered to site in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.19 Install super cone fender and accessories

The quantity to be paid for shall be the actual set of super cone fender and accessories to be installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 3.20 Reinstall mooring bollards (T-head type, 100 Tons) including new accessories

The quantity to be paid for shall be the actual set of mooring bollards (T-head type, 100 Tons) including new accessories to be reinstalled in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

BILL NO. 4

POWER HOUSE, FENCE AND GATE

Item 4.01 Subgrade preparations

The quantity to be paid for shall be the actual area in square meter of subgrade preparations in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.02 Supply and apply soil treatment

The quantity to be paid for shall be the actual area in square meter of soil treatment to be supplied and applied in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.03 Supply, place and compact gravel bedding

The quantity to be paid for shall be the actual volume in cubic meter of gravel bedding to be supplied, placed and compacted in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.04 Supply, spread and compact aggregate base course

The quantity to be paid for shall be the actual volume in cubic meter of aggregate base course to be supplied, spread and compacted in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.05 Supply, spread and compact aggregate sub-base course

The quantity to be paid for shall be the actual volume in cubic meters of aggregate sub-base course to be supplied, spread and compacted in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full

compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.06 Supply & place 4,000 psi. concrete for building structure

The quantity to be paid for shall be the actual volume in cubic meters of 4,000 psi. concrete for building structure to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.07 Supply & install steel reinforcement for building structure
a. Steel Reinforcement (Grade 40)
b. Steel Reinforcement (Grade 60)

The quantity to be paid for shall be the actual area in square meters of steel reinforcement for building structure (Grade 40 and Grade 60) to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.08 Construct 4,000 psi. concrete slab and ramp on-fill including reinforcement

The quantity to be paid for shall be the actual area in square meter of 4,000 psi. concrete slab and ramp on-fill including reinforcement to be constructed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.09 Supply, fabricate & install structural steel for trusses and roofing system, including base plates, stiffeners, painting and other accessories

The quantity to be paid for shall be the actual lot of structural steel for trusses and roofing system, including base plates, stiffeners, painting and other accessories to be supplied, fabricated and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.10 Supply, fabricate & install roofing works including long span roofing, ridge roll, gutter, metal cladding and other accessories

The quantity to be paid for shall be the actual lot of roofing works including long span roofing, ridge roll, gutter, metal cladding and other accessories to be supplied, fabricated and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.11 Construct 150mm thick CHB wall including reinforcement

The quantity to be paid for shall be the actual area in square meters of 150mm thick CHB wall including reinforcement to be constructed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.12 Supply and place 13mm thick cement Plaster finish

The quantity to be paid for shall be the actual area in square meter of 13mm thick cement Plaster finish to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.13 Supply and apply Elastomeric paint (2-coats)

The quantity to be paid for shall be the actual area in square meter of Elastomeric paint (2-coats) to be supplied and applied in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.14 Supply and apply Quick Drying enamel (2-coats)

The quantity to be paid for shall be the actual area in square meter of Quick Drying enamel (2-coats) to be supplied and applied in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.15 Supply and apply Varnish Paint

The quantity to be paid for shall be the actual area in square meters of varnish paint to be supplied and applied in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.16 Supply and apply water proofing

The quantity to be paid for shall be the actual area in square meter of waterproofing to be supplied and applied in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.17 Supply and place 13mm thick cement Plaster finish

The quantity to be paid for shall be the actual area in square meter of 13mm thick cement Plaster finish to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.18 Supply and place stair nosing

The quantity to be paid for shall be the actual length in linear meter of stair nosing to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.19 Supply and install 0.60m x 0.60m Unglazed Ceramic Floor Tiles

The quantity to be paid for shall be the actual area in square meter of 0.60m x 0.60m Unglazed Ceramic Floor Tiles to be supplied and installed in accordance with the

plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.20 Supply and place Non-skid / Rough Cement Floor Finish

The quantity to be paid for shall be the actual area in square meter of Non-skid / Rough Cement Floor Finish to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.21 Supply and Install 0.30m x 0.60m Ceramic Wall Tiles

The quantity to be paid for shall be the actual area in square meter of 0.30m x 0.60m Ceramic Wall Tiles to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.22 Supply and Install Quartz countertop and splash board

The quantity to be paid for shall be the actual area in square meters of Quartz countertop and splash board to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.23 Supply and install 0.4mm thk. Pre-formed/Pre-painted ribbed type spandrel metal ceiling including accessories

The quantity to be paid for shall be the actual area in square meter of 0.4mm thk. Pre-formed/Pre-painted ribbed type spandrel metal ceiling including accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.24 Supply and install 12mm thk. Gypsum board on 0.40mm thk galvanized steel ceiling suspension system at 0.40m O.C. (furring) carrying channel) and suspension rod (C4)

The quantity to be paid for shall be the actual area in square meter of 12mm thk. Gypsum board on 0.40mm thk galvanized steel ceiling suspension system at 0.40m O.C. (furring) carrying channel) and suspension rod (C4) to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.25 Supply and install fabricated Windows including accessories

The quantity to be paid for shall be the actual lot of fabricated Windows including accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.26 Supply and install fabricated Roll-up door and Metal door including fixed metal louver and other accessories

The quantity to be paid for shall be the actual lot of fabricated Roll-up door and Metal door including fixed metal louver and other accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.27 Supply and install fabricated Solid wood door and Hollow Core flush door including door jambs, hinges and locksets and accessories

The quantity to be paid for shall be the actual lot of fabricated Solid wood door and Hollow Core flush door including door jambs, hinges and locksets and accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.28 Supply and install Toilet Fixtures and accessories

The quantity to be paid for shall be the actual lot of Toilet Fixtures and accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.29 Supply and install water line pipes and fittings including accessories.

The quantity to be paid for shall be the actual lot of **water line pipes and fittings including accessories** to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.30 Supply and install sewerage pipes and fittings including accessories

The quantity to be paid for shall be the actual lot of sewerage pipes and fittings including accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.31 Supply and install drainage pipes and fittings including accessories

The quantity to be paid for shall be the actual lot of drainage pipes and fittings including accessories to be supplied and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.32 Construct septic vault including water proofing fittings and accessories

The quantity to be paid for shall be the actual number of septic vaults including water proofing fittings and accessories to be constructed in accordance with the plans and

specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.33 Construct electrical manhole including accessories

The quantity to be paid for shall be the actual number of electrical manhole including accessories to be constructed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.34 Construct Catch basin including accessories

The quantity to be paid for shall be the actual number of Catch basin including accessories to be constructed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.35 Construct cable trench including accessories

The quantity to be paid for shall be the actual length in linear meter of cable trench including accessories to be constructed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.36 Supply, deliver and install Electrical works including wires, cables, wiring devices, grounding, lighting fixture, aircondition and other accessories

The quantity to be paid for shall be the actual lot of Electrical works including wires, cables, wiring devices, grounding, lighting fixture, aircondition and other accessories to be supplied, delivered installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.37 Supply and deliver office furniture and accessories

The quantity to be paid for shall be the actual lot of office furniture and accessories to be supplied and delivered in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.38 Construct Security fence and gate including accessories

The quantity to be paid for shall be the actual lot of Security fence and gate including accessories to be constructed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.39 Supply and lay 300mm dia. reinforced concrete pipe

The quantity to be paid for shall be the actual length in linear meters of 300mm dia. reinforced concrete pipe to be supplied and laid in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.40 Supply and place gravel as surface finish for substation compound

The quantity to be paid for shall be the actual area in square meter of gravel as surface finish for substation compound to be supplied and placed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 4.41 Restoration of newly removed concrete pavement

The quantity to be paid for shall be the actual area in square meter of newly removed concrete pavement to be restored in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

BILL NO. 5

QUAY CRANE & ELECTRICAL SYSTEM

Item 5.01 Supply, deliver and install primary cables including accessories

The quantity to be paid for shall be the actual lot of primary cables including accessories to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.02 Supply, deliver and install conduit pipe including fittings of various sizes

The quantity to be paid for shall be the actual lot of conduit pipe including fittings of various sizes to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.03 Supply, deliver and install lightning protection including accessories.

The quantity to be paid for shall be the actual lot of lightning protection including accessories to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.04 Supply, deliver and install primary service entrance devices including accessories

The quantity to be paid for shall be the actual lot of primary service entrance devices including accessories to be supplied, delivered and installed in accordance with the

plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.05 Supply and deliver to site switchgear assembly including accessories

The quantity to be paid for shall be the actual lot of switchgear assembly including accessories to be supplied and delivered in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.06 Supply and deliver to site generator sets including accessories.

The quantity to be paid for shall be the actual lot of generator sets including accessories to be supplied and delivered to site in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.07 Supply, deliver and install Powerhouse distribution panels including accessories

The quantity to be paid for shall be the actual lot of Powerhouse distribution panels including accessories to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.08 Supply, deliver and install Pad Mounted Transformer

The quantity to be paid for shall be the actual lot of Pad Mounted Transformer to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Item 5.09 Supply, deliver, install Quay Crane including testing, commissioning, operator's training and other accessories

The quantity to be paid for shall be the actual lot of Quay Crane including testing, commissioning, operator's training and other accessories to be supplied, delivered and installed in accordance with the plans and specifications and accepted by the Engineer. The contract unit price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the work.

BILL NO. 6

REIMBURSABLE ITEMS

Item 6.01 **Secure approval of environmental Compliance Certificate (ECC) Application, Clearance and other necessary documentary requirements**

Payment for the aforementioned items will be made upon the successful securement of the approved ECC and, if necessary, the Area Clearance for the Construction of Crane Railway & Installation of Quay Crane located at the Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City. These approvals will be issued by the concerned Department of Environment and Natural Resources (DENR).

The contract's lump sum price will serve as full compensation to the Contractor, who is responsible for all activities related to securing the ECC and Area Clearance, whether carried out in-house or through a commissioned consultant. Claims for payment must be accompanied by invoice and/or other supporting documents (e.g., a notarized certificate of completion). The total amount payable shall not exceed the contract's lump sum price.

FACILITIES TO BE PROVIDED FOR THE ENGINEER & HIS STAFF

RENTAL OF SITE OFFICE AND RESIDENCE FOR THE ENGINEER & STAFF

The Contractor shall provide a temporary site office and residence (rental) with an area of at least 48 square meters for use of the Engineer and his staff for the whole duration of the project.

SECURE APPROVAL OF ENVIRONMENTAL COMPLIANCE CERTIFICATE (ECC) APPLICATION AND AREA CLEARANCE (IF NECESSARY)

The Contractor shall be responsible for facilitating the securement of the Environmental Compliance Certificate (ECC) and, if necessary, the Area Clearance prior to the commencement of the project. This process may be carried out through either in-house resources or a commissioned consultant. The Contractor's responsibilities include, but are not limited to:

A. Preparation of the Environmental Impact Assessment (EIA) Report

The Contractor shall prepare the EIA Report in compliance with all applicable laws, policies, and guidelines set forth by the Department of Environment and Natural Resources (DENR).

B. Submission of Required Documents

The Contractor shall submit all necessary documentation to the appropriate DENR Regional Office and coordinate with other government agencies to acquire the ECC and Area Clearance. This includes obtaining any additional clearances or permits that may be required.

C. Technical Expertise

The Contractor shall provide technical expertise throughout the processing of the ECC and Area Clearance applications until the approvals are granted.

D. Facilitation of Related Activities

The Contractor shall facilitate any other activities or undertakings associated with obtaining the necessary approvals.

During the initial stages of the ECC application, the Contractor may seek assistance from the concerned Port Management Office (PMO) for tasks such as identifying necessary documents and navigating the initial application submission process.

MINIMUM MAJOR EQUIPMENT REQUIREMENTS

2	unit/s	Air Compressor (250 cfm, minimum), owned
1	unit/s	Backhoe (0.40 cu.m., 94.30hp, minimum), owned
1	unit/s	Centrifugal Trash pumps, owned/leased
1	unit/s	Clamshell, owned
1	unit/s	Concrete cutter, owned
2	unit/s	Concrete Mixer (1 bagger, minimum), owned
1	unit/s	Concrete bucket, owned
1	unit/s	Concrete Screeder, owned
2	unit/s	Concrete Vibrator (3.5 hp, minimum), owned
1	unit/s	Crawler Crane (60T, minimum), owned
1	unit/s	Crawler Crane (20T, minimum), owned/ leased
1	unit/s	Pile Hammer (Diesel, 10,500. - 16,000 kg.m, or Hydraulic equivalent), owned
1	unit/s	Drop Hammer (2T, minimum), owned
1	unit/s	Dump Truck (10T net capacity, minimum), owned
2	unit/s	Bar Bender (electric, 25mm dia min.), owned
2	unit/s	Bar Cutter (electric, 25mm dia min.), owned
2	unit/s	Jackhammer, owned
1	unit/s	Oxy/Acetylene cutting outfit, owned
1	unit/s	Payloader (80 hp, minimum), owned
1	unit/s	Plate Compactor (5 hp, minimum), owned
1	unit/s	Road Grader (125 hp, minimum), owned/leased
1	unit/s	Road Roller (10T, vibratory, minimum), owned/ leased
2	unit/s	Transit Mixer (6 cu.m. cap., minimum), owned/leased
1	unit/s	Water Truck with pump (1,000 gal., minimum), owned
2	unit/s	Welding Machine (400 amp., minimum), owned
1	unit/s	Cargo Truck (2 tons capacity, minimum), owned
1	unit/s	Pavement Breaker (Backhoe Attachment), owned/leased

CONSTRUCTION SAFETY AND HEALTH REQUIREMENT

The Contractor shall implement the construction safety and health program in accordance with the applicable provisions of the Occupational Safety and Health Standards (OSHS) of the Department of Labor and Employment (DOLE).

The Contractor, subject to the approval of the Engineer shall provide and maintain throughout the duration of the contract a medical room with at least 15 square meters together with all necessary supplies to be sited in the Contractor's main area.

The Contractor shall provide the following minimum requirements:

L A B O R

1	no.	Safety Engineer / Officer
1	no.	Nurse / Health Officer

EQUIPMENT / MATERIALS

Personnel Protective Equipment

45	pcs.	Hard Hats
45	pcs.	Gloves (rubberized)
45	pcs.	Safety Glasses/Goggles (clear)
90	pcs.	Long sleeve T-shirt
8	pcs.	Aprons
4	pcs.	Safety Belts
45	pairs	Safety Shoes
4	pcs.	Life lines

Safety Devices

1	lot	Barricades
1	lot	Warning signs (Signages)
2	unit/s	Fire extinguisher (10kg)

Medical and First Aid System - Twenty-four (24) mos.

NOTE:

The Contractor shall provide the above-cited minimum construction safety and health requirements or as required by the Engineer.

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REVISED SCHEDULE OF MINIMUM TEST REQUIREMENTS OF CONSTRUCTION MATERIALS FOR PPA INFRASTRUCTURE PROJECTS

Materials/Items of Work	*Required Tests*	*Minimum Incremental Frequency of Tests*
I. Construction of Pier/Wharf, Platform and Ramp		
Structural Concrete (SC)		
A Portland Cement	Quality Test	For every 2,000 bags (40kg) or fraction thereof
B Fine Aggregate	Quality Test for Grading, Elutriation (wash), Bulk Specific Gravity, Absorption, Mortar Strength, Soundness, Organic Impurities, Unit Weight, % Clay Lumps and Shale	For every 1,500 cubic meter or fraction thereof
C Coarse Aggregate	Quality Test for Grading, Bulk Specific Gravity, Absorption and Abrasion	For every 1,500 cubic meter or fraction thereof
D Water	Certificate from the Engineer or Quality Test for Density and Chloride Content	One per source
E Steel Bars	Mill Certificate and Quality Test for Chemical Composition and Mechanical Properties	For every 10,000 kg or fraction thereof
F Concrete	Compressive Strength on cylinder samples	1 set consisting of 3 concrete cylinder samples shall be taken from each day's pouring and to represent not more than 75 cu m of concrete or fraction thereof
	Slump Test	For every mix
G Admixture and Concrete Curing Materials	Quality Test	One per shipment
Piling (P)		
A Concrete Piles	Fabrication Report	One per fabrication
1 Concrete	Same test as for SC (F)	Same frequency as SC (F)
2 Steel Bars	Same test as for SC (E)	Same frequency as SC (E)
3 High Tension Strand	Test for Chemical Composition and Mechanical Properties	For every 20000kg or fraction thereof

Materials/Items of Work	Required Tests	Minimum Incremental Frequency of Tests
4 Coarse Aggregates	Same Test as for SC (C)	Same frequency as SC (C)
5 Fine Aggregates	Same Test as for SC (B)	Same frequency as SC (B)
B Steel Pipe Piles	Fabrication Report, Mill Certificate and Quality Test for Chemical and Mechanical properties	One per fabrication
1 Steel	Chemical Composition (refer below)	
	- Under 14" (355 60mm) Outside Diameter	2 from 200 pipe of fraction thereof
	- 14" to 36" (355 6 to 914mm) Outside Dia	2 from 100 pipe or fraction thereof
	- Over 36" (914mm) Outside Diameter	2 from 3000ft (914m) or fraction thereof
	Mechanical/Tensile	One (1) tension test shall be made on one length or fraction thereof of each size, or one piece of skelp representing each lot of 200 lengths or fraction thereof of each size
2 Polyurethane Coating	Mill Certificate and Quality Test	One per fabrication
3 Concrete	Same test as for SC (F)	Same frequency as SC (F)
4 Fine Aggregate	Same test as for SC (B)	Same frequency as SC (B)
5 Coarse Aggregate	Same test as for SC (C)	Same frequency as SC (C)
6 Steel Bars	Same Test as SC (E)	Same frequency as SC (E)
7 Water	Same Test as SC (D)	Same frequency as SC (D)
Rubber Dock Fenders (RDF)	Physical Test	All units
	Performance Test for Energy Absorption and Reaction Force	All units
Accessories		
Washer and Fixing Bolt, Anchor Bolt	Physical Test	All units
	Quality Test for Chemical Composition and Mechanical Properties	One per fabrication

Materials/Items of Work	*Required Tests*	*Minimum Incremental Frequency of Tests*
Mooring Bollard (MB) and Accessories (Hexagon Nuts, Plain Washer, Anchor Ring and Anchor Bolt)	Physical Test Quality Test for Chemical Composition and Mechanical Properties	All Units One per fabrication
II. Construction of Back-Up Area, Causeway and Pavement		
Sheet Piling (SP)		
A Concrete Sheet Piles		
1 Concrete	Same test as for SC (F)	Same frequency as SC (F)
2 Steel Bars	Same test as for SC (E)	Same frequency as SC (E)
3 High Tension Strands	Same test as for P (A 3)	Same frequency as P (A 3)
4 Fine Aggregates	Same test as for SC (B)	Same frequency as SC (B)
5 Coase Aggregates	Same Test as for SC (C)	Same frequency as SC (C)
B Steel Pipe Piles		
1 Steel	Same test as for P (B1)	Same frequency as P (B1)
2 Concrete	Same test as for SC (F)	Same frequency as SC (F)
3 Fine Aggregate	Same test as for SC (B)	Same frequency as SC (B)
4 Steel Bars	Same test as for SC (E)	Same frequency as SC (E)

Materials/Items of Work	***Required Tests***	***Minimum Incremental Frequency of Tests***
Rocks	Test for Apparent Specific Gravity and Abrasion	For every 1,500 cubic meter or fraction thereof
Geotextile Filter	Physical and Mechanical Test Mill Certificate	One per batch One per batch
Sand and Gravel Fill	Quality Test for Organic Impurities and Grading	For every 1,500 cubic meter or fraction thereof
Selected Fill	Quality Test for Grading, Plasticity and Laboratory Compaction Test Laboratory California Bearing Ratio (CBR) Field Density Test	For every 1,500 cubic meter or fraction thereof For every 2,500 cubic meter or fraction thereof For every layer of 150mm of compacted depth at least one group of three in-situ density test for every 500 sq m or fraction thereof
Aggregate Base Course	Quality Test for Grading and Plasticity Quality Test for Grading, Plasticity, Abrasion and Laboratory Compaction Test Laboratory California Bearing Ratio (CBR) Field Density Test	For every 300 cubic meter or fraction thereof For every 1,500 cubic meter or fraction thereof Same frequency as Selected Fill Same frequency as Selected Fill
Portland Cement Concrete Pavement (PCCP) A Portland Cement B Fine Aggregate C Coarse Aggregate D Water E Steel Bars (Dowels) F Joint Filler	 Same test as for SC (A) Same test as for SC (B) Same test as for SC (C) Same test as for SC (D) Same test as for SC (E) Quality Test	 Same frequency as SC (A) Same frequency as SC (B) Same frequency as SC (C) Same frequency as SC (D) Same frequency as SC (E) One (1) per shipment

Materials/Items of Work	*Required Tests*	*Minimum Incremental Frequency of Tests*
G Admixture and Concrete Curing Material	Same test as for SC (G)	Same frequency as SC (G)
H Concrete	Same test as for SC (F)	Same frequency as SC (F)
	Flexural Test	3 beam samples for every 330 sq m or fraction thereof
I Completed Pavement	Core Test	1 set (3 specimen) for every 2,500 sq m and fraction thereof
Interlocking Concrete Blocks		
A Cement	Same test as for SC (A)	Same frequency as SC (A)
B Fine Aggregate	Same test as for SC (B)	Same frequency as SC (B)
C Coarse Aggregate	Same test as for SC (C)	Same frequency as SC (C)
D Water	Same test as for SC (D)	Same frequency as SC (D)
E Admixture & Concrete Curing Materials	Same test as for SC (G)	Same frequency as SC (G)
F Completed Blocks	Physical Test and Compressive Strength	6 blocks per day of fabrication
Cement Treated Base Course (CTB)		
A Portland Cement	Same test as for SC (A)	Same frequency as SC (A)
B Fine & Coarse Aggregates	Quality Test for Grading, Abrasion and Soundness	For every 1,500 cubic meter or fraction thereof
C Water	Same test as for SC (D)	Same frequency as SC (D)
D Completed CTB	Field Density Test	For every layer of 150mm of compacted depth at least one group of three in-situ density test every 500 sq m or fraction thereof
Retaining Wall/Coping Wall/RC Curb/RC Ditch/Shear Key/Concrete Blocks\Lean Concrete		
A Portland Cement	Same test as for SC (A)	Same frequency as SC (A)
B Fine Aggregate	Same test as for SC (B)	Same frequency as SC (B)

Materials/Items of Work	***Required Tests***	***Minimum Incremental Frequency of Tests***
C Coarse Aggregates	Same test as for SC (C)	Same frequency as SC (C)
D Water	Same test as for SC (D)	Same frequency as SC (D)
E Steel Bars	Same test as for SC (E)	Same frequency as SC (E)
F Admixture and Concrete Curing	Same test as for SC (G)	Same frequency as SC (G)
G Concrete	Same test as for SC (F)	Same frequency as SC (F)
Tie Rod		
A Steel	Same test as for SC (E)	One per batch
B Assembly	Performance Test (Tension)	One per batch
Tie Bars and Dowels	Same test as for SC (E)	For every 10,000 kg or fraction thereof per Tie bars and Dowels
Pipe Culverts and Storm Drains		
A Pipes	Test for Strength, Absorption and Physical	For every 50 pieces
B Mortar or Joint	Same Test as for SC (A,B and D) Alternative Test Same test as for SC (F) and Inspection Report	For every 25 pieces
Concrete Hollow Blocks		
A Portland Cement	Same test as for SC (A)	Same frequency as SC (A)
B Fine Aggregates	Same test as for SC (B)	Same frequency as SC (B)
C Water	Same test as for SC (D)	Same frequency as SC (C)
D Concrete	Same test as for SC (F)	Same frequency as SC (F)
E Completed CHB	Quality Test	One for every 500 pieces or fraction thereof
Construction Joints (CJ)		
A Angle Bars	Test for Physical and Mechanical Properties	One per batch
B Steel Bars	Same test as for SC (E)	One per batch
C Zinc (Hot Dip Galvanizing) Coatings	Physical Test for Appearance, Stripping, Weighing, Adherence and Adhesion	All units
	Coating Thickness Magnetic Thickness Measurement	1 set (3 specimen) for every 100,000 sq mm or fraction thereof

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Materials/Items of Work	*Required Tests*	*Minimum Incremental Frequency of Tests*
Sacked Concrete		
A Cement	Same test as for SC (A)	Same frequency as SC (A)
B Fine Aggregates	Same test as for SC (B)	Same frequency as SC (B)
C Coarse Aggregates	Same test as for SC (C)	Same frequency as SC (C)
D Water	Same test as for SC (D)	Same frequency as SC (D)
E Concrete	Same test as for SC (F)	Same frequency as SC (F)
F Sack (jute)	Physical Test	One for every 50 pieces
Rubble Concrete		
A Cement	Same test as for SC (A)	Same frequency as SC (A)
B Fine Aggregates	Same test as for SC (B)	Same frequency as SC (B)
C Coarse Aggregates	Same test as for SC (C)	Same frequency as SC (C)
D Water	Same test as for SC (D)	Same frequency as SC (D)
E Concrete	Same test as for SC (F)	Same frequency as SC (F)
F Rocks	Same test as for ROCKS	Same frequency as ROCKS
Earthworks		
A Sub-grade preparation	Grading Test Plasticity Test (LL,PL,PI) Laboratory Compaction Test	For every 1,500 cubic meter or fraction thereof
	Density Test	For every layer of 150mm of compacted depth at least one group of three in-situ density test every 500 sq m or fraction thereof
B Structure Excavation	If excavated materials shall be used as Backfill Grading Test Plasticity Test (LL,PL,PI) Laboratory Compaction Test	For every 1,500 cubic meter or fraction thereof
	Density Test	For every layer of 150mm of compacted depth at least one group of three in-situ density test every 500 sq m or fraction thereof

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Materials/Items of Work	*Required Tests*	*Minimum Incremental Frequency of Tests*
III Port Operations Building/Passenger Terminal Building/Transit Shed/Warehouse		
STRUCTURAL WORKS	Refer to Structural Concrete (SC) and Piling Works (P)	
ARCHITECTURAL WORKS		
Ceramic – Filled Liquid Membrane / Water Proofing, Hydrophobic Poreblocking Ingredients with Superplasticizer	Physical Property, Mechanical and Chemical Property, Leak Test / Flood Test	One per shipment
Paint	Quality Test	One 4-L can for every 100 cans or fraction thereof
Ceramic Tile	Inspection and Evaluation Report from the Engineer	One per shipment
Stainless Steel	Inspection and Evaluation Report from the Engineer	One per shipment
Roofing Materials	Inspection and Evaluation Report from the Engineer	One per shipment
Ceiling Materials	Inspection and Evaluation Report from the Engineer	One per shipment
ELECTRICAL AND MECHANICAL WORKS		
Wires / Cables	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per shipment
Electrical Devices	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per shipment
Fire Alarm System	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
Wiring Devices	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per shipment

Materials/Items of Work	Required Tests	Minimum Incremental Frequency of Tests
Protective Devices	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per shipment
Telephone System	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
CCTV System	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
CATV System	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
Background Music and Paging System	Inspection and Evaluation Report from the Engineer, Testing and Commissioning	One per item
Air Conditioning Units & Ventilation	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
Conduit Pipes	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
Lighting Fixtures	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
PLUMBING WORKS		
Pipes	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item

PPA MEMORANDUM CIRCULAR
No 02
Series of 2016
Attachment

Materials/Items of Work	Required Tests	Minimum Incremental Frequency of Tests
Fixtures	Inspection and Evaluation Report from the Engineer Testing and Commissioning	One per item
Pipe Culverts	Compression Strength Inspection and Evaluation Report from the Engineer	For every size not more than 25 pipes cast in the field
IV Miscellaneous Materials Fencing A Barbed Wire, Cyclone Wire Mesh, Chain Link B Concrete Post	Physical Test (Dimensions and Coatings) Refer to Superstructure (SC)	One per Batch Refer to Superstructure (SC)
Lamp Post A Structural Steel B Zinc (Hot Dip Galvanizing) Coatings	Physical Test (Dimensions) Same test as for SC (E) Same test as for CJ (C)	All units One per batch
Drainage Steel Grating	Same test as for SC (E) Inspection Report	One (1) batch
Metal Pipe (Cast Iron Galvanized, etc)	Physical Test (Dimensions and Coatings)	1 per delivery
Welding Works	Destructive and Non Destructive Test	One (1) per lot

NOTES
1. **Testing of RDF shall be performed only by an independent Testing Laboratory duly accredited by BRS, DOST and PPA**
2. **Testing of other materials shall be performed only by an independent Testing Laboratory duly accredited by BRS and PPA.**
3. **All other issuances which are otherwise inconsistent herewith are hereby revoked or otherwise amended.**

Approved

RAUL T. SANTOS
Officer-In-Charge,
Office of the General Manager

SECTION IX

CHECKLIST OF TECHNICAL AND FINANCIAL DOCUMENTS

Checklist of Technical and Financial Documents

I. TECHNICAL COMPONENT ENVELOPE

Class "A" Documents

Legal Documents

☐ (a) Valid PhilGEPS Registration Certificate (Platinum Membership) (all pages)

Technical Documents

☐ (b) Statement of the prospective bidder of all its ongoing government and private contracts, including contracts awarded but not yet started, if any, whether similar or not similar in nature and complexity to the contract to be bid; **and**

☐ (c) Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid, except under conditions provided under the rules; **and**

☐ (d) Special PCAB License in case of Joint Ventures;
and registration for the type and cost of the contract to be bid; **and**

☐ (e) Original copy of Bid Security. If in the form of a Surety Bond, submit also a certification issued by the Insurance Commission;
or
Original copy of Notarized Bid Securing Declaration; **and**

(f) Project Requirements, which shall include the following:

☐ a. Organizational chart for the contract to be bid;

☐ b. List of contractor's key personnel (*e.g.*, Project Manager, Project Engineers, Materials Engineers, and Foremen), to be assigned to the contract to be bid, with their complete qualification and experience data;

☐ c. List of contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership or certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be; **and**

☐ (g) Original duly signed Omnibus Swom Statement (OSS);
and if applicable, Original Notarized Secretary's Certificate in case of a corporation, partnership, or cooperative; or Original Special Power of Attorney of all members of the joint venture giving full power and authority to its officer to sign the OSS and do acts to represent the Bidder.

Financial Documents

☐ (h) The prospective bidder's computation of Net Financial Contracting Capacity (NFCC).

Class "B" Documents

☐ (i) If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence;
or
duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.

II. FINANCIAL COMPONENT ENVELOPE

☐ (j) Original of duly signed and accomplished Financial Bid Form; **and**

Other documentary requirements under RA No. 9184

☐ (k) Original of duly signed Bid Prices in the Bill of Quantities; **and**

☐ (l) Duly accomplished Detailed Estimates Form, including a summary sheet indicating the unit prices of construction materials, labor rates, and equipment rentals used in coming up with the Bid; **and**

☐ (m) Cash Flow by Quarter.

SECTION X

BIDDING FORM

Bid Form for the Procurement of Infrastructure Projects

[shall be submitted with the Bid]

BID FORM

Date : _____
Project Identification No. : _____

To: **Philippine Ports Authority**
PPA Building, Bonifacio Drive,
South Harbor, Port Area, Manila

Having examined the Philippine Bidding Documents (PBDs) including the Supplemental or Bid Bulletin Numbers _____, the receipt of which is hereby duly acknowledged, we, the undersigned, declare that:

a. We have no reservation to the PBDs, including the Supplemental or Bid Bulletins, for the Procurement Project: **Construction of Crane Railway & Installation of Quay Crane, Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City**;

b. We offer to execute the Works for this Contract in accordance with the PBDs;

c. The total price of our Bid in words and figures, excluding any discounts offered below is: _____;

d. The discounts offered and the methodology for their application are: _____;

e. The total bid price includes the cost of all taxes, such as, but not limited to: *[specify the applicable taxes, e.g. (i) value added tax (VAT), (ii) income tax, (iii) local taxes, and (iv) other fiscal levies and duties]*, which are itemized herein and reflected in the detailed estimates,

f. Our Bid shall be valid within the period stated in the PBDs, and it shall remain binding upon us at any time before the expiration of that period;

g. If our Bid is accepted, we commit to obtain a Performance Security in the amount of _____ percent of the Contract Price for the due performance of the Contract, or a Performance Securing Declaration in lieu of the the allowable forms of Performance Security, subject to the terms and conditions of issued GPPB guidelines[1] for this purpose;

h. We are not participating, as Bidders, in more than one Bid in this bidding process, other than alternative offers in accordance with the Bidding Documents;

i. We understand that this Bid, together with your written acceptance thereof included

[1] currently based on GPPB Resolution No. 09-2020

in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed; and

j. We understand that you are not bound to accept the Lowest Calculated Bid or any other Bid that you may receive.

k. We likewise certify/confirm that the undersigned, is the duly authorized representative of the bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for the **Construction of Crane Railway & Installation of Quay Crane, Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City** of the **Philippine Ports Authority**.

l. We acknowledge that failure to sign each and every page of this Bid Form, including the Bill of Quantities, shall be a ground for the rejection of our bid.

Name: _____

Legal Capacity: _____

Signature: _____

Duly authorized to sign the Bid for and behalf of: _____

Date: _____

STATEMENT OF THE BIDDER'S ALL ONGOING GOVERNMENT AND PRIVATE CONTRACTS, INCLUDING CONTRACTS AWARDED BUT NOT YET STARTED

I hereby declare that all ongoing contracts, including awarded contracts yet to be started coinciding with the contract to be bid are listed below:

Name of outstanding Contracts 1]	Owner's Name and Address	Scope of Work 2]	Contractor's Role and Percentage of Participation 3]	Total Contract Amount or Value 4]	Date of Contract and NOA 5]	Value of Outstanding Works 6]	Accomplishment (in percentage, %) 7]		Contract Duration 8]	
							Planned	Actual	Start of Project	Estimated Completion Date
A) Government Contracts i. On-going ii. Awarded but not yet started B) Private Contracts i. On-going ii. Awarded but not yet started										

NOTE:

1] As appearing in the contract executed by the parties.
2] With special reference to the Scope of Works of the Project as described/enumerated in the Contract.
3] Indicate the percentage of participation and whether as Sole Contractor, Sub-Contractor or Member in a Joint Venture / Consortium.
4] Indicate the FOREX used if Contract Value is expressed in a currency other than the Philippine Peso.
5] As appearing in the Contract and Notice of Award (NOA).
6] Amount or value of all outstanding or uncompleted portions of the projects under ongoing contracts, including awarded contracts yet to be started coinciding with the contract to be bid.
7] Percentage of Accomplishment as of the preceding month which should not be earlier than two (2) months from the date of bid submission.
8] As appearing in the Notice to Proceed and Contract.

This Statement shall be supported by:

a) Notice of Award
b) Notice to Proceed and Contract

Name of Firm	Name of Bidder/Authorized Representative (Signatory's Legal Capacity)	Date

Revised: September 2021

STATEMENT OF THE BIDDER'S SINGLE LARGEST COMPLETED CONTRACT (SLCC) SIMILAR TO THE CONTRACT TO BE BID

Name of the completed Contract 1]	Owner's Name and Address	Scope of Work 2]	Contractor's Role and Percentage of Participation 3]	Total Contract Value At 4]			Date of Award 5]	Contract Duration 6]	
				Award	Completion	Escalated Value to Present Prices		Start	Completed

NOTE :

1] As appearing in the contract executed by the parties.
2] With special reference to the Scope of Works of the Project as described/enumerated in the Contract.
3] Indicate the percentage of participation and whether as Sole Contractor, Sub-Contractor or Member in a Joint Venture / Consortium.
4] Indicate the FOREX used if Contract Value is expressed in a currency other than the Philippine Peso. Attached the computation for the escalated contract value.
5] As appearing in the Notice of Award.
6] As appearing in the Notice to proceed and Certificate of Completion.

A. The bidder must have an experience of having completed a SLCC that is similar to the contract to be bid equivalent to at least fifty percent (50%) of the ABC, adjusted if necessary, by the Bidder to current prices using the PSA consumer price indices. A contract is considered to be "similar" to the contract to be bid if it has the same Major Categories of Work as stated in the Bid Data Sheet (BDS).

B. This Statement shall be supported by:
   a. Notice of Award, Notice to Proceed and Contract.
   b. Project Owner's Certificate of Final Acceptance issued by the owner and/ or Constructors Performance Evaluation System (CPES) Final Rating, which must be at least Satisfactory. The said Certificate of Acceptance shall contain the following: 1) Name of project owner that issued the certificate, 2) Name of Contractor/ Constructor, 3) Name of Contract, and 4) Contract Duration.
   c. Recapitulation or Final Bill of Quantities.

Name of Firm	Name of Bidder/Authorized Representative (Signatory's Legal Capacity)	Date

Revised: September 2021

STATEMENT OF THE BIDDER'S EXPERIENCE ON MAJOR CATEGORIES OF WORK OF THE SLCC INCLUDING OTHER COMPLETED CONTRACTS SIMILAR TO THE CONTRACT TO BE BID

Major Categories of Work 1]	Unit of Measure 1]	Quantity 1]	SLCC similar to the contract to be bid 2]	Other completed contracts similar to the contract to be bid 2]			Unit of Measure 2]	Quantity 2]
			Name of the contract	Name of the contract	Name of the contract	Name of the contract		
1. Pile driving works	l.m.	2,279						
2. Reinforced Concrete Works:	cu.m.	1,976						
3. Installation of Cargo Handling Equipment or similar	cu.m.	1						

NOTE:
1] As stated in the Bid Data Sheet.
2] As appearing in the Recapitulation and/ or Final Bill of Quantities.
This statement shall be supported by:

a. Notice of Award, Notice to Proceed and Contract.
b. Project Owner's Certificate of Final Acceptance issued by the owner and/ or Constructors Performance Evaluation System (CPES) Final Rating, of at least satisfactory. The said Certificate of Acceptance shall contain the following: 1) Name of project owner that issued the certificate, 2) Name of Contractor/Constructor, 3) Name of Contract, and 4) Contract Duration.
c. Recapitulation and/ or Final Bill of Quantities.

Name of Firm

Name of Bidder/Authorized Representative
Signatory's Legal Capacity

Date

Revised: September 2021

FINANCIAL DATA

A. The prospective bidder's audited Financial Statements, showing, among others, the prospective bidder's total and current assets and liabilities, stamped "RECEIVED" by the Bureau of Internal Revenue (BIR), or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission.

	Year
1. Total Assets	
2. Current Assets	
3. Total Liabilities	
4. Current Liabilities	
5. Net worth (1-3)	
6. Net Working Capital (2-4)	

B. The computation of the bidders Net Financial Contracting Capacity (NFCC) must be at least equal to the ABC to be bid, as follows:

NFCC = [(Current assets minus current liabilities) (15)] minus the value of all outstanding or uncompleted portions of the projects under ongoing contracts, including awarded contracts yet to be started coinciding with the contract to be bid.

NFCC = _____

Attached herewith are certified true copies of the audited financial statements stamped received by the BIR or BIR authorized collecting agent for the latest/immediately preceding calendar year.

_____
Name of Firm/Applicant

_____
Authorized Signing Official

Date:_____

NOTES:

If Partnership or Joint Venture, each Partner or Member Firm of Joint venture shall submit separate financial statements.

STATEMENT OF THE BIDDER'S KEY PERSONNEL PLEDGED FOR THE CONTRACT TO BE BID

I hereby declare that the following key personnel are qualified and available for the duration of the contract to be bid:

Position of Key Personnel 1]	Name	No. of Key Personnel	Similar Experience in the Position (Years) 2]	Total Experience in the Position (Years)	Attachment(s)	Annex(es)
Project Manager					PRC License (CE Preferred) Complete Qualification and Experience Data Certificate of Commitment	Annex "_"
Project Engineer					PRC License (CE Preferred) Complete Qualification and Experience Data Certificate of Commitment	Annex "_"
Project Architect					PRC License Complete Qualification and Experience Data Certificate of Commitment	
Materials Engineer II					PRC License (CE Preferred) Submit Valid and Renewed DPWH Certificate of Accreditation Submit Accreditation Identification Card as Materials Engineer Complete Qualification and Experience Data Certificate of Commitment	Annex "_"
Construction Safety and Health Officer					Certificate of Safety and Health Construction Related Course issued by DOLE Accredited Trainings Complete Qualification and Experience Data Certificate of Commitment	Annex "_"
Foreman					Complete Qualification and Experience Data Certificate of Commitment	Annex "_"
Other Position(s)					Complete Qualification and Experience Data Certificate of Commitment	Annex "_"

NOTE: 1] As stated in the Bid Data Sheet
2] The number of years of experience of the key personnel shall be as indicated in the qualification and experience data or curriculum vitae.

Minimum qualification requirements: The key personnel must have a work experience that is similar in nature and complexity to the contract to be bid.

Project Manager - Five (5) years
Project Engineer - Three (3) years
Project Architect- Three (3) years
Materials Engineer II – for projects costing more than 100M
Construction Safety and Health Officer – One (1) year
Foreman - Five (5) years

Name of Firm	Name of Bidder/Authorized Representative (Signatory's Legal Capacity)	Date

Revised: September 2021

STATEMENT OF THE BIDDER'S EQUIPMENT PLEDGED FOR THE CONTRACT TO BE BID

I hereby declare that the following equipment are in good operating condition and available for the duration of the contract to be bid:

DESCRIPTION (Type, Model, Make)	No. of Unit(s)	Capacity/ Output 1]	Owned, Leased, and/or under purchased agreement 2]	Proof of Ownership/ Leased/ Under Purchase Agreement (Mark as Annex "A.....Z") 3]	OTHER INFORMATION (As Applicable)				
					Manufacturer	Engine Serial No.	Chassis No./ Name of Vessel	Location	Status

NOTE:

1] The unit of capacity of the pledged equipment shall be as indicated in the Proof of Ownership, i.e. GW (for crane barge), DWT (for deck barge and hopper barge), Ton (for crane, road roller and drop hammer), kg.-m/blow (for diesel hammer), cu.m. (for dump truck), hp (for tugboat, road grader, bulldozer and concrete vibrator), cfm (for compressor), gal (for water truck with pump), amp (for welding machine), bagger (for concrete mixer). If the capacity of the pledged equipment is not indicated in the Proof of Ownership/Lease Contract/Purchased Agreement, submit other proof of capacity such as specifications, brochures or other verifiable printouts indicating the model name, model number and other details of the equipment.

2] Indicate if the pledged equipment are owned, leased or under purchase agreement.

3] If the pledged equipment is owned, it should be in the name of the bidder. Submit proof of ownership, i.e. deed of sale, sales invoice, official receipt; For owned Water Truck, Dump Truck, Cargo Truck and Transit Mixer submit LTO Certificate of Registration and valid Official Receipt; For owned barge/tugboat, submit Marina Certificate of Ownership and valid Cargo Ship Safety Certificate.

If the pledged equipment is leased/under purchase agreement, submit the following:

For equipment under lease agreement:

a. certification of availability of equipment from the equipment lessor for the duration of the project
b. duly Notarized copy of lease contract
c. For Water Truck, Dump Truck, Cargo Truck and Transit Mixer submit LTO Certificate of Registration and valid Official Receipt

For equipment under purchase agreement:

a. certification of availability of equipment from the equipment vendor
b. duly Notarized copy of purchase agreement
c. For Water Truck, Dump Truck and Transit Mixer submit LTO Certificate of Registration and valid Official Receipt or copy of conduction sticker, whichever is applicable.

If the pledged barge/tugboat is leased/under purchase agreement, submit certification of availability of barge/tugboat from the equipment lessor/vendor for the duration of the project, and duly Notarized copy of lease contract/purchased agreement together with a copy of the Marina Certificate of Ownership and valid Cargo Ship Safety Certificate.

The Minimum Major Equipment Requirements are listed in Section 8, Annex 3.

Name of Firm	Name of Bidder/Authorized Representative (Signatory's Legal Capacity)	Date

Revised: August 2024

Omnibus Sworn Statement for Sole Proprietorship

[shall be submitted with the Bid]

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

AFFIDAVIT

I, _____, of legal age, [Civil Status], [Nationality], and residing at _____, after having been duly sworn in accordance with law, do hereby depose and state that:

1. I am the sole proprietor or authorized representative of _____ with office address at _____;

2. As the owner and sole proprietor, or authorized representative of _____, I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for **Construction of Crane Railway & Installation of Quay Crane, Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City** as shown in the attached duly notarized Special Power of Attorney;

3. [Name of Bidder] is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board, **by itself or by relation, membership, association, affiliation, or controlling interest with another blacklisted person or entity as defined and provided for in the Uniform Guidelines on Blacklisting;**

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;

5. [Name of Bidder] is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. The owner or sole proprietor is not related to the Head of the Procuring Entity, Procurement Agent if engaged, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and

8. *[Name of Bidder]* is aware of and has undertaken the responsibilities as a Bidder in compliance with the Philippine Bidding Documents, which includes:

   a. Carefully examining all of the Bidding Documents;
   b. Acknowledging all conditions, local or otherwise, affecting the implementation of the Contract;
   c. Making an estimate of the facilities available and needed for the contract to be bid, if any; and
   d. Inquiring or securing Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or

representative of the government in relation to any procurement project or activity.

10. **In case advance payment was made or given, failure to perform or deliver any of the obligations and undertakings in the contract shall be sufficient grounds to constitute criminal liability for Swindling (Estafa) or the commission of fraud with unfaithfulness or abuse of confidence through misappropriating or converting any payment received by a person or entity under an obligation involving the duty to deliver certain goods or services, to the prejudice of the public and the government of the Philippines pursuant to Article 315 of Act No. 3815 s. 1930, as amended, or the Revised Penal Code.**

IN WITNESS WHEREOF, I have hereunto set my hand this __ day of ___, 20__ at _____, Philippines.

_____
Name of Bidder/ Authorized Representative
(Signatory's Legal Capacity)
AFFIANT

[Jurat]
[Format shall be based on the latest Rules on Notarial Practice]

Omnibus Sworn Statement for Partnership or Cooperative

[shall be submitted with the Bid]

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

AFFIDAVIT

I, _____, of legal age, [Civil Status], [Nationality], and residing at _____, after having been duly sworn in accordance with law, do hereby depose and state that:

1. I am the duly authorized and designated representative of _____ with office address at _____;

2. I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for **Construction of Crane Railway & Installation of Quay Crane, Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City** of the **Philippine Ports Authority**, as shown in the attached [state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, whichever is applicable;)];

3. [Name of Bidder] is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board, **by itself or by relation, membership, association, affiliation, or controlling interest with another blacklisted person or entity as defined and provided for in the Uniform Guidelines on Blacklisting;**

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;

5. [Name of Bidder] is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. None of the officers and members of *[Name of Bidder]* is related to the Head of the Procuring Entity, Procurement Agent if engaged, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and

8. *[Name of Bidder]* is aware of and has undertaken the responsibilities as a Bidder in compliance with the Philippine Bidding Documents, which includes:

   a. Carefully examining all of the Bidding Documents;
   b. Acknowledging all conditions, local or otherwise, affecting the implementation of the Contract;
   c. Making an estimate of the facilities available and needed for the contract to be bid, if any; and
   d. Inquiring or securing Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.

10. **In case advance payment was made or given, failure to perform or deliver any of the obligations and undertakings in the contract shall be sufficient grounds to constitute criminal liability for Swindling (Estafa) or the commission of fraud with unfaithfulness or abuse of confidence through misappropriating or converting any payment received by a person or entity under an obligation involving the duty to deliver certain goods or services, to the prejudice of the public and the government of the Philippines pursuant to Article 315 of Act No. 3815 s. 1930, as amended, or the Revised Penal Code.**

IN WITNESS WHEREOF, I have hereunto set my hand this __ day of ___, 20__ at _____, Philippines.

_____
Name of Bidder/ Authorized Representative
(Signatory's Legal Capacity)
AFFIANT

[Jurat]
[Format shall be based on the latest Rules on Notarial Practice]

Omnibus Sworn Statement for Corporation or Joint Venture

[shall be submitted with the Bid]

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

AFFIDAVIT

I, _____, of legal age, [Civil Status], [Nationality], and residing at _____, after having been duly sworn in accordance with law, do hereby depose and state that:

1. I am the duly authorized and designated representative of _____ with office address at _____;

2. I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for **Construction of Crane Railway & Installation of Quay Crane, Iloilo Commercial Port Complex (ICPC), Loboc, Lapaz, Iloilo City**, as shown in the attached [state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, whichever is applicable;)];

3. [Name of Bidder] is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board, **by itself or by relation, membership, association, affiliation, or controlling interest with another blacklisted person or entity as defined and provided for in the Uniform Guidelines on Blacklisting;**

4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;

5. [Name of Bidder] is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, Procurement Agent if engaged, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and

8. *[Name of Bidder]* is aware of and has undertaken the responsibilities as a Bidder in compliance with the Philippine Bidding Documents, which includes:

   a. Carefully examining all of the Bidding Documents;
   b. Acknowledging all conditions, local or otherwise, affecting the implementation of the Contract;
   c. Making an estimate of the facilities available and needed for the contract to be bid, if any; and
   d. Inquiring or securing Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.

10. **In case advance payment was made or given, failure to perform or deliver any of the obligations and undertakings in the contract shall be sufficient grounds to constitute criminal liability for Swindling (Estafa) or the commission of fraud with unfaithfulness or abuse of confidence through misappropriating or converting any payment received by a person or entity under an obligation involving the duty to deliver certain goods or services, to the prejudice of the public and the government of the Philippines pursuant to Article 315 of Act No. 3815 s. 1930, as amended, or the Revised Penal Code.**

IN WITNESS WHEREOF, I have hereunto set my hand this __ day of ___, 20__ at _____, Philippines.

_____
Name of Bidder/ Authorized Representative
(Signatory's Legal Capacity)
AFFIANT

[Jurat]
[Format shall be based on the latest Rules on Notarial Practice]

Bid Securing Declaration Form

[shall be submitted with the Bid if bidder opts to provide this form of bid security]

REPUBLIC OF THE PHILIPPINES)
CITY OF _____) S.S.

BID SECURING DECLARATION
Project Identification No.:_____

To: **Philippine Ports Authority**
PPA Building, Bonifacio Drive,
South Harbor, Port Area, Manila

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid Securing Declaration.

2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any procurement contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of the written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1(f),of the IRR of RA No. 9184; without prejudice to other legal action the government may undertake.

3. I/We understand that this Bid Securing Declaration shall cease to be valid on the following circumstances:

   a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
   b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right; and
   c. I am/we are declared the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

IN WITNESS WHEREOF, I/We have hereunto set my/our hand/s this ____ day of *[month] [year]* at *[place of execution]*.

_____
Name of Bidder/ Authorized Representative
(Signatory's Legal Capacity)
AFFIANT

[Jurat]
[Format shall be based on the latest Rules on Notarial Practice]

CONSTRUCTION METHODOLOGY

Name of Project : _____

Project Description : _____

Location : _____

MINIMUM SCOPE OF CONSTRUCTION METHODOLOGY

A. REMOVAL, DISPOSAL AND EXCAVATION WORKS

1. Removal of existing rubber dock fender and mooring bollard
2. Removal & disposal of existing RC deck including piles
3. Removal of existing building structure
4. Removal & disposal of pavement
5. Excavation and backfilling work

B. UPGRADING OF EXISTING R.C. WHARF

1. Supply & delivery of Steel Pipe Piles including polyurethane
2. Handling, pitching & driving of Steel Pipe piles
3. Fabrication of band tip and splicing of steel pipe piles
4. Cutting & disposal of newly driven Steel Pipe piles
5. Extraction of clogged materials inside the SPP
6. Supply & placing of concrete filler for SPP
7. Supply & installation of reinforcing steel cage for SPP
8. Supply & installation of reinforcing steel bars for the superstructure
9. Supply & placing of concrete for the superstructure
10. Construction of cable trench
11. Installation of crane rail system and accessories
12. Supply & installation of cone fenders
13. Reinstallation of mooring bollards

C. POWER HOUSE, FENCE AND GATE

1. Construction of powerhouse, complete with architectural finishes, structural, electrical, plumbing, drainage and painting etc.
2. Construction of cable trench and accessories
3. Construction of perimeter fence
4. Drainage system
5. Supply and placing of gravel for the substation compound
6. Restoration of the newly removed concrete pavement

D. QUAY CRANE & ELECTRICAL SYSTEM

1. Supply, delivery & installation of primary cables
2. Supply, delivery & installation of conduit pipes
3. Supply, delivery & installation of lighting protection
4. Supply, delivery & installation of primary service entrance
5. Supply, delivery & installation of switch gear assembly
6. Supply, delivery & installation of generation set

7. Supply, delivery & installation of powerhouse distribution panels
8. Supply, delivery & installation of pad mounted transfomer
9. Supply, delivery & installation of quay crane and accessories

NOTES:

The narrative construction method will guide and familiarize the contractor and the PPA on how the project shall be carried out in accordance with the highest standard of workmanship.

The construction method shall be consistent with the Bar Chart / S-Curve Schedule, Equipment Schedule and Manpower Schedule.

_____
Name of Bidder/Authorized Representative
(Signatory's Legal Capacity)

Revised: September 2021

MANPOWER SCHEDULE

Name of Project : _____

Project Description : _____

Location : _____

MANPOWER (Minimum)	CONTRACT DURATION (_____ Calendar Days)																							
	MONTHLY																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Project Manager																								
Project Engineer																								
Project Architect																								
Materials Engineer II																								
Construction Safety and Health Officer																								
Foreman																								
Specify other applicable positions, ie.:																								
Carpenter																								
Steelman																								
Mason																								
Electrician																								
Rigger																								
Others																								

_____
Name of Bidder/Authorized Representative
(Signatory's Legal Capacity)

Revised: September 2021

EQUIPMENT UTILIZATION SCHEDULE

Name of Project : ____________________

Project Description : ____________________

Location : ____________________

EQUIPMENT (Minimum)	No. of Units	CONTRACT DURATION (_____ Calendar Days)																							
		M O N T H L Y																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

____
Name of Bidder/Authorized Representative
(Signatory's Legal Capacity)

Revised: September 2021

CASHFLOW BY QUARTER AND PAYMENT SCHEDULE

Name of Project: : _____

Project Description : _____

Location : _____

Project Duration (days or months)	Payment Schedule (Monthly, in Pesos)	Cash flow (Quarterly, in Pesos)
TOTAL		

NOTES

- The cash flow by quarter and payment schedule should be consistent with the Bar Chart and S-curb.
- Payment schedule shall not be more than once a month.

_____
Name of Bidder/Authorized Representative
(Signatory's Legal Capacity)

Revised: September 2021

Contract Agreement Form for the Procurement of Infrastructure Projects (Revised)

[not required to be submitted with the Bid, but it shall be submitted within ten (10) days after receiving the Notice of Award]

CONTRACT AGREEMENT

THIS AGREEMENT, made this _____ day of _____, _____ between **Philippine Ports Authority** with principal office at PPA Building, Bonifacio Drive, South Harbor, Port Area, Manila (hereinafter called the "Entity") and **[name and address of Contractor]** (hereinafter called the "Contractor").

WHEREAS, the Entity is desirous that the Contractor execute **[name and identification number of contract]** (hereinafter called "the Works") and the Entity has accepted the Bid for **[contract price in words and figures in specified currency]** by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents as required by the 2016 revised Implementing Rules and Regulations of Republic Act No. 9184 shall be deemed to form and be read and construed as part of this Agreement, *viz.*:

   a. Philippine Bidding Documents (PBDs);
      i. Drawings/Plans;
      ii. Specifications;
      iii. Bill of Quantities;
      iv. General and Special Conditions of Contract;
      v. Supplemental or Bid Bulletins, if any;

   b. Winning bidder's bid, including the Eligibility requirements, Technical and Financial Proposals, and all other documents or statements submitted;

   Bid form, including all the documents/statements contained in the Bidder's bidding envelopes, as annexes, and all other documents submitted (*e.g.*, Bidder's response to request for clarifications on the bid), including corrections to the bid, if any, resulting from the Procuring Entity's bid evaluation;

   c. Performance Security;

   d. Notice of Award of Contract and the Bidder's conforme thereto; and

e. Other contract documents that may be required by existing laws and/or the Procuring Entity concerned in the PBDs. **Winning bidder agrees that additional contract documents or information prescribed by the GPPB that are subsequently required for submission after the contract execution, such as the Notice to Proceed, Variation Orders, and Warranty Security, shall likewise form part of the Contract.**

3. In consideration for the sum of **[total contract price in words and figures]** or such other sums as may be ascertained, **[Named of the bidder]** agrees to **[state the object of the contract]** in accordance with his/her/its Bid.

4. The **Philippine Ports Authority** agrees to pay the above-mentioned sum in accordance with the terms of the Bidding.

IN WITNESS whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

JAY DANIEL R. SANTIAGO General Manager	**Name of Bidder/ Authorized Representative** (Signatory's Legal Capacity)
for:	for:
Philippine Ports Authority	**Contractor**

Acknowledgment

[Format shall be based on the latest Rules on Notarial Practice]