



REPUBLIC OF THE PHILIPPINES  
**NATIONAL POWER CORPORATION**  
(Pambansang Korporasyon sa Elektrisidad)

## **BID DOCUMENTS**

**Name of Project:** SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2 X 90 KW MODULAR DIESEL GENSETS AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP

**Project Location:** SITIO PALINA GRANDE, BRGY. BANGONGON, TAGUBANHAN IS., CONCEPCION, ILOILO

**Specification No.:** Visp21Z1282se

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Design and Development Department



## **SECTION I**

# **INVITATION TO BID**



# National Power Corporation

## INVITATION TO BID

### PUBLIC BIDDING – BCS 2022-0544

1. The NATIONAL POWER CORPORATION (NPC), through its approved Corporate Budget of CY 2022 intends to apply the sum of **(Please see schedule below)** being the Approved Budget for the Contract (ABC) to payments under the contract. Bids received in excess of the ABC shall be automatically rejected at Bid opening.

PR Nos./PB Ref No. & Description	Similar Contracts	Pre-bid Conference	Bid Submission / Opening	ABC/ Amt. of Bid Docs
SO-OPD22-007 / PB220831-HG00341  Supply, Delivery, Installation, Test and Commissioning of 1 x 120kW and 2 x 90kW Modular Diesel Gensets and Associated Electrical Equipment for Tagubanhon DPP	Supply, Delivery, Installation, Test and Commissioning or Construction of Power Facilities, Installation, Test and Commissioning of "Unit Diesel Generator – Transformer" with generator capacity of at least 90kW Prime or Continuous and associated Power Transformer of at least 112.5 kVA rating	17 August 2022 9:30 A.M	31 August 2022 9:30 A.M	Total P 16,630,952.00 / P 25,000.00
HO-PIG21-019 / PB211117-SV00417 (PB4)  Supply, Delivery, Installation, Test and Commissioning of 1 x 100 kW (for Dancalan DPP) and 1 x 100 kW (for Malaking -Ilog DPP) Modular Diesel Gensets and Associated Electrical Equipment under Package 13-A	Supply, Delivery, Installation, Test and Commissioning or Construction of Power Facilities, Installation, Test and Commissioning of "Unit Diesel Generator – Transformer" with generator capacity of at least 50kW Prime or Continuous Power and associated Power Transformer of at least 100 kVA rating	17 August 2022 9:30 A.M	31 August 2022 9:30 A.M	Total P 13,956,855.00 / P 25,000.00
<b>Venue: Kañao Function Room, NPC Bldg. Diliman, Quezon City</b>				

2. The NPC now invites bids for Item listed above. Delivery of the Goods is required (**see table below**) specified in the Technical Specifications. Bidders should have completed, within (**see table below**) from the date of submission and receipt of bids, a contract similar to the Project. The description of an eligible bidder is contained in the Bidding Documents, particularly, in Section II. (Instruction to Bidders).

PR No/s. / PB Ref No/s.	Delivery Period / Contract Duration	Relevant Period of SLCC reckoned from the date of submission & receipt of bids
SO-OPD22-007	Two Hundred Forty (240) Calendar Days	Fifteen (15) Years
HO-PIG21-019	Two Hundred Forty (240) Calendar Days	Fifteen (15) Years

- Bidding will be conducted through open competitive bidding procedures using a non-discretionary "pass/fail" criterion as specified in the 2016 revised Implementing Rules and Regulations (IRR) of Republic Act (RA) No. 9184.

Bidding is restricted to Filipino citizens/sole proprietorships, partnerships, or organizations with at least sixty percent (60%) interest or outstanding capital stock belonging to citizens of the Philippines, and to citizens or organizations of a country the laws or regulations of which grant similar rights or privileges to Filipino citizens, pursuant to RA 5183.

- Prospective Bidders may obtain further information from National Power Corporation, Bids and Contracts Services Division and inspect the Bidding Documents at the address given below during office hours (8:00AM to 5:00PM), Monday to Friday.
- A complete set of Bidding Documents may be acquired by interested Bidders from the given address and website(s) and upon payment of the applicable fee for the Bidding Documents, pursuant to the latest Guidelines issued by the GPPB. Bidding fee may be refunded in accordance with the guidelines based on the grounds provided under Section 41 of R.A. 9184 and its Revised IRR.
- The National Power Corporation will hold Pre-Bid Conference (see table above) and/or through video conferencing or webcasting which shall be open to prospective bidders.

Only registered bidder/s shall be allowed to participate for the conduct of virtual pre-bid conference. **Unregistered bidders** may attend the Pre-Bid Conference at the Kañao Room, NPC subject to the following:

- Only a maximum of two (2) representatives from each bidder / company shall be allowed to participate during the virtual pre-bid conference.
  - A "No Face mask / No Entry" policy shall be implemented in the NPC premises. Face mask shall be 3-ply surgical or KN95 mask type.
  - The requirements herein stated including the medium of submission shall be subject to GPPB Resolution No. 09-2020 dated 07 May 2020
  - The Guidelines on the Implementation of Early Procurement Activities (EPA) shall be subject to GPPB Circular No. 06-2019 dated 17 July 2019
- Bids must be duly received by the BAC Secretariat through (i) manual submission at the office address indicated below; (ii) online or electronic submission before the specified time stated in the table above for opening of bids. Late bids shall not be accepted.
  - All Bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in ITB Clause 14.
  - Bid opening shall be on Kañao Function Room, NPC Head Office, Diliman, Quezon City and/or via online platform to be announced by NPC. Bids will be opened in the presence of the bidders' representatives who choose to attend the activity.
  - The National Power Corporation reserves the right to reject any and all bids, declare a failure of bidding, or not award the contract at any time prior to contract award in accordance with Sections 35.6 and 41 of the 2016 revised IRR of R.A. No. 9184, without thereby incurring any liability to the affected bidder or bidders.



11. For further information, please refer to:

**Bids and Contracts Services Division,  
Logistics Department**

BIR Road cor. Quezon Avenue

Diliman, Quezon City

Tel Nos.: 8924-5211 and 8921-3541 local 5504/5239/5397

Fax No.: 8922-1622

Email: [bcsd@napocor.gov.ph](mailto:bcsd@napocor.gov.ph) / [bcsd\\_napocor@yahoo.com](mailto:bcsd_napocor@yahoo.com)

12. You may visit the following websites:

For downloading of Bidding Documents: <https://www.napocor.gov.ph/bcsd/bids.php>



**RENE B. BARRUELA**

Vice President, Corporate Affairs Group  
Chairman, Bids and Awards Committee

## **SECTION II**

# **INSTRUCTIONS TO BIDDERS**

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## **SECTION II – INSTRUCTIONS TO BIDDERS**

### **1. Scope of Bid**

The National Power Corporation (NPC or NAPOCOR) wishes to receive Bids for the **SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1 X 120 KW AND 2 X 90 KW MODULAR DIESEL GENSETS AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP**, with identification number **VisP21Z1282Se**.

The Procurement Project (referred to herein as "Project") is composed of one (1) lot and will be awarded to one (1) Bidder in one complete contract, the details of which are described in Section VI (Technical Specifications).

### **2. Funding Information**

- 2.1. The GOP through the source of funding as indicated below for CY 2021 in the amount specified in the Invitation to Bid.
- 2.2. The source of funding is the Corporate Operating Budget of the National Power Corporation.

### **3. Bidding Requirements**

The Bidding for the Project shall be governed by all the provisions of RA No. 9184 and its 2016 revised IRR, including its Generic Procurement Manuals and associated policies, rules and regulations as the primary source thereof, while the herein clauses shall serve as the secondary source thereof.

Any amendments made to the IRR and other GPPB issuances shall be applicable only to the ongoing posting, advertisement, or IB by the BAC through the issuance of a supplemental or bid bulletin.

The Bidder, by the act of submitting its Bid, shall be deemed to have verified and accepted the general requirements of this Project, including other factors that may affect the cost, duration and execution or implementation of the contract, project, or work and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

### **4. Corrupt, Fraudulent, Collusive, and Coercive Practices**

The Procuring Entity, as well as the Bidders and Suppliers, shall observe the highest standard of ethics during the procurement and execution of the contract. They or through an agent shall not engage in corrupt, fraudulent, collusive, coercive, and obstructive practices defined under Annex "I" of the 2016 revised IRR of RA No. 9184 or other integrity violations in competing for the Project.

## 5. Eligible Bidders

- 5.1. Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.
- 5.2. Foreign ownership exceeding those allowed under the rules may participate when citizens, corporations, or associations of a country, included in the list issued by the GPPB, the laws or regulations of which grant reciprocal rights or privileges to citizens, corporations, or associations of the Philippines.  
  
The foreign bidder claiming eligibility by reason of their country's extension of reciprocal rights to Filipinos shall submit a certification from the relevant government office of their country stating that Filipinos are allowed to participate in their government procurement activities for the same item/product. The said certification shall be validated during the post-qualification of bidders.
- 5.3. Pursuant to Section 23.4.1.3 of the 2016 revised IRR of RA No.9184, the Bidder shall have an SLCC that is at least one (1) contract similar to the Project the value of which, adjusted to current prices using the PSA's CPI, must be at least equivalent to at least fifty percent (50%) of the ABC.
- 5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.1 of the 2016 IRR of RA No. 9184.

## 6. Origin of Goods

There is no restriction on the origin of goods other than those prohibited by a decision of the UN Security Council taken under Chapter VII of the Charter of the UN, subject to Domestic Preference requirements under ITB Clause 18.

## 7. Subcontracts

- 7.1. The Bidder may subcontract portions of the Project to the extent allowed by the Procuring Entity as stated herein, but in no case more than twenty percent (20%) of the Project.  
  
The portions of Project and the maximum percentage allowed to be subcontracted are indicated in the BDS, which shall not exceed twenty percent (20%) of the contracted Goods.
- 7.2. The Supplier may identify its subcontractor during the contract implementation stage. Subcontractors identified during the bidding may be changed during the implementation of this Contract. Subcontractors must submit the documentary requirements under Section 23.1 of the 2016 revised IRR of RA No. 9184 and comply with the eligibility criteria specified in ITB Clause 5 to the implementing or end-user unit.
- 7.3. Subcontracting of any portion of the Project does not relieve the Supplier of any liability or obligation under the Contract. The Supplier will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants, or workmen as fully as if these were the Supplier's own acts, defaults, or negligence, or those of its agents, servants, or workmen.

SECTION II – INSTRUCTIONS TO BIDDERS

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**8. Pre-Bid Conference**

The Procuring Entity will hold a pre-bid conference for this Project on the specified date and time and either at its physical address and/or through videoconferencing/webcasting as indicated in paragraph 6 of the IB.

**9. Clarification and Amendment of Bidding Documents**

Prospective bidders may request for clarification on and/or interpretation of any part of the Bidding Documents. Such requests must be in writing and received by the Procuring Entity, either at its given address or through electronic mail indicated in the IB, at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.

**10. Documents comprising the Bid: Eligibility and Technical Components**

10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in Section VIII (NPCSF-GOODS-01 - Checklist of Technical and Financial Documents).

10.2. The Bidder's SLCC as indicated in ITB Clause 5.3 should have been completed within Fifteen (15) Years prior to the deadline for the submission and receipt of bids.

10.3. If the eligibility requirements or statements, the bids, and all other documents for submission to the BAC are in foreign language other than English, it must be accompanied by a translation in English, which shall be authenticated by the appropriate Philippine foreign service establishment, post, or the equivalent office having jurisdiction over the foreign bidder's affairs in the Philippines. Similar to the required authentication above, for Contracting Parties to the Apostille Convention, only the translated documents shall be authenticated through an apostille pursuant to GPPB Resolution No. 13-2019 dated 23 May 2019. The English translation shall govern, for purposes of interpretation of the bid.

10.4. The Statement of the bidder's Single Largest Completed Contract (SLCC) (NPCSF-GOODS-03) and List of all Ongoing Government & Private Contracts Including Contracts Awarded but not yet Started (NPCSF-GOODS-02) shall comply with the documentary requirements specified in the **BDS**.

**11. Documents comprising the Bid: Financial Component**

11.1. The second bid envelope shall contain the financial documents for the Bid as specified in Section VIII (NPCSF-GOODS-01 - Checklist of Technical and Financial Documents).

11.2. If the Bidder claims preference as a Domestic Bidder or Domestic Entity, a certification issued by DTI shall be provided by the Bidder in accordance with Section 43.1.3 of the 2016 revised IRR of RA No. 9184.

11.3. Any bid exceeding the ABC indicated in paragraph 1 of the IB shall not be accepted.

## SECTION II – INSTRUCTIONS TO BIDDERS

- 11.4. For Foreign-funded Procurement, a ceiling may be applied to bid prices provided the conditions are met under Section 31.2 of the 2016 revised IRR of RA No. 9184.

**12. Bid Prices**

- 12.1. Prices indicated on the Price Schedule shall be entered separately in the following manner:

- a. For Goods offered from within the Procuring Entity's country:
  - i. The price of the Goods quoted EXW (ex-works, ex-factory, ex-warehouse, ex-showroom, or off-the-shelf, as applicable);
  - ii. The cost of all customs duties and sales and other taxes already paid or payable;
  - iii. The cost of transportation, insurance, and other costs incidental to delivery of the Goods to their final destination; and
  - iv. The price of other (incidental) services, if any, listed in the **BDS**.
- b. For Goods offered from abroad:
  - i. Unless otherwise stated in the **BDS**, the price of the Goods shall be quoted delivered duty paid (DDP) with the place of destination in the Philippines as specified in the **BDS**. In quoting the price, the Bidder shall be free to use transportation through carriers registered in any eligible country. Similarly, the Bidder may obtain insurance services from any eligible source country.
  - ii. The price of other (incidental) services, if any, as listed in the **BDS**.

**13. Bid and Payment Currencies**

- 13.1. For Goods that the Bidder will supply from outside the Philippines, the bid prices may be quoted in the local currency or tradeable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies, shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.

- 13.2. Payment of the contract price shall be made in Philippine Pesos.

**14. Bid Security**

- 14.1. The Bidder shall submit a Bid Securing Declaration or any form of Bid Security in the amount indicated in the **BDS**, which shall be not less than the percentage of the ABC in accordance with the schedule in the **BDS**.
- 14.2. The Bid and bid security shall be valid for **One Hundred Twenty (120) calendar** days from the date of opening of bids. Any Bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

SECTION II – INSTRUCTIONS TO BIDDERS

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**15. Sealing and Marking of Bids**

Each Bidder shall submit one copy of the first and second components of its Bid.

The Procuring Entity may request additional hard copies and/or electronic copies of the Bid. However, failure of the Bidders to comply with the said request shall not be a ground for disqualification.

If the Procuring Entity allows the submission of bids through online submission or any other electronic means, the Bidder shall submit an electronic copy of its Bid, which must be digitally signed. An electronic copy that cannot be opened or is corrupted shall be considered non-responsive and, thus, automatically disqualified.

**16. Deadline for Submission of Bids**

16.1. The Bidders shall submit on the specified date and time and either at its physical address or through online submission as indicated in paragraph 7 of the IB.

**17. Opening and Preliminary Examination of Bids**

17.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the IB. The Bidders' representatives who are present shall sign a register evidencing their attendance. In case videoconferencing, webcasting or other similar technologies will be used, attendance of participants shall likewise be recorded by the BAC Secretariat.

In case the Bids cannot be opened as scheduled due to justifiable reasons, the rescheduling requirements under Section 29 of the 2016 revised IRR of RA No. 9184 shall prevail.

17.2. The preliminary examination of bids shall be governed by Section 30 of the 2016 revised IRR of RA No. 9184.

**18. Domestic Preference**

18.1. The Procuring Entity will grant a margin of preference for the purpose of comparison of Bids in accordance with Section 43.1.2 of the 2016 revised IRR of RA No. 9184.

**19. Detailed Evaluation and Comparison of Bids**

19.1. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all Bids rated "*passed*," using non-discretionary pass/fail criteria. The BAC shall consider the conditions in the evaluation of Bids under Section 32.2 of the 2016 revised IRR of RA No. 9184.

19.2. If the Project allows partial bids, bidders may submit a proposal on any of the lots or items, and evaluation will be undertaken on a per lot or item basis, as the case maybe. In this case, the Bid Security as required by ITB Clause 14 shall be submitted for each lot or item separately.



SECTION II – INSTRUCTIONS TO BIDDERS

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- 19.3. The descriptions of the lots or items shall be indicated in **Section VI (Technical Specifications)**, although the ABCs of these lots or items are indicated in the **BDS** for purposes of the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184. The NFCC must be sufficient for the total of the ABCs for all the lots or items participated in by the prospective Bidder.
- 19.4. The Project shall be awarded to one (1) Bidder in one complete contract.
- 19.5. Except for bidders submitting a committed Line of Credit from a Universal or Commercial Bank in lieu of its NFCC computation, all Bids must include the NFCC computation pursuant to Section 23.4.1.4 of the 2016 revised IRR of RA No. 9184, which must be sufficient for the total of the ABCs for all the lots or items participated in by the prospective Bidder. For bidders submitting the committed Line of Credit, it must be at least equal to ten percent (10%) of the ABCs for all the lots or items participated in by the prospective Bidder.

**20. Post-Qualification**

- 20.1. Within a non-extendible period of five (5) calendar days from receipt by the Bidder of the notice from the BAC that it submitted the Lowest Calculated Bid, the Bidder shall submit its latest income and business tax returns filed and paid through the BIR Electronic Filing and Payment System (eFPS) and other appropriate licenses and permits required by law and stated in the **BDS**.

**21. Signing of the Contract**

- 21.1. The documents required in Section 37.2 of the 2016 revised IRR of RA No. 9184 shall form part of the Contract. Additional Contract documents are indicated in the **BDS**.

## **SECTION III**

# **BID DATA SHEET**

## SECTION III - BID DATA SHEET

ITB Clause	
5.3	<p>For this purpose, similar contracts shall refer to Supply, Delivery, Installation, Test and Commissioning or Construction of Power Facilities, Installation, Test and Commissioning of <b>"Unit Diesel Generator – Transformer"</b> with generator capacity of at least 90 kW Prime or Continuous and associated Power Transformer of at least 112.5 kVA rating.</p> <p>The Single Largest Completed Contract (SLCC) as declared by the bidder shall be verified and validated to ascertain such completed contract. Hence, bidders must ensure access to sites of such projects/equipment to NPC representatives for verification and validation purposes during post-qualification process.</p> <p>It shall be a ground for disqualification, if verification and validation cannot be conducted for reasons attributable to the Bidder.</p> <p>Bidders must also comply with the Diesel Engine-Generator and Associated Equipment Data Summary specified in Section M-1.0. of the Section VI - Technical Data Sheet.</p>
7.1	<p>Subcontracting may be allowed on transport, local/non-skilled labor under the supervision of the Bidder. The Bidder shall not be relieved from any liability or obligation that may arise from the performance of the Subcontractor.</p>
10.4	<p>The list of on-going contracts (Form No. NPCSF-GOODS-02) shall be supported by the following documents for each on-going contract to be submitted during <b>Post-Qualification</b>:</p> <ol style="list-style-type: none"> <li>1. Contract/Purchase Order and/or Notice of Award</li> <li>2. Certification coming from the project owner/client that the performance is satisfactory as of the bidding date</li> </ol> <p>The bidder shall declare in this form all his on-going government and private contracts including contracts where the bidder (either as individual or as a Joint Venture) is a partner in a Joint Venture agreement other than his current joint venture where he is a partner. Non declaration will be a ground for disqualification of bid.</p> <p>The Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid (Form No. NPCSF-GOODS-03) shall be supported by the following documents to be submitted during <b>Bid Opening</b>:</p> <ol style="list-style-type: none"> <li>1. Contract/Purchase Order</li> <li>2. Certificate of Acceptance; or Certificate of Completion; or Official Receipt (O.R); or Sales Invoice</li> </ol>

## SECTION III – BID DATA SHEET

	<p>The prospective bidders shall declare its Joint Venture partner during the purchase of bid/tender documents. Any single bidder/s who already procured/secured the bidding documents but want to avail the Joint Venture Agreement (JVA) shall inform the BAC in writing prior to the bid opening for records and documentation purposes. Failure to do so shall be a ground for disqualification/non-acceptance of its bid.</p>
10.5	<p>Bidders shall also submit the following requirements in their first envelope, Eligibility and Technical Component of their bid:</p> <ol style="list-style-type: none"> <li>1. Drawings &amp; Documents to be submitted with the Proposal as specified in Sections M-1.0, M-2.0, Annexes A.1 to A.3 for Mechanical Works and Sections E-1.0 and E-2.0 for Electrical Works, Section VI – Part II Technical Data Sheets.</li> </ol> <p>Manufacturer's brochures, manuals and other supporting documents of equipment, materials, hardware and tools proposed by the bidders must comply with the technical specifications of such equipment, materials, hardware and tools. It shall be a ground for rejection of the said equipment, materials, hardware and tools if the submitted brochures, manuals and other supporting documents are determined not complying with the specifications during the contract implementation.</p> <p>Equipment, materials, hardware and tools proposed by the winning bidder to be supplied, which were evaluated to be complying with the technical specifications, shall not be replaced and must be the same items to be delivered/installed/used during the contract implementation. Any proposed changes/replacement of said items may be allowed on meritorious reasons subject to validation and prior approval by NPC.</p> <ol style="list-style-type: none"> <li>2. Complete eligibility documents of the proposed sub-contractor, if any</li> </ol>
12	<p>The price of the Goods shall be quoted DDP Project Site or the applicable International Commercial Terms (INCOTERMS) for this Project.</p>
14.1	<p>The bid security shall be in the form of a Bid Securing Declaration, or any of the following forms and amounts:</p> <ol style="list-style-type: none"> <li>a) The amount of not less two percent (2%) of ABC, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit; or</li> <li>b) The amount of not less than five percent (5%) of ABC, if bid security is in Surety Bond.</li> </ol>

## SECTION III – BID DATA SHEET

19.3	<p>The goods are grouped together in one (1) lot and will be awarded to one (1) bidder in one complete contract. Partial bid is not allowed.</p> <p>The lot is further divided into sub-lots for the purpose of bid evaluation. The sub-lots are as follows:</p> <table border="1"> <thead> <tr> <th>DESCRIPTION</th><th>ABC (PhP)</th></tr> </thead> <tbody> <tr> <td>a. Generating Set(s)</td><td>6,242,857.00</td></tr> <tr> <td>b. Power Transformers</td><td>3,269,790.00</td></tr> <tr> <td>c. Other Mechanical Works</td><td>1,620,518.00</td></tr> <tr> <td>d. Other Electrical Works</td><td>1,653,236.00</td></tr> <tr> <td>e. Civil and Architectural Works</td><td>344,552.00</td></tr> <tr> <td>f. Spare Parts</td><td>2,467,478.00</td></tr> <tr> <td>g. Miscellaneous Work</td><td>1,032,521.00</td></tr> <tr> <td><b>TOTAL ABC</b></td><td><b>16,630,952.00</b></td></tr> </tbody> </table> <p>The bidders bid offer must be within the ABC of the lot/sub-lots. Bid offers that exceed the ABC of the lot/sub-lots, or with incomplete price, shall be rejected.</p> <p>Bids shall also be further evaluated based on the Computed Fuel Consumption Cost. The formula and its application are stated below. It is understood however, that the award of contract shall be at the Bidder's submitted bid price or its calculated bid price due to computational errors, omissions and discount, whichever is lower. Contract amount shall be exclusive of computed Fuel Consumption Cost.</p> <p><b>Fuel Consumption Cost:</b></p> <p>Fuel Consumption for one (1) year for each bidder for their guaranteed fuel rate at Guaranteed Rated Output, shall be computed based on the accomplished Bid Forms, (Section M-2.0 – Fuel Consumption Form for Diesel Engine-Generator Sets), which shall be accomplished and submitted by the Bidders. The formula for the Fuel Consumption Cost (FCC) is:</p> $FCC = (\text{Bidder's Guaranteed Fuel Rate, in lit./kW-Hr}) \times (\text{fuel cost per liter}) \times (3,427 \text{ operating hours per year}) \times (\text{Guaranteed Rated Output in kW}) \times (\text{number of D/G units})$ <p>The corrected bid price (calculated bid) due to computational errors, omissions and discounts, PLUS: the computed Fuel Consumption Cost shall become the total evaluated bid price, for bid comparison purposes.</p>	DESCRIPTION	ABC (PhP)	a. Generating Set(s)	6,242,857.00	b. Power Transformers	3,269,790.00	c. Other Mechanical Works	1,620,518.00	d. Other Electrical Works	1,653,236.00	e. Civil and Architectural Works	344,552.00	f. Spare Parts	2,467,478.00	g. Miscellaneous Work	1,032,521.00	<b>TOTAL ABC</b>	<b>16,630,952.00</b>
DESCRIPTION	ABC (PhP)																		
a. Generating Set(s)	6,242,857.00																		
b. Power Transformers	3,269,790.00																		
c. Other Mechanical Works	1,620,518.00																		
d. Other Electrical Works	1,653,236.00																		
e. Civil and Architectural Works	344,552.00																		
f. Spare Parts	2,467,478.00																		
g. Miscellaneous Work	1,032,521.00																		
<b>TOTAL ABC</b>	<b>16,630,952.00</b>																		
19.5	If the Bidder opted to submit a Committed Line of Credit (CLC), the bidder must submit a granted credit line valid/effective at the date of bidding.																		
20.1	<p>Additional documents to be submitted during Post-Qualification:</p> <p>a. Contract/Purchase Order and/or Notice of Award for the contracts stated in the List of all Ongoing Government &amp; Private Contracts Including Contracts Awarded but not yet Started (NPCSF-GOODS-02);</p>																		

## SECTION III – BID DATA SHEET

	<p>b. Certification coming from the project owner/client that the performance is satisfactory as of the bidding date for all ongoing contracts stated in Form NPCSF-GOODS-02;</p> <p>c. The website, name, address, contact person, telephone number and e-mail address of the principal supplier of the Diesel Gensets to be supplied for this project.</p> <p>d. The name, address, telephone number and e-mail address of the manufacturer's technical coordinator or specialist with whom NPC can interface throughout the contract duration.</p> <p>e. The name, address, contact person and number of the Bidder's Local Service Center in the Philippines declared in the Bid Proposal, that will efficiently cater to the maintenance, repair, and spare parts requirements of the supplied unit/s during the warranty period as prescribed in the Conditions of Contract and/or Technical Specifications. Bidders shall also submit the Bio-data/work experience of at least two (2) of its personnel in the Local Service Center. A certification from Manufacturer/Authorized Representative to prove that the said personnel has undergone required training to service the unit/s to be supplied for this project shall also be submitted.</p> <p>In case the Local Service Center is not owned by the Bidder, a Memorandum of Agreement (or any similar document) between the Bidder and the Manufacturer/Authorized Representative of the supplied unit/s shall be submitted by the Bidder subject to verification/approval of NPC. Non-submission of this requirement shall be grounds for disqualification of the bid.</p> <p>f. Drawings and documents to be submitted during post-qualification process Sections M-3.0 to M-5.0 for Mechanical Works and Sections E-3.0 to E-8.0 for Electrical Works, Section VI – Part II Technical Data Sheets.</p>
20.2	The licenses and permits relevant to the Project and the corresponding law requiring it as specified in the Technical Specifications, if any.
21.2	Notice to Proceed.

## **SECTION IV**

# **GENERAL CONDITIONS OF CONTRACT**

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## SECTION IV – GENERAL CONDITIONS OF CONTRACT

### 1. Scope of Contract

This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. All the provisions of RA No. 9184 and its 2016 revised IRR, including the Generic Procurement Manual, and associated issuances, constitute the primary source for the terms and conditions of the Contract, and thus, applicable in contract implementation. Herein clauses shall serve as the secondary source for the terms and conditions of the Contract.

This is without prejudice to Sections 74.1 and 74.2 of the 2016 revised IRR of RA No. 9184 allowing the GPPB to amend the IRR, which shall be applied to all procurement activities, the advertisement, posting, or invitation of which were issued after the effectivity of the said amendment.

Additional requirements for the completion of this Contract shall be provided in the **Special Conditions of Contract (SCC)**.

### 2. Advance Payment and Terms of Payment

- 2.1. Advance payment of the contract amount is provided under Annex "D" of the revised 2016 IRR of RA No. 9184.
- 2.2. The Procuring Entity is allowed to determine the terms of payment on the partial or staggered delivery of the Goods procured, provided such partial payment shall correspond to the value of the goods delivered and accepted in accordance with prevailing accounting and auditing rules and regulations. The terms of payment are indicated in the **SCC**.

### 3. Performance Security

- 3.1. Within ten (10) calendar days from receipt of the Notice of Award by the Bidder from the Procuring Entity but in no case later than the signing of the Contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR of RA No. 9184.
- 3.2. The performance bond to be posted by the Contractor must also comply with additional requirements specified in the **SCC**.

### 4. Inspection and Tests

The Procuring Entity or its representative shall have the right to inspect and/or to test the Goods to confirm their conformity to the Project specifications at no extra cost to the Procuring Entity in accordance with the Generic Procurement Manual. In addition to tests in the **SCC, Section VI (Technical Specifications)** shall specify what inspections and/or tests the Procuring Entity requires, and where they are to be

SECTION IV – GENERAL CONDITIONS OF CONTRACT

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conducted. The Procuring Entity shall notify the Supplier in writing, in a timely manner, of the identity of any representatives retained for these purposes.

All reasonable facilities and assistance for the inspection and testing of Goods, including access to drawings and production data, shall be provided by the Supplier to the authorized inspectors at no charge to the Procuring Entity.

**5. Warranty**

- 5.1 In order to assure that manufacturing defects shall be corrected by the Supplier, a warranty shall be required from the Supplier as provided under Section 62.1 of the 2016 revised IRR of RA No. 9184.
- 5.2 The Procuring Entity shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall correct/repair or replace the defective Goods or parts thereof within the period specified in the **SCC**, without cost to the Procuring Entity, pursuant to the Generic Procurement Manual.

**6. Liability of the Supplier**

The Supplier's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

If the Supplier is a joint venture, all partners to the joint venture shall be jointly and severally liable to the Procuring Entity.

## **SECTION V**

# **SPECIAL CONDITIONS OF CONTRACT**

**SECTION IV – SPECIAL CONDITIONS OF CONTRACT**

GCC Clause	
1	<p><b>Delivery and Documents –</b></p> <p>The delivery terms applicable to the Contract is DDP delivered to the project site specified in the technical specifications, in accordance with INCOTERMS. Risk and title will pass from the Supplier to the Procuring Entity upon receipt and final acceptance of the Goods at their final destination.</p> <p>Delivery of the Goods shall be made by the Supplier in accordance with the terms specified in Section VI – Technical Specifications. The details of shipping and/or other documents to be furnished by the Supplier are as follows:</p> <p><i>For Goods supplied from within the Philippines</i></p> <p>Upon delivery of the Goods to the Project Site, the Supplier shall notify the Procuring Entity and present the following documents to the Procuring Entity:</p> <ul style="list-style-type: none"> <li>(i) Original and four copies of the Supplier's invoice showing Goods' description, quantity, unit price, and total amount;</li> <li>(ii) Original and four copies of Supplier's factory test/inspection report;</li> <li>(iii) Original and four copies of the certificate of origin (for imported Goods);</li> <li>(iv) Delivery receipt detailing number and description of items received signed by the Procuring Entity's representative at the Project Site;</li> <li>(v) Certificate of Completion/Inspection Report signed by the Procuring Entity's representative at the Project Site;</li> <li>(vi) Original and four copies of the Inspection Receiving Report signed by the Procuring Entity's representative at the Project Site;</li> <li>(vii) Original and four copies of the Manufacturer's and/or Supplier's warranty certificate; and</li> <li>(viii) Documents specified in the Technical Specifications, if any.</li> </ul> <p><i>For Goods supplied from abroad:</i></p> <p>Upon shipment, the Supplier shall notify the Procuring Entity and the insurance company by e-mail the full details of the shipment, including Contract Number, description of the Goods, quantity, vessel, bill of lading number and date, port of loading, date of shipment, port of discharge etc. Upon delivery to the Project Site, the Supplier shall notify the Procuring Entity and present the following documents as applicable with the documentary requirements of any letter of credit issued taking precedence:</p>

## SECTION V – SPECIAL CONDITIONS OF CONTRACT

- (i) Original and four copies of the Supplier's invoice showing Goods' description, quantity, unit price, and total amount;
- (ii) Original and four copies of the negotiable, clean shipped on board bill of lading marked "freight pre-paid" and five copies of the non-negotiable bill of lading ;
- (iii) Original and four copies of Supplier's factory test/inspection report;
- (iv) Delivery receipt detailing number and description of items received signed by the Procuring Entity's representative at the Project Site;
- (v) Certificate of Completion/Inspection Report signed by the Procuring Entity's representative at the Project Site;
- (vi) Original and four copies of the Inspection Receiving Report signed by the Procuring Entity's representative at the Project Site;
- (vii) Original and four copies of the certificate of origin (for imported Goods); and
- (viii) Original and four copies of the Manufacturer's and/or Supplier's warranty certificate including all other documents specified in the Technical Specifications, if any.

For purposes of this Clause the Procuring Entity's Representative at the Project Site is Vice President - SPUG or duly authorized representative..

**Incidental Services –**

The Supplier is required to provide all of the following services, including additional services, if any, specified in Section VI. Schedule of Requirements:

- a. performance or supervision of on-site assembly and/or start-up of the supplied Goods;
- b. furnishing of tools required for assembly and/or maintenance of the supplied Goods;
- c. furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied Goods;
- d. performance or supervision or maintenance and/or repair of the supplied Goods, for a period of time agreed by the parties, provided that this service shall not relieve the Supplier of any warranty obligations under this Contract; and
- e. training of the Procuring Entity's personnel, at the Supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied Goods.

## SECTION V – SPECIAL CONDITIONS OF CONTRACT

- f. Additional requirements specified in Section VI – Technical Specifications, if any.

The Contract price for the Goods shall include the prices charged by the Supplier for incidental services and shall not exceed the prevailing rates charged to other parties by the Supplier for similar services.

**Spare Parts –**

The Supplier is required to provide all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the Supplier:

1. such spare parts as the Procuring Entity may elect to purchase from the Supplier, provided that this election shall not relieve the Supplier of any warranty obligations under this Contract; and
2. in the event of termination of production of the spare parts:
  - i. advance notification to the Procuring Entity of the pending termination, in sufficient time to permit the Procuring Entity to procure needed requirements; and
  - ii. following such termination, furnishing at no cost to the Procuring Entity, the blueprints, drawings, and specifications of the spare parts, if requested

The spare parts and other components required are listed in **Section VI (Technical Specifications)** and **Section VII (Schedule of Requirements/Bid Price Schedule)** and the costs thereof are included in the contract price.

The Supplier shall carry sufficient inventories to assure ex-stock supply of consumable spare parts or components for the Goods for the period specified in the Technical Specifications.

Spare parts or components shall be supplied as promptly as possible, but in any case, within three (3) months of placing the order.

**Packaging –**

The Supplier shall provide such packaging of the Goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in this Contract. The packaging shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packaging case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.

The packaging, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly

## SECTION V – SPECIAL CONDITIONS OF CONTRACT

	<p>provided for in the Contract, including additional requirements, if any, specified below, and in any subsequent instructions ordered by the Procuring Entity.</p> <p>The outer packaging must be clearly marked on at least four (4) sides as follows:</p> <p>Name of the Procuring Entity Name of the Supplier Contract Description Final Destination Gross weight Any special lifting instructions Any special handling instructions Any relevant HAZCHEM classifications</p> <p>A packaging list identifying the contents and quantities of the package is to be placed on an accessible point of the outer packaging if practical. If not practical the packaging list is to be placed inside the outer packaging but outside the secondary packaging.</p> <p><b>Transportation –</b></p> <p>Where the Supplier is required under Contract to deliver the Goods CIF, CIP, or DDP, transport of the Goods to the port of destination or such other named place of destination in the Philippines, as shall be specified in this Contract, shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.</p> <p>Where the Supplier is required under this Contract to transport the Goods to a specified place of destination within the Philippines, defined as the Project Site, transport to such place of destination in the Philippines, including insurance and storage, as shall be specified in this Contract, shall be arranged by the Supplier, and related costs shall be included in the contract price.</p> <p>Where the Supplier is required under Contract to deliver the Goods CIF, CIP or DDP, Goods are to be transported on carriers of Philippine registry. In the event that no carrier of Philippine registry is available, Goods may be shipped by a carrier which is not of Philippine registry provided that the Supplier obtains and presents to the Procuring Entity certification to this effect from the nearest Philippine consulate to the port of dispatch. In the event that carriers of Philippine registry are available but their schedule delays the Supplier in its performance of this Contract the period from when the Goods were first ready for shipment and the actual date of shipment the period of delay will be considered force majeure.</p> <p>The Procuring Entity accepts no liability for the damage of Goods during transit other than those prescribed by INCOTERMS for DDP deliveries. In the case of Goods supplied from within the Philippines or supplied by domestic Suppliers risk and title will not be deemed to have passed to the Procuring Entity until their receipt and final acceptance at the final destination.</p>
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SECTION V – SPECIAL CONDITIONS OF CONTRACT

	<p><b>Intellectual Property Rights –</b></p> <p>The Supplier shall indemnify the Procuring Entity against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the Goods or any part thereof.</p>
2.0	<p>The applicable Terms of Payment for this Contract is Clause 2.2, Item No. 3.</p>
2.2	<p>Advance payment not to exceed fifteen percent (15%) of the contract amount shall be allowed and paid within sixty (60) calendar days from effectivity of the contract and upon the submission to and acceptance by the Procuring Entity of an irrevocable letter of credit or bank guarantee issued by a Universal or Commercial Bank. The irrevocable letter of credit or bank guarantee must be for an equivalent amount, shall remain valid until the goods are delivered, and accompanied by a claim for advance payment.</p> <p>All progress payments shall first be charged against the advance payment until the latter has been fully exhausted.</p> <p>The terms of payment shall be as follows:</p> <p><b>1) For Supply and Delivery Pay items:</b></p> <p>(a) On Contract Effectivity: Advance payment of Fifteen percent (15%) of the total Contract Price shall be paid within sixty (60) days from effectivity of the Contract and upon submission of a claim and an irrevocable letter of credit or bank guarantee issued by a Universal or Commercial Bank for the equivalent amount valid until the Goods are delivered and in the form provided in Section VIII- Bidding Forms.</p> <p>(b) On Delivery: Eighty percent (80%) of the Contract Price of the <b>delivered Goods</b> shall be considered for payment, less the total amount of advance payment, if any and other deductions. If the amount is sufficient to fully recoup the advance payment, the remainder after deductions shall be paid to the Supplier within sixty (60) days after the date of receipt of the Goods and upon submission of the documents (i) through (vi) specified in the <u>SCC</u> provision on Delivery and Documents. Otherwise, the total delivery payment shall be charged against the advance payment and the remaining advance payment will be fully recouped from the succeeding claims.</p> <p>(c) On Acceptance: The remaining twenty percent (20%) of the Contract Price of the <b>delivered Goods</b> shall be paid to the Supplier within sixty (60) days after the date of submission of the acceptance and inspection certificate for the respective delivery issued by the Procuring Entity's authorized representative. In the event that no acceptance certificate is issued by the Procuring Entity's authorized representative within forty five (45) days after successful test and commissioning, if required, the Supplier shall have the right to claim payment of the remaining twenty percent (20%) subject to the Procuring Entity's own verification of the reason(s) for the failure to</p>



## SECTION V – SPECIAL CONDITIONS OF CONTRACT

	<p>issue documents (vii) and (viii) as described in the <u>SCC</u> provision on Delivery and Documents.</p> <p><b>2) For Supply, Delivery, Installation, Test and Commissioning Pay Items:</b></p> <p>(a) On Contract Effectivity: Advance payment of Fifteen percent (15%) of the total Contract Price shall be paid within sixty (60) days from effectivity of the Contract and upon submission of a claim and an irrevocable letter of credit or bank guarantee issued by a Universal or Commercial Bank for the equivalent amount valid until the Goods are delivered and in the form provided in Section VIII- Bidding Forms.</p> <p>(b) On Delivery: Eighty percent (80%) of the price of the <b>delivered Goods</b>, excluding price for installation, test and commissioning shall be considered for payment, less the total amount of advance payment, if any and other deductions. If the amount is sufficient to fully recoup the advance payment, the remainder after deductions shall be paid to the Supplier within sixty (60) days after the date of receipt of the Goods and upon submission of the documents (i) through (vi) specified in the <u>SCC</u> provision on Delivery and Documents. Otherwise, the total delivery payment shall be charged against the advance payment and the remaining advance payment will be fully recouped from the succeeding claims.</p> <p>(c) On Acceptance: The remaining twenty percent (20%) of the price of the <b>delivered Goods</b> plus price for installation, test and commissioning shall be paid to the Supplier within sixty (60) days after the date of submission of the acceptance and inspection certificate for the respective delivery issued by the Procuring Entity's authorized representative. In the event that no acceptance certificate is issued by the Procuring Entity's authorized representative within forty five (45) days after successful test and commissioning, the Supplier shall have the right to claim payment subject to the Procuring Entity's own verification of the reason(s) for the failure to issue documents (vii) and (viii) as described in the <u>SCC</u> provision on Delivery and Documents.</p> <p><b>3) For Supply, Delivery, Installation, Test and Commissioning Contracts where Installation, Test and Commissioning prices are included in the supply price:</b></p> <p>(a) On Contract Effectivity: Advance payment of Fifteen percent (15%) of the total Contract Price shall be paid within sixty (60) days from effectivity of the Contract and upon submission of a claim and an irrevocable letter of credit or bank guarantee issued by a Universal or Commercial Bank for the equivalent amount valid until the Goods are delivered and in the form provided in Section VIII- Bidding Forms.</p> <p>(b) On Delivery: Sixty percent (60%) of the price of the <b>delivered Goods</b> shall be considered for payment, less the total amount of advance payment, if any and other deductions. If the amount is sufficient to fully recoup the advance payment, the remainder after deductions shall be paid to the Supplier within sixty (60) days after the date of receipt of the Goods and upon submission of the documents (i) through (vi)</p>
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## SECTION V – SPECIAL CONDITIONS OF CONTRACT

	<p>specified in the <u>SCC</u> provision on Delivery and Documents. Otherwise, the total delivery payment shall be charged against the advance payment and the remaining advance payment will be fully recouped from the succeeding claims.</p> <p>(c) On Acceptance: The remaining forty percent (40%) of the price of the <b>delivered Goods</b> shall be paid to the Supplier within sixty (60) days after the date of submission of the acceptance and inspection certificate for the respective delivery issued by the Procuring Entity's authorized representative. In the event that no acceptance certificate is issued by the Procuring Entity's authorized representative within forty five (45) days after successful test and commissioning, the Supplier shall have the right to claim payment subject to the Procuring Entity's own verification of the reason(s) for the failure to issue documents (vii) and (viii) as described in the <u>SCC</u> provision on Delivery and Documents</p>
3.2	<ol style="list-style-type: none"> <li>1. The following must be indicated in the performance bond to be posted by the Contractor: <ol style="list-style-type: none"> <li>i. Company Name</li> <li>ii. Correct amount of the Bond</li> <li>iii. Contract/Purchase Order Reference Number</li> <li>iv. Purpose of the Bond: "To guarantee the faithful performance of the Principal's obligation to undertake <u>(Contract/Purchase Order Description)</u> in accordance with the terms and conditions of <u>(Contract No. &amp; Schedule/Purchase Order No.)</u> entered into by the parties."</li> </ol> </li> <li>2. The bond shall remain valid and effective until the duration of the contract <u>(should be specific date reckoned from the contract effectivity)</u> plus sixty (60) days after NPC's acceptance of the last delivery/final acceptance of the project.</li> <li>3. In case of surety bond, any extension of the contract duration or delivery period granted to the CONTRACTOR shall be considered as given, and any modification of the contract shall be considered as authorized, as if with the expressed consent of the surety, provided that such extension or modifications falls within the effective period of the said surety bond. However, in the event that the extension of the contract duration or delivery schedule would be beyond the effective period of the surety bond first posted, it shall be the sole obligation of the CONTRACTOR to post an acceptable Performance Security within ten (10) calendar days after the contract duration/delivery period extension has been granted by NPC.</li> <li>4. Other required conditions in addition to the standard policy terms issued by the Bonding Company: <ol style="list-style-type: none"> <li>i. The bond is a penal bond, callable on demand and the entire amount thereof shall be forfeited in favor of the Obligee upon default of the Principal without the need to prove or to show grounds or reasons for demand for the sum specified therein;</li> </ol> </li> </ol>

## SECTION V – SPECIAL CONDITIONS OF CONTRACT

	<p>ii. The amount claimed by the Obligee under this bond shall be paid in full and shall never be subject to any adjustment by the Surety;</p> <p>iii. In case of claim, the Surety shall pay such claim within sixty (60) days from receipt by the Surety of the Obligee's notice of claim/demand letter notwithstanding any objection thereto by the Principal.</p>
4	The inspections and tests that will be conducted are specified in the Technical Specifications.
5.2	The period for correction of defects in the warranty period shall not exceed thirty (30) days upon receipt of the notice from NPC.
6	<p>Aside from the Liquidated Damages, the PROCURING ENTITY shall also implement the following additional penalties:</p> <p><b>1. Penalty for Failure to Meet Guaranteed Rated Output</b></p> <p>Aside from the Liquidated Damages, the PROCURING ENTITY shall impose a penalty in case the Supplier fails to attain the guaranteed rated output of the diesel gensets.</p> <p>If the diesel gensets fails to attain the guaranteed kW output at site during the performance test as measured at the generator output terminals, a penalty shall be imposed to the Supplier for each diesel genset that failed to attain the guaranteed kW output, computed in accordance with the formula specified below:</p> $\text{Penalty/Unit} = \text{TCP} \times \left(1 - \frac{\text{ATRO}}{\text{GRO}}\right) \times 2$ <p>Where:</p> <p>TCP = Total Contract price for one DG Set (Item 1 of the Bid Price Schedule)</p> <p>ATRO= Actual Tested Rated Output of the DG Set at site corrected to ISO 3046 conditions</p> <p>GRO= Guaranteed Rated Output of the DG Set at ISO 3046 conditions</p> <p>2 = Penalty Constant</p> <p><b>2. Penalty for Failure to Meet Guaranteed Fuel Rate</b></p> <p>Aside from the Liquidated Damages and Penalty for Failure to Meet Guaranteed Rated Output, the PROCURING ENTITY shall impose a penalty in case the Supplier fails to attain the guaranteed fuel rate of the diesel gensets.</p> <p>The penalty to be imposed to the Supplier for each diesel genset that failed to attain the guaranteed fuel rate shall be in accordance with the formula specified below:</p> $\text{Penalty/Unit} = (\text{AFR} - \text{GFR}) \times \text{GRO} \times \text{PCF} \times 3427 \times 2$ <p>Where:</p> <p>AFR = Actual Fuel Rate for each DG Set at site corrected to ISO 3046 conditions, li/kW-hr</p> <p>GFR = Guaranteed Fuel Rate of the DG Set at ISO 3046 conditions, li/kW-hr</p>

## SECTION V – SPECIAL CONDITIONS OF CONTRACT

	<p><i>GRO =Guaranteed Rated Output of the DG Set at ISO 3046 conditions, kW</i>  <i>PCF = Prevailing cost of fuel per liter (delivered at site)</i>  <i>3427 =Number of operating hours for one (1) year period computed to be equal to 16 hours per day, 25 days PMS, 10% Outages and assumed 70% Utilization Factor</i>  <i>2 = Penalty Constant</i></p> <p><b>3. Penalty for Failure to Meet Transformer Guarantees</b></p> <p>Aside from the Liquidated Damages, Penalty for Failure to Meet Guaranteed Output and Penalty for Failure to Meet Guaranteed Fuel Rate, the PROCURING ENTITY shall also impose a penalty in case the Supplier</p> <p>The penalty to be imposed to the Supplier shall be in accordance with Section VI - Part I, Technical Specifications (Electrical Works).</p>
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# **PART I – TECHNICAL SPECIFICATIONS**

## **GW – GENERAL WORKS**

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**SECTION VI – TECHNICAL SPECIFICATIONS****PART I – TECHNICAL SPECIFICATIONS****GW - GENERAL WORKS****GW-1.0 GENERAL**

This section covers the general technical requirements for furnishing all labor, materials, supplies, tools and equipment in accordance with specifications contained herein and as shown on the accompanying drawings for the **Supply, Delivery, Installation, Test and Commissioning of 1x120 kW and 2 X 90 kW Modular Diesel Gensets and Associated Electrical Equipment for Tagubanhon DPP**.

All materials, equipment, devices and accessories to be supplied under this contract shall be new and unused, free from defects and imperfections and best suited for the purpose intended.

All equipment shall essentially be the standard products of the Manufacturer which best meets the conditions of sound engineering economy of manufacture and procurement of any necessary spare parts.

It is not the intent to specify completely herein all details of design and construction of the Works. However, the Works shall conform in all respects to high standards of engineering, design and workmanship, and shall be capable of performing its continuous commercial operation up to the Supplier's guarantees in a manner acceptable to NPC, who shall be entitled to reject any work or material which in his judgment is not in full accordance therewith.

The Supplier shall be fully responsible for its work in the design, manufacturing, assembly, documentation, reports, corrosion protection, shop testing, preparation for shipment, field testing and commissioning, warranty provisions and compliance with the applicable codes and standards and the requirements of this specification.

All necessary corrections and deviations from the specification of the equipment arising either from error in the workmanship or design made by the Supplier/Manufacturer with the resulting extra expenses and related damages shall be solely charged to the account of the Supplier.

The Supplier shall strictly observe the general requirements of this specification (General Works) in conjunction with the specific requirements described in the relevant specific technical specifications (Mechanical, Electrical and Civil Works). The specific technical specifications shall take precedence over the general requirements (General Works) in case of any inconsistency.

**GW-1.1 Project Description**

The Project calls for site development as required for the supply, delivery, installation/erection, test and commissioning of 1 x 120 kW and 2 x 90 kW Diesel Generator Sets and auxiliaries including its associated electrical equipment.

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Each generating set shall be designed for Prime Duty operation as defined in ISO 8528, capable of delivering the required Guaranteed Prime Rated Power of not less than 1 x 120 kW and 2 x 90 kW measured and/or adjusted to the Reference Site Conditions in Clause MW-4.1 of the Mechanical Works specifications.

Each diesel engine shall be designed to burn on diesel fuel oil with characteristics as specified in the relevant section of this specification.

Each diesel generating set shall be fully enclosed in a sound attenuated and weatherproof enclosure designed to provide a sound pressure level of not more than 85 dBA at 1-meter distance measured at any point of the unit.

Each generating set shall be provided with separate Generator Control and Protection Panel to be installed in the existing control room.

The new generating sets and associated electrical equipment shall be installed in the area as shown on the drawings. The new generating sets shall be designed to operate in parallel with the new and/or existing generating sets.

**GW-1.2 Project Location**

The project which consists of 1 x 120 kW and 2 x 90 kW diesel engine generating sets and associated electrical equipment shall be located in existing plant site at Sitio Palina Grande, Barangay Bangongon, Tagubanhon Is., Concepcion, Iloilo.

Means of transportation going to Barangay Bangongon, Tagubanhon Island is by boat from fish port in Poblacion, Concepcion, Iloilo. Land travel by bus and rental service is available from Iloilo port, Barangay Loboc, Iloilo City to fish port in Poblacion, Concepcion, Iloilo. Means of transportation from Manila shall be by boat from port of Manila to port of Iloilo, Barangay Loboc, Iloilo City.

**GW-1.3 Project Duration**

The Supplier shall complete the works as specified within **Two Hundred Forty (240) Calendar Days** which shall become effective from receipt of the Notice to Proceed. The total contract period is inclusive of twenty (20) rainy/unworkable days, considered unfavorable for the execution of works at each site.

## SECTION VI – TECHNICAL SPECIFICATIONS

**GW-2.0 SCOPE OF WORK****GW-2.1 General**

It is not the intent of this specification to specify all technical requirements or to set forth those requirements covered by applicable codes and standards. The Supplier shall furnish high quality work, materials and equipment meeting the requirements of this specification and industry standards and shall be capable of performing and meeting the Supplier's guarantees in a manner acceptable to NPC, who shall be entitled to reject any work or material which in his judgment is not in full accordance therewith.

The Supplier/Manufacturer shall have an established local service center (owned or accredited in the Philippines) with experienced technical personnel that will promptly and efficiently cater to the repair and maintenance requirements of the supplied unit/s during the warranty period.

The Supplier shall be responsible for visiting each project site and thoroughly investigate and familiarize himself with all the conditions at site, the surrounding area and take particular reference to its accessibility, means of communication and transportation, determine possible sources of materials and equipment to be supplied/utilized during the project execution, verify the actual scope of works and relative costs, and all other factors that could hamper the smooth execution of the contract.

The Supplier shall also be responsible to assess and determine all and every work and service although not specifically detailed but are deemed required to fully complete the work and placing ready for the safe and reliable operation of the diesel generating sets and associated electrical equipment. Relative costs of any additional works or materials which the Supplier deemed required or necessary to complete the works shall be included in the bid proposal.

Any and/or all expenses arising through the lack of knowledge or understanding regarding the existing conditions of each site shall be the responsibility of the Supplier and no additional payment thereof shall be made by NPC.

Any discrepancies of the scope of work specified in this section with those specified in the relevant specific technical specifications (Mechanical, Electrical and Civil Works), the specific technical specifications shall govern. However, anything mentioned in the specific technical specifications and not shown on the drawings, or shown in the drawings but not mentioned in the specifications but which are obviously necessary to make a complete installation shall be considered under the Supplier's Scope of Works.

The Supplier's scope of work under this Project shall generally consist of the following:

- a) Design, manufacture, factory test, deliver, installation of electro-mechanical equipment, associated auxiliaries and electrical equipment;
- b) Delivery of labor and supervision, materials and supplies, tools and equipment for the construction of civil works including detailed design

of associated civil/structural works for all equipment to be supplied by the Supplier and as specified herein;

- c) Inspection, test and commissioning of equipment and machinery to ascertain that they are functioning in accordance with the contract provisions and guarantees.
- d) Training of NPC personnel covering electrical, mechanical, instrumentation and control systems, troubleshooting including the supply of manufacturer's software needed in programming the genset control setting and electro/digital governing system including other digital components that require exclusive programs from the Manufacturer with free update throughout the operating life of the generating set.

The Supplier also provide all other related works not specifically mentioned in the Specifications but are necessary to complete the Works so as to be ready for commercial operation in accordance with the intent of the Contract. It is understood that all costs pertinent thereto are included in the Schedule of Requirements.

The scope of works shall consist of the design, furnishing/supply, delivery, installation, test and commissioning of modular diesel engine-generator sets and auxiliaries, electrical equipment and associated civil works, but not limited to the following:

#### **GW-2.2 Mechanical Works**

- a) One (1) x 120 kW and Two (2) x 90 kW (Guaranteed Prime Power Output) Modular Diesel Generating sets, 1800 rpm maximum, In-line multi-cylinder arrangement, 480 V, 3-phase, 60 Hz, each equipped with turbocharger and air-to-air charged air cooler, electronic governor, direct injection, sound attenuated and weatherproof enclosure and complete with auxiliary equipment, engine mounted selective control/monitoring and protection panel, battery system with charger, including anchor/foundation bolts and other devices/accessories as described in the relevant technical specifications.
- b) 1,000L elevated fuel day tank for each generating set, complete with accessories, associated structural supports, isolation valves, 50 liters per minute @ 10 meters discharge head cast iron double acting rotary hand pump with flexible hose of appropriate materials and size, instruments and other accessories as shown on the bid drawings. The fuel day tank shall be provided with high and low level alarm contacts for annunciation in the generator control and protection panel;
- c) One (1) lot of Piping Materials complete with valves, fittings, supports and accessories, interconnection works with the common piping and existing piping systems (fuel oil storage tank & fuel oil day tanks' supply/filling, cooling water make-up supply/filling and engine fuel supply/return from/to fuel day tank), waste oil piping to existing oil-water separator and engine smoke stack/pipe and associated

structural steel supports, including any required excavation and backfilling works;

- d) Fuel oil, lubricating oil, lubricants, coolant, chemicals and other consumables required during initial filling, test and commissioning at site.

Cost of fuel consumed during the start-up, pre-testing/pre-commissioning and re-test of the performance test shall be borne by the Supplier. Fuel used/consumed during the performance and reliability tests (where generated energy are already exported to the grid/consumers) shall be supplied by NPC;

- e) Furnish measuring and testing instruments, tools and devices to be used during the test and commissioning;

- f) Supply and delivery of all required spare parts including labor and travel time necessary for repair works (consumables are by supply and delivery only) during the warranty period.

The supply shall include all spare parts specified in the technical specifications and Technical Data Sheets including replacement parts which are consumed during the test and commissioning;

- g) Supply and delivery of standard and special tools as specified in the specification or technical data sheets and other necessary tools as recommended by the manufacturer including tool box required for start-up, test and commissioning, operation and normal/overhaul maintenance. It shall include Portable Computer for diagnostic and programming the genset control setting complete with licensed software of genset control system and electronic/digital governing system including other digital components that require exclusive programs from the Manufacturer and/or Supplier;

- h) Hydrostatic testing of field-installed piping systems under the presence of NPC;

- i) Conduct test and commissioning of the diesel generating sets and its auxiliaries including associated electrical equipment in accordance with the approved test procedure submitted by the Supplier. It shall include compiling, recording and submitting test reports to NPC.

The Supplier may request NPC to provide operations and maintenance personnel to assist the Supplier during the conduct of the test and commissioning.

The Supplier shall provide highly qualified and experience technical personnel/engineers during the test and commissioning;

- j) All other required works to complete the project.

**SECTION VI – TECHNICAL SPECIFICATIONS****GW-2.3 Electrical Works**

- a) Supply, Installation and Test of 1 x 120 kW, 480V, 3-phase, 60 Hz AC Generator and associated auxiliary electrical equipment including grounding materials;
- b) Supply, Installation and Test of 2 x 90 kW, 480V, 3-phase, 60 Hz AC Generator and associated auxiliary electrical equipment including grounding materials;
- c) Supply, Installation and Test of Generator Control and Protection Panel (GCPP) for 1 x 120 kW D/G set equipped with monitoring, metering, control, protection and synchronizing equipment/devices;
- d) Supply, Installation and Test of Generator Control and Protection Panel (GCPP) for 2 x 90 kW D/G set equipped with monitoring, metering, control, protection and synchronizing equipment/devices
- e) Supply of One (1) Spare Circuit Breaker for 120 kW D/G Set;
- f) Supply of One (1) Spare Circuit Breaker for 90 kW D/G Set;
- g) Supply, Installation and Test of 1 x 150 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
- h) Supply, Installation and Test of 2 x 112.5 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
- i) Supply, Installation and Test of 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
- j) Supply, Installation and Test of Bus Conductor and Line Materials and Hardware;
- k) Supply, Laying and Test of Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the interfacing of supplied equipment;
- l) Supply and Installation of Electrical Conduit and cable tray system;
- m) Supply, Installation and Test of grounding conductors, ground connectors, ground rods and other accessories required for the interfacing of all equipment to the existing grounding system;
- n) Construction of New Cable Trench/es;
- o) Supply, Delivery and Test of Two (2) sets of Job Site Cameras to be installed before the start of construction and/or installation of equipment; and
- p) All other works and services including those not specifically detailed herein but are required to fully complete the project.

**GW-2.4 Civil Works**

- a) Mobilization, demobilization, clean-up, provision of temporary office & housing and storage, and all miscellaneous works required for the implementation of the project;

**SECTION VI – TECHNICAL SPECIFICATIONS**

- b) Site development and grading to required elevations of designated areas/equipment location for modular generating sets and transformers in accordance with the details shown on the drawings;
- c) Design and construction of new reinforced concrete foundations for modular gensets and control panels, transformers including anchor bolts/machine bolts to ensure proper anchoring and installation. Design calculations and detailed drawings shall be submitted for NPC's review and approval prior to construction;
- d) Structural excavation and backfill for foundations of modular diesel generating set/s and its auxiliaries, transformers, fuel oil day tanks and its structural supports and for all miscellaneous Balance-of-Plant (BOP) structures required;
- e) Concreting works, including fabrication (cutting/bending) and installation of reinforcement, for foundations of modular diesel generating set/s and its auxiliaries, transformers, fuel oil day tanks and its structural supports and for all miscellaneous Balance-of-Plant (BOP) structures required;
- f) Fabrication and erection/installation of structural steel supports for fuel oil day tanks;
- g) Laying of gravel at the genset area;
- h) Supply and erection of one (1) lot of steel pole/s complete with appropriate steel cross arms, braces and structure dressing as specified and/or as shown on the bid drawings;
- i) Demolition of any existing structures or facilities as may be required or as shown on the drawings/photos and disposal of demolished materials and equipment at the area within the plant or as designated by NPC plant management; and
- j) All other works and services required to complete the project

**GW-2.5 Other Works and Services**

- a) Conduct actual inspection at project site and make assessment on the physical conditions of any existing equipment and facilities to be affected by the works (such as cable trench and associated cables and trays including terminal points, interconnection points for fuel supply and cooling water supply lines), determine possible sources of materials and equipment to be supplied/utilized during project execution, and verify the extent of the scope of works required for the proper installation and reliable operation of the generating sets and associated equipment.

NPC-SPUG plant personnel shall extend any assistance that the Supplier may require during his inspection/assessment (such as dimensional measurement, megger and wiring continuity test, etc.) at each site including existing facilities;



- b) Conduct training of NPC plant operator at site who will be assigned to operate and maintain the diesel generating sets regarding proper operation, preventive maintenance and troubleshooting including proper maintenance during standby condition.

The training program shall be conducted by expert/s who are knowledgeable and well-trained by the genset manufacturer or his authorized distributor;

- c) Provide the services of competent engineer/s and/or technical staff/s from the equipment Manufacturer/Supplier or his authorized local representative to be assigned at plant to conduct relative activities during the period of test and commissioning.

The services shall include plant visits of not less than two (2) days in two (2) separate visits which will coincide on the first two (2) scheduled periods of preventive maintenance (every 250 hours or per manufacturer's recommended hours) of at least one generating set during the warranty period to perform the services as described in the relevant clause of this specification. This shall include any maintenance/repair services rendered upon request of NPC in the event of any abnormality occurs within the warranty period. The costs of said services shall be included in the bid price proposal;

- d) After contract award and prior to procurement/contract implementation, submit five (5) sets of drawings and documents for approval of materials and equipment such as dimensioned assembly drawings of generating sets and its auxiliary equipment, sound attenuated and weatherproof enclosure, schematics and wiring diagrams, control and protection panels, transformers, interconnecting diagrams identifying terminal numbers, test procedures, training program, draft of O & M manuals and other documents specified in Clause GW-6.3.

Seven (7) sets of Approved Operation and Maintenance Manuals per Plant site that include Part List and Preventive Maintenance Schedule during the life span of the generating sets shall be submitted prior to test and commissioning;

- e) Corrosion protection and painting;
- f) Provide Labels or Standard Plant Identification Number (SPIN) for all equipment, valves, piping and instruments supplied;
- g) Clean up of work areas after the completion of works covered by the contract; and
- h) Other works and services as specified in the relevant specifications including those that are not specifically detailed herein but are required to fully complete and placing ready for the safe and reliable operation of the Diesel Generating sets.

**GW-3.0 DESIGN AND DUTY CONDITIONS****GW-3.1 Site Conditions**

The Supplier shall be responsible for visiting the plant site and thoroughly investigate and familiarize himself with all the conditions at each site, the surrounding area and take particular reference to its accessibility, means of communication and transportation, and all other factors that could hamper the smooth execution of the contract.

Any and/or all expenses arising through the lack of knowledge or understanding regarding the existing conditions of the site shall be the responsibility of the Supplier and no additional payment thereof shall be made by NPC.

The conditions stated below shall be taken into consideration in the design, manufacture and selection of the equipment and materials to be supplied by the Supplier, unless otherwise specifically indicated in the relevant technical specifications.

Elevation above sea level	:	0 to 500 M
Ambient temperature	:	up to 45°C
Barometric pressure	:	0.974 - 1.03 kg/cm <sup>2</sup> abs
% Relative humidity	:	up to 85 %
Design for seismic loads	:	Seismic zone factor 0.4
Max. wind velocity	:	250 km/hr and/or as specified in the latest edition of National Structural Code of the Philippines

There are two (2) pronounced seasons in the province, the dry and wet season. The wettest months are from July to November. The other months of the year are generally dry with occasional rain showers.

The prevailing atmospheric condition is generally warm, humid, and salt laden.

**GW-3.2 Earthquake and Wind Design Requirements**

Plant and equipment may be subjected to both horizontal and vertical seismic induced accelerations of 0.40 g. or more depending on:

- a) Natural period and mode of vibration
- b) Damping (inherent or specifically provided)
- c) Manner of failure (ductile or brittle)
- d) Location (at ground level or at a higher level)

The plant and equipment required under this contract shall meet the seismic design requirement for earthquake conditions to conform with the latest edition of National Structural Code of the Philippines.

It is evident from the design response spectra that the degree of response varies markedly with the period of vibration. It is essential, therefore, that any equipment, or its supporting structure which has modes of vibration or

**SECTION VI – TECHNICAL SPECIFICATIONS**

components with modes of vibration with a natural period longer than 0.1 second be identified.

Provision shall be made for seismic movement by providing seismic movement joints between components which are interconnected and may have different vibratory characteristics. These joints shall be capable of withstanding the sum of the maximum deflection of each component resulting from a design earthquake.

The plant and equipment under this contract shall meet the requirements for a wind velocity of not less than 250 km/hr gust and/or as specified in the latest edition of National Structural Code of the Philippines.

**GW-3.3 Sound Control**

The Supplier shall ensure that the sound level of equipment covered by this specification, including those equipment and tools to be used during the performance of his works, are within the permissible limits for personnel as defined in DOLE's Occupational Safety & Health Standards for Noise and contractual requirements for overall plant noise levels.

The sound pressure level for the modular diesel generating set and auxiliary equipment shall not exceed 85 dBA measured at 1 meter distance from any point around the unit's enclosure or source. Sound pressure levels shall be indicated in the Suppliers proposal for review and evaluation by NPC.

If the Supplier expects the maximum sound level of the equipment to exceed the specified level at a distance of 1 meter, the Supplier shall use acoustical treatment features, subject to NPC's review and acceptance, to achieve the sound control design objectives.

**GW-3.4 Emission Standards**

The diesel-generating units shall also comply with the Emission Standards of the Philippine Clean Air Act, including but not limited to the following:

<b>Pollutant</b>	<b>Max. Permissible Limit (mg/Ncm)</b>	<b>Method of Sampling</b>	<b>Method of Analysis</b>
NOx	2000 as NO <sub>2</sub>	USEPA Methods 1 thru 4 & Method 7	Phenol-disulfonic Acid Method or as per sampling method
SOx	700 as SO <sub>2</sub>	USEPA Methods 1 thru 4 & Method 6 or 8 as appropriate	As per sampling method
CO	500 as CO	USEPA Method 3 or 10	Orsat Analysis or NDIR
Particulates	200	USEPA Methods 1 through 5	Gravimetric per sampling method

**SECTION VI – TECHNICAL SPECIFICATIONS****GW-3.5 Fuel Specifications Requirement**

The basic specification for the diesel fuel oil to be used by the diesel engine unit will be as follows:

Property	Unit	ASTM Method	Min.	Max.
1. Density @ 15 C	kg/L	D-1289	0.82	0.88
2. Kinematic Viscosity @ 40 °C	cSt	D-445	1.7	5.5
3. Flash point	°C (°F)	D-93	55(131)	
4. Pour Point	°C (°F)	D-97		10 (50)
5. Cloud Point	°C (°F)	D-2500		16 (60.8)
6. Ash	% wt.	D-482		0.01
7. Sulfur	% wt.	D-4294/D-129		0.3
8. Water & Sediment	% vol.	D-2709		0.1
9. Water Content (by distillation)	% vol.	D-95		0.1
10. Calorific Value				
HHV	BTU/lb	D-240/D4868	19,600	
LHV	BTU/lb	D-4809	18,400	
11. Others				
a) Distillation Temperature 90% Recovery	°C	D-86		370
b) Carbon Residue, 10% Bottoms	% wt.	D-4530-85		0.35
c) Cetane Index		D-976	45	
d) ASTM Colour		D-1500		5.0
e) Sediment (by extraction)	% wt.	D-473		0.01
f) Copper strip corrosion, 3 h at 50 °C		ASTM D-130		No. 1
g) FAME content	% vol.	PNS EN 14078 modified	1.7	
h) Methyl laurate (C12 ME)	% wt.	PNS EN 14331 modified	0.8	
i) Free Water	% vol.			1.0

Although this is the base specification that will be used for Performance Test, NPC prefers that the engine be able to run on a wide range of fuels.

**GW-3.6 Torsional Critical Speeds**

The Supplier shall ensure that the torsional vibration conditions of the units under dynamic conditions are satisfactory. Calculations shall be produced, if called for, showing the torsional vibrational stresses in the engine crankshaft, generator and exciter shafts resulting from torsional critical speeds.

## SECTION VI – TECHNICAL SPECIFICATIONS

**GW-3.7 Plant Operating Characteristics**

Each diesel engine generator unit shall be capable of providing the specified **prime power output** as defined in ISO 8528, under the most adverse ambient condition as specified in the technical specifications.

Speed and voltage control systems shall be designed to maintain the frequency and voltage within acceptable limits for the following loading conditions:

- a) Under steady state (i.e., slowly changing) conditions, the frequency and voltage shall be maintained within one half percent of rated or set value, respectively.
- b) At no time during any loading sequence shall the voltage fall below 85 percent of rated value and the frequency fall below 95 percent of rated value.
- c) Rejection of the total short time capability load shall not cause an overspeed trip nor shall rejection of the largest single load, when the unit is carrying the maximum load, cause a speed rise in excess of 15% of rated speed.

The governor and excitation control systems shall be designed to permit the operation of the unit either isolated or in parallel with the system specified herein, without exceeding the active and reactive power limitations of the engine and generator.

Each diesel generator unit shall be designed for remote start-up and speed control including automatic and manual control. It shall be equipped with all necessary instrumentation to provide adequate monitoring and control of the unit under all operating conditions including "standby".

The start-up operation of the unit shall generally be performed remotely from the generator control and protection panel (to be installed in the existing control room) with provision of selective manual operation of the diesel generator set and applicable auxiliary equipment from the local control panel mounted/installed (per manufacturer's standard) on the genset skid.

Each diesel-generator unit shall be capable of operation at fraction of its rated speed and at no load for reasonable periods of time as recommended by the Manufacturer. If the speed at which idle operation is permissible is lower than the rated speed, the Supplier shall state both the idle speed and the minimum load required at rated speed for satisfactory operation of the unit.

During the above condition, engine and generator design, i.e. overspeed, over & under frequency capability & relay setting, must be fully coordinated and made compatible with the generator excitation limits to ensure that the generator does not suffer damage due to over excitation, continuous field flashing and other frequency related events.

Each engine shall be capable of starting from the "cold" condition, and of operating for specified time (to be specified by the Supplier) under load, without AC power available for motor-driven auxiliaries, if applicable.

Vibration and over-speed requirements shall be met by the diesel-generator unit as follows:

- a) Harmful vibration stresses shall not occur during acceleration, deceleration and at rated speed.
- b) Harmful torsional vibration stresses shall not occur within a range from 10 percent below rated idle speed and from 5 percent above to 5 percent below rated synchronous speed.
- c) Moving parts shall be designed to withstand, without damage, the level of overspeed that is caused by the following:
  - c.1 Full short-time load rejection; plus
  - c.2 Margin to allow the overspeed device to be set sufficiently high to guarantee that the unit will not trip on full short time load rejection.

As minimum, the generator, exciter and flywheel shall be designed to withstand an overspeed of 25 percent of the rated speed without damage.

#### **GW-3.8 Power System Characteristics**

The generating sets to be supplied shall be capable of parallel operation both at regulation and base load with the existing generator set/s of different make/manufacturers and rating/s or to the existing power system.

The power system with which parallel operation may be required shall have the following characteristics:

- a) Voltage variation:  $\pm 5\%$  Nominal Voltage: 480 volts, 3 phase
- b) Frequency variation:  $\pm 5\%$  Nominal Frequency: 60 Hz

#### **GW-3.9 Service Life**

The diesel-generator unit and its auxiliary equipment shall be designed based on a minimum service life of ten (10) years or 61,000 running hours. Components for which ten (10) years life expectancy cannot reasonably be assured shall be designed and installed to permit safe and convenient replacement.

**SECTION VI – TECHNICAL SPECIFICATIONS****GW-4.0 MATERIALS AND EQUIPMENT****GW-4.1 General**

All materials, equipment, devices and accessories to be supplied under this contract shall be new and unused, free from defects and imperfections and best suited for the purpose intended. Materials used in the manufacture and installation of all equipment to be furnished shall be of the required quality used in commercial products of reputable manufacturers.

All materials shall comply with the latest revisions or editions of the specified standards for each material specification unless otherwise specified or permitted by NPC. The materials selected shall be appropriately matched to other items complying with all applicable regulations, quality and dimension standards. All materials or components used shall be tested in conformance with the applicable specifications and purchased with certified mechanical and chemical properties.

The names of manufacturers of equipment and articles contemplated for incorporation in the work together with performance capacities and other significant information pertaining to the equipment shall be furnished for approval. Equipment or articles supplied or used without such approval shall be at the Supplier's risk of subsequent rejections.

The equipment and materials to be furnished under this specification shall be essentially the current standard products of the respective manufacturer regularly engaged in the production of such equipment and materials. It shall be designed and manufactured for maximum safety and reliability in accordance with quality specifications.

Original brochures, catalogues and other related technical data sheets of materials and equipment to be supplied by the Supplier under this contract, in binder with cover, shall be submitted with the bid by the Supplier and/or for NPC's review and approval prior to fabrication.

Certified mill test reports as required in the relevant sections of this specification and the governing codes and standards shall be furnished by the Supplier for NPC's record. Copies of each mill test report shall be submitted to NPC prior to fabrication of materials covered.

The relative experience of the Manufacturer in the business of manufacturing the equipment and materials shall not be less than the number of years specified in the relevant specifications. Experience less than what is required will be ground for rejection.

**GW-4.2 Applicable Codes and Standards**

All equipment and materials to be furnished shall be in accordance with, but not limited to, the latest codes and standards issued by the following authorities:

ABS	American Bureau of Shipping
ANSI	American National Standard Institute
ASME	American Society of Mechanical Engineers

ASTM	American Society for Testing and Materials
AWS	American Welding Society
BSI	British Standards Institute
CE	European Commission
CSA	Canadian Standard Association
DEMA	Diesel Engine Manufacturer's Association
DIN	Deutsches Institut für Normung
FM	Factory Mutual Engineering
HIS	Hydraulic Institute Standards
IBC	International Building Code
ICS	General Standards for Industrial Control and Systems
	MG-1 Motors and Generators
	MG-2 Safety Standard for Construction & Guide for Selection, Installation and Use of Electric Motors and Generators
IEC	International Electrotechnical Commission
	60044 Instrument Transformer
	60071 Insulation Coordination
	60060 High Voltage Test Technique
IEEE	Integrated Institute of Electrical Engineers
ISO	International Organization for Standardization
	9001 Quality Management System
JEC	Japanese Electrotechnical Committee
JEM	Japan Electrical Manufacturer's Association
JIS	Japanese Industrial Standard
LR	Lloyd's Register
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
	MG 1 Standard for Motors and Generators
	WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
	ICS2 Industrial Controls and Systems: Controllers, Contactors and Overload Relays rated 600 Volts
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
	272 Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables
NKK	Nippon Kaiji Kyokai
OHSAS	Occupational Health and Safety Assessment Series
PEC	Philippine Electrical Code
SSPC	Steel Structures Painting Council
TEMA	Standards for the Tubular Exchanger Manufacturers Association



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<b>UL</b>	<b>Underwriter's Laboratories</b>
44	Rubber-Insulated Wires and Cables
508A	Industrial Control Equipment
2200	Standard for Stationary Engine Generator Assemblies

Generating Set Model should be certified by any of the following internationally recognized certifying body/organization: CSA, UL, JIS, CE, LR, GL, NKK and ABS. Accordingly, supporting documents shall be submitted by the Bidder during the contract implementation.

In addition to the above codes and standards, the Supplier shall comply with all applicable national and local laws, codes, regulations, statutes, and ordinances.

Other internationally recognized national standards may be accepted, such will guarantee a quality not inferior to that guaranteed by the above standards. The list of these alternative standards which the Bidder proposes to adopt must be attached to his Bid for acceptance. In every case, Bidders must list fully the standards they will conform to for this Contract.

In case of conflicting requirements between authorities cited above or between authorities cited and those specified, such disagreement shall be resolved by NPC and its decision shall be final. The responsibility shall be on the Bidder to show the suitability of any alternative standard he may wish to use.

All units, dimensions and calculations shall be in metric system.

**GW-4.3 Test of Materials**

All materials, parts and assemblies to be used shall be tested conforming to the latest specifications and provisions of approved Standards of Testing Materials. Results of the test shall be made to provide means of determining compliance with the applicable specifications. When requested, all test or trials shall be made in the presence of NPC or his duly authorized representative.

All units, dimensions and calculations used for the project under this contract shall be in metric.

**GW-4.4 Tropical Serviceability****GW-4.4.1 General**

In choosing materials and their finishes, due regard shall be given to the humid tropical conditions under which the equipment is to work. Cubicles used for switchgear and control cabinets in outdoor plant shall be vermin-proof and fungus-proof. Some relaxation of the following provisions may be permitted where equipment is hermetically sealed but it is preferred that tropical grade materials should be used wherever possible.

Totally enclosed motors and enclosures containing electrical control and switching equipment and instrument for outdoor installations shall be

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equipped with temperature controlled electrical heaters. The construction of the enclosures and installation of heaters shall be as to ensure effective circulation of air while ensuring that no damage to equipment occurs due to overheating.

**GW-4.4.2 Metals**

Iron and steel are in general to be galvanized or painted, as appropriate. Small iron and steel plate (other than SUS 316 stainless steel) of all instruments and electrical equipment, the cores of electromagnets and the metal parts or relays and mechanisms are to be treated in an approved manner to prevent rusting. Cores or other components which are laminated, or which cannot be rust-proofed, shall have all the expected parts thoroughly cleaned and heavily enameled, lacquered or compounded.

**GW-4.4.3 Screws, Nuts, Springs, Pivots, etc.**

The use of iron and steel is to be avoided in instruments and electrical relays wherever possible. Steel screws, when used, are to be zinc, cadmium or chromium plated or, when plating is not possible owing to tolerance limitations, are to be of corrosion-resistant steel. All wood screws are to be of dull nickel-plated brass or of other approved finish.

Instrument screws (except those forming part of a magnetic circuit) shall be stainless steel or cadmium plated steel. Springs are to be of non-rusting materials, e.g. phosphor bronze or nickel silver, as far as possible.

Pivots and other parts for which non-ferrous material is unsuitable are to be of approved rustless steel where possible.

**GW-4.4.4 Fabrics, Cork, Paper, etc.**

Fabrics, cork, paper and similar materials, which are subsequently to be protected by impregnation, are to be adequately treated with an approved fungicide. Fabrics treated with linseed oil or linseed oil varnishes shall not be used.

**GW-4.4.5 Adhesives**

Adhesives are to be specially selected to ensure that the type to be used shall be impervious and resistant to attack of mildew and insects. Synthetic resin cement only shall be used for joining wood.

**GW-4.5 Interchangeability**

The Diesel engine-generator sets and its associated auxiliary equipment shall be of the same Brand/Model to allow interchangeability and easy procurement of spare parts.

Corresponding parts throughout shall be interchangeable and shall perform in identical manner if fitted in another unit. Likewise, all spare parts must fit accurately in place without additional machining and shall perform in no inferior manner to the original part.

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**GW-4.6 Workmanship**

Workmanship shall be of first class quality and in accordance with the best modern engineering practice for the manufacture, assembly, test and commissioning of equipment, notwithstanding any omissions from the specifications and drawings. To have quality workmanship, only technicians skilled in their respective trades shall be employed.

**GW-5.0 EQUIPMENT MARKING, LABELING & MISCELLANEOUS REQUIREMENTS****GW-5.1 Nameplates**

All equipment and auxiliaries to be supplied by the Supplier under this contract shall be provided with 1 mm thick of stainless steel or approved equivalent corrosion-resistant nameplate with clearly legible writing of approved size and pattern which shall be permanently attached to each assembled piece of equipment at an easily visible location subject to approval by NPC.

Nameplates generally contain the brief technical specifications or characteristics of each component or equipment has been designed to operate and shall include the following: manufacturer's name, type of equipment, serial number, year of manufacture, weight, Standard Plant Identification Number (SPIN) if assigned/designated by NPC or indicated on drawings and other relevant information in compliance with applicable standards. Nameplate of the generating set shall also indicate the "Prime" and/or allowable "Continuous" kW Ratings. Any special instructions shall also be shown and suitably attached, as much as practicable, to the equipment or other visible location near the subject equipment.

For other major components, i.e. pumps, motors, etc., the following shall be added: rated horsepower, speed, total head, capacity, direction of rotation and any other pertinent information.

Nameplates for panels, boards, etc. shall be made of laminated black and white plastic. The lettering shall be bold-engraved through the black layer so that the letters appear white.

Each equipment and plant areas (engine room, switchyard area, etc.) wherever necessary, shall be provided with cautionary and warning plates and signs in accordance with the prescribed ANSI/IEEE or equivalent IEC Standards for the particular equipment.

Nameplates shall be attached by screws, the use of glue is only permitted for fixing labels on inside of a panel where screws are not applicable due to physical size of equipment.

Nameplates, labels and warning plates shall be in English.

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**GW-5.2 Labels**

Labels contain only the Standard Plant Identification Number (SPIN) of each component or equipment for maintenance management and record purposes. In case SPIN is already factory fixed in the nameplate, labels are no longer required.

Labels for pumps and other rotary equipment shall be securely attached or installed adjacent to the equipment or as directed by NPC. For large equipment, i.e. tanks, piping, etc, the labels may be printed directly on the equipment's external surface which shall be fixed at readily visible locations. In addition to labels, a direction of flow for pipelines shall also be identified by arrows painted with color different from the pipe base color. Size of labels varies with the size of the equipment.

All valves shall be provided with suitable labels attached to the valve handwheel and engraved in it the valve number or SPIN and other inscriptions as applicable. Valve body mounted shall be applied where handwheel top mounted labels are not applicable.

Labels shall be provided on both front and rear sides of MCC's, boards, panels, etc.

Standard Plant Identification Number (SPIN) for instruments and other devices shall also be provided and inscribed in the label or nameplate as applicable.

Labels shall be secured by screws or by flexible wires if screws are not applicable such as for valves, instruments, etc.

**GW-5.3 Tag Numbers/Standard Plant Identification Number (SPIN)**

Tag Numbers or SPIN for all supplied equipment and materials shall be provided by the Supplier.

Tag Numbers/SPIN are designation codes which shall be used to achieve uniformity and standardization in identifying each component and equipment for installation, maintenance, documentation and record purposes. The Tag Numbers/SPIN shall be clearly inscribed in a stainless steel or equivalent corrosion resistant metal in accordance with the NPC Standard Specifications.

Tag Numbers/SPIN are generally specified or indicated on the Bid drawings. In case of supplied equipment, valves, instruments or devices are not designated with tag numbers or SPIN, the Supplier shall assign a number subject to the approval of NPC.

**GW-5.4 Erection Marks**

All members comprising multi-part assemblies are to be marked with distinguishing numbers and/or letters corresponding to those of the approved drawings or material lists. These erection marks, if impressed before painting or galvanizing, shall be clearly readable.

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Color banding of a code approved by NPC is to be employed to identify members of similar shape or type but of differing strengths or grades.

**GW-5.5 Locks**

Where locks are called for in the Specification, they shall be of the barrel type. Whenever possible, they shall be incorporated in the appropriate door handle. Padlocks will be acceptable on valves and are preferred for all outdoor equipment.

In general, all locks shall be supplied with three keys, and all locks and keys are to be non-interchangeable. However, in the case of an electric switchboard containing a number of lockable doors, all locks shall be operated by one key. In all other cases where a set of locks is provided under any section of the equipment, a group master key shall also be supplied. Where a group of locks is supplied under any part of the Contract, a key cabinet is to be supplied for the accommodation of all padlocks and/or keys while not in use. Padlocks and keys are to be engraved with a suitable identifying code or inscription and this is to be repeated in the cabinet on engraved labels.

**GW-5.6 Guards**

Protection guards shall be provided for rotating components such as coupling, drive shafts, fans, etc. These shall comply with ANSI Standard B15.1, Safety Code for Mechanical Power Transmission Apparatus.

**GW-5.7 Lifting Lugs**

Each item of equipment or component which requires to be removed for servicing and which weighs more than 20 kg shall be provided with lifting lugs. Each lug shall be capable of supporting the entire unit. Lifting lugs shall be welded to and be of the same material as the equipment. Lug location shall minimize tilting of the equipment when suspended by the lugs.

**GW-6.0 DRAWINGS AND INSTRUCTION MANUALS****GW-6.1 Drawings Contained in the Tender Document**

The drawings contained in relevant section of this tender document shall be the Bid Drawings and/or Reference Drawings which shall be utilized for bidding purposes only. They are considered as defining the minimum requirements for the design of the equipment to be furnished and to show the general layout and equipment arrangement which indicate limiting or mandatory dimensions and elevations. However, if such indicated dimensions are found deemed inadequate during the implementation stage, changes or adjustments may be made subject to NPC's review and approval.

Bid drawings which show the work to be done as definitely and in as much detail as possible may be used as guide by the Supplier in the performance of his works. Bid drawings particularly plant layout, equipment layout and piping layout, which require changes or adjustments to suit with actual site

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conditions or which may be modified in design/details to conform with the configuration of the supplied equipment shall be prepared/submitted by the Supplier for NPC's review and approval. Accordingly, soft copies of said bid drawings may be furnished upon receipt of request by the Supplier for their ready reference/perusal.

Anything mentioned in the specifications and not shown on the drawings, or shown in the drawings but not mentioned in the specifications but which are obviously necessary to make a complete installation shall be considered/ included under the Supplier's Scope of Works.

Discrepancies between the drawings and actual field conditions or between drawings and specifications shall immediately be brought to the attention of NPC for proper resolution. All works involving discrepancies shall not be started without NPC's formal approval.

All drawings submitted by the Supplier or by any Sub-Supplier shall contain in the lower right-hand corner, in addition to the Supplier's name with signature, the date, drawing scale, drawing number and title, and contract number as given in the Specification. Drawing Title Blocks per NPC standard specifications shall be provided to the Supplier during the contract stage.

The drawings shall be adequate to demonstrate full compliance with the Contract requirements and provide NPC complete understanding of the equipment and its associated auxiliaries and associated works.

All data and information to be submitted shall be in the English language and all drawings shall be drawn using the metric system as unit of measurement.

**GW-6.2 Drawings and Documents to be submitted with the Bid**

The Supplier shall submit with his Bid the required copies of all the documents specified in Section VI – (Part II) Technical Data sheets under the Section "Annexes" including other documents specified in the relevant Clauses of the bid documents (Refer to Form No. NPCSF-GOODS-01-Checklis of Technical and Financial Envelope Requirements for Bidders, Section VIII-Bidding Forms).

Drawings and other data or information that the Bidders may deem useful in the evaluation of their bids may be submitted with the bid.

**GW-6.3 Supplier's/Manufacturer's Drawings and Instruction Manuals****GW-6.3.1 General**

The Supplier shall submit to NPC five (5) copies for approval or reference, drawings, plans, brochures, equipment technical specifications or data sheets, erection manuals, calculations as required, codes and standards, operation and maintenance instructions and all other documents necessary for rendering the Works, prior to fabrication, manufacturing and/or purchasing all equipment and materials to be supplied under this Contract.

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The sequence of submission shall be such that information is available for checking or approval of each drawing or document received.

To provide the basis for programming the checking of the Supplier's drawings, the Supplier shall, within fifteen (15) Calendar Days from effectivity date of the contract, prepare and submit to NPC for approval a drawing and document lists summarizing the drawings he proposes to submit in accordance with the requirements specified herein, together with the dates on which he proposes to submit such drawings. These lists shall be updated monthly to show the status of the drawings and documents submitted and any additional proposed drawings. NPC shall have the right to require the Supplier to submit additional information as may reasonably be required.

The name and signatures of the Supplier/Manufacturer's designer and approving officer who process the drawing for NPC's approval shall be included in the title block for each drawing/document submitted.

Drawings approved by NPC shall in no way relieve the Supplier from entire responsibility for engineering, design, workmanship, material and all other liabilities under the Contract.

Any manufacturing, test, installation of equipment and appurtenances and construction of any particular structure or portion thereof prior to the approval of drawings pertinent thereto shall be at the Supplier's risk. The Supplier shall be responsible for any extra cost that may arise in consequence to such risks or in correcting the work already done to conform with the drawings as revised and approved.

The Supplier shall be responsible for any discrepancies, errors or omissions in the drawings and other particulars supplied by him whether such drawings and particulars have been approved by NPC or not, provided that such discrepancies, errors or omissions are not due to inaccurate information or particulars furnished in writing to the Supplier by NPC.

NPC shall have the right to require the Supplier to make any changes to the drawings necessary to make the works conform to the intent of the Contract.

Should an error be found in the Supplier's drawings during approval, or during construction/erection, the correction including any field change considered necessary shall be noted on the drawings and shall be resubmitted for approval.

NPC reserves the right to reproduce any drawings or prints received from the Supplier as may be required despite any notice prohibiting the same appearing on the drawing or the print. All drawings are preferred in a computer-aided format. However, if unable to comply with this requirement, manual drafted drawings will be acceptable. All CAD produced drawings are to be submitted in Autocad formats. All other computer-generated documents are to conform to Microsoft Office.

**SECTION VI – TECHNICAL SPECIFICATIONS****GW-6.3.2 Bar Chart**

A Bar Chart must be submitted by the Supplier/Contractor within fifteen (15) calendar days from the effectivity of the Contract for NPC review and approval indicating the schedule of various activities for the project such as design, engineering, approval (brochures/drawings), manufacturing, testing, delivery, erection, site test and commissioning.

The "Agreed Bar Chart" shall not be revised or modified without the prior approval/confirmation of NPC or except where extension of the contract period is approved in accordance with relevant provisions of the specification.

If the Works is not being adequately or properly performed in any respect, NPC shall require the Supplier to submit a new "Agreed Bar Chart" providing for the proper and timely completion of the Works covered by this Contract.

The Supplier shall see to it that the "Agreed Bar Chart" is followed as much as possible. The percentage which will be the basis for judgment of the progress of the Works shall be computed in percent of progress in each different item of work and integrated on the "Agreed Bar Chart". The actual value or quantity of work done divided by the value or quantity of the total work, respectively, and multiplied by 100 shall be the Contractor's percentage of accomplishment.

The percentage of accomplishment subtracted from anticipated percentage on the "Agreed Bar Chart" is the percentage the Supplier is behind or ahead in his work.

**GW-6.3.3 General and Detailed Drawings and Specifications for Electro-Mechanical Equipment**

Before proceeding with the manufacture of the equipment, the Supplier shall submit for approval the applicable designs, design computations as required, brochures, detailed specifications or equipment data sheets, general assembly drawings, outline/arrangement drawings, system drawings (flow diagrams), and sufficient sub-assembly drawings, P & I diagrams, schematic and control wiring diagrams, site training program, test and commissioning procedures, test reports and details to demonstrate fully that all parts will conform with the provisions and intent of the Specifications and with the requirements of their installation, operation and maintenance.

The drawings shall show all necessary dimensions and tolerances, field joints, and sub-assemblies in which the equipment will be shipped, terminal boxes and wire sizes for electrical circuits and wiring diagram for power and control circuits.

Formats and symbols for electrical drawings and logic diagram shall be standardized for all the plant systems under this Contract subject to NPC's approval.



**SECTION VI – TECHNICAL SPECIFICATIONS****GW-6.3.4 General and Detailed Design Drawings for Civil Works**

The above drawings shall indicate, besides relative calculations and instructions, all data necessary for the design of supporting structures such as dimensions, weights, loads and stresses under operating conditions, dimensions and weights for installation, assembly and maintenance.

In addition, these drawings shall indicate all necessary details such as foundations, anchor, tie rods, trenches for cables and pipes, catwalks and supports and any other data used in the design of Civil Works.

The structures shall not substantially differ from those shown in the bid drawings.

**GW-6.3.5 Working Plan**

The Working Plan shall include the organization, working system, temporary yard installation, construction method, overall construction schedule, a list of Construction Equipment/Temporary Facilities to be used, etc.

**GW-6.3.6 Progress Report****a) Monthly Reports**

The Supplier shall submit to NPC on the seventh (7th) day of every month written detailed progress report, in an approved form, indicating the stage reached and anticipated completion dates for the design, ordering, procurement, manufacture, delivery and erection of the components. The report should be forwarded promptly so that on receipt by NPC the information is not unduly out of date.

From the commencement of manufacturing works, the Supplier shall provide color photographs of the Works which will be attached to the monthly progress reports. Each photographic print shall bear a printed description, a serial number and the date when taken. Inscriptions shall be in English. Each photograph shall record or illustrate specific events.

**b) Weekly Summary Report**

The Supplier shall also prepare a weekly summary report covering all the site activities and submit it to NPC. This report shall include projected work activities for at least 2 weeks ahead of those being reported upon.

**GW-6.3.7 Instruction Manuals**

Supplier shall submit five (5) sets of the draft of Operation and Maintenance Manuals required for all equipment supplied under this Contract, at least forty five (45) days prior to test and commissioning for NPC review and approval. Upon approval, the Supplier shall submit seven (7) final copies of the O & M Manuals per plant site for distribution to the following:

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<b>Number of Copies/Rating</b>	<b>Delivery Site/Group</b>
3	Plant Site
2	Eastern Visayas Workshop, Maintenance and Technical Services Division
1	Eastern Visayas Operations Division
1	Visayas Operations Department

The Manuals shall include Parts List and Preventive Maintenance Schedule during the life span of the generating set and shall be submitted at least 1 month prior to the delivery of the generating sets.

Instruction Manuals shall be furnished by the Supplier and assembled on standard metric A4 sheets. Covers and binders to be used for the manuals shall be robust and oil-resistant.

Manuals shall contain data relevant to the equipment or system design and its installation, start-up, operation, lay-up, preventive maintenance, troubleshooting, testing and repair. Drawings and schedules which are to be bound into the manual shall also be A4 or A3 folded to A4.

The descriptions shall not be general or applicable to any type and size of Supplier's equipment, but shall be specific with (whenever possible) references to drawings submitted by the Supplier.

The following requirements shall be included but not limited to:

- a) List of all equipment and systems supplied and its accessory components complete with respective descriptions, operating requirements at all processes and ambient conditions, storage requirements, reference codes and standards, Supplier's/manufacture's specification or technical data sheets supported with illustrative catalogues and brochures as applicable;
- b) Applicable drawings including equipment outline drawings, assembly drawings, system flow diagrams, single line diagram, schematic and control circuit diagrams (alarm and trip), interconnection diagrams of the generator, exciter, governor and other integral devices and other relevant drawings;
- c) Mechanical and Electrical Parts lists itemizing type, number, rating, performance limits, and services required including electric power, water (cooling and seal), fuel and lube oil;
- d) Instrument lists (including switches and probes) itemizing function, set points, type, catalogue number, and range;
- e) Piping Line and Valve lists itemizing type, size, material, and ANSI class;

- f) Lists of trips and alarms complete with set points;
- g) Operating procedures and instructions shall provide the operator with information that tells him when and how to operate the equipment, including precautions, limitations and set points. Procedures listed in step-by-step sequence shall include start-up, shutdown, normal operation and load variation. Troubleshooting charts and tables shall be used to list likely evidence of malfunction and what could be responsible. The effect of loss of normal power and effect of electrical supply frequency drop shall be addressed;
- h) Preventive Maintenance Schedule for all equipment with servicing procedures including instructions for dismantling and/or replacing components, routine electrical and mechanical procedures, performance check and tests, checks for cleaning, lubricating and otherwise caring for equipment. These procedures shall include instrument calibration and maintenance of interlocks and other safety features;
- i) Maintenance and overhaul instructions with step-by-step procedures for all anticipated equipment repairs including control system troubleshooting, alignment and calibration, assembly and disassembly. Dimension record with clearances and tolerances and torque values for all bolts shall be provided for reference;
- j) Special/standard tools list;
- k) Parts list including ASTM designation (if applicable). The spare parts list shall be in the form of a report that provides sufficient data necessary for computerized information processing. The set of data for a particular piece of equipment shall include, but not limited to the following:
  - k.1 Equipment identification number or SPIN
  - k.2 Description of part
  - k.3 Manufacturer/Supplier part number
  - k.4 Manufacturer's drawing number
  - k.5 Self life
  - k.6 Ordering lead time
  - k.7 Unit cost
  - k.8 Weight
  - k.9 Quantity required
  - k.10 Outline sketch diagram

#### **GW-6.3.8 As-Built Drawings**

The Supplier shall provide and keep an up-to-date "As-Built" drawings of all structures constructed and all equipment and accessories and miscellaneous works erected or installed. These drawings shall show all changes and revisions from the original drawings and specifications, including the exact "as-built" locations, sizes and kinds of equipment and

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accessories, miscellaneous metal works, embedded piping and electrical systems and other concealed items of work.

These drawings shall be kept in the Supplier's field office but shall be made available at all times for review of NPC. At the end of every work, all entries, changes or revisions made in the drawings by the Supplier shall be checked and approved by NPC.

The complete and duly checked and approved "As-Built" drawings shall be submitted by the Supplier within thirty (30) calendar days from the completion of the contract in five (5) prints and one (1) set of electronic copy on CD/DVD. Such CD/DVD shall be suitable for any optical drive of computer system.

**GW-6.3.9 Documents for NPC's Records**

The Supplier shall furnish five (5) copies of the following documents for NPC's records:

- a) Material Data, Material Certifications and Test Reports required by governing Codes and Standards;
- b) Factory Test/Site Test (Performance) Results; and
- c) Other Documents as may be required.

**GW-6.4 Processing of Drawings/Documents**

All drawings and documents to be prepared by the Supplier for NPC's review and approval shall be on A4 size or A3 size folded to A4 and submitted to, except otherwise mutually agreed during the implementation stage:

The Manager, Design and Development Department  
National Power Corporation  
BIR Road corner Quezon Avenue,  
Diliman, Quezon City 1100

NPC shall review, comment or note corrections to be made and return two (2) copies to the Supplier within twenty (20) calendar days after receipt of the drawing. If corrections are required, the Supplier shall make all necessary corrections and re-submit within fourteen (14) calendar days for NPC's review and approval.

Five (5) prints with dark lines on a white background shall be furnished to NPC for each drawing submitted for approval. Two (2) copies will be returned to the Supplier either marked "Approved", "Approved with Corrections Indicated", or "Returned for Corrections". Prints marked "Approved" or "Approved with Corrections Indicated" authorize the Supplier to proceed with the procurement/fabrication, assembly and construction of the works shown on the drawings, with corrections, if any, indicated thereon.

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When prints of drawings are marked "Approved with Corrections Indicated" or "Returned for Corrections", the Supplier shall finalize the drawings and re-submit it in five (5) copies each for final approval. Every revision shall be shown by number, date and subject in a revision block.

If minor revisions are made after a drawing has been approved, the Supplier shall incorporate the corrections on the as-built drawings to be submitted by the Supplier. No major revision affecting the design shall be made after a drawing has been marked "Approved" without re-submitting the drawing for formal approval of said revision.

Drawings and documents marked "Noted" without comments are deemed approved. If comments/corrections are indicated thereon, the Supplier shall finalize the drawings/documents and resubmit for NPC review and reference.

Failure of the Supplier to submit the approved "As-Built" Drawings and "Operation and Maintenance" Manuals to NPC on the respective dates specified in this section, NPC shall withhold Five percent (5%) of contract amount from payments due to the Supplier.

**GW-7.0 DISMANTLING AND HAULING REQUIREMENTS (AS APPLICABLE)****GW-7.1 General**

This section shall apply and/or serve as guide in the performance of the works which require dismantling/removal, crating, hauling, transporting, disposal of debris and temporary storage of any existing facilities or equipment at the project site, as applicable. He shall furnish all necessary plant, equipment, tools and labor to execute the works.

The Supplier shall submit after the award of contract the general procedure or overall work program which require the dismantling/removal, crating as required, hauling, transporting, disposal of debris and temporary storage of the existing facilities/equipment including the new equipment and materials within the Power Plant site.

The facilities/equipment shall be handled with care at all times to prevent damage of any kind during the dismantling and temporary relocation.

The Supplier shall strictly observe the safety requirements/regulations of the existing plant during the performance of the work.

All works shall be coordinated with NPC at site so that interference in the performance of works will be avoided. In case interference occurs, NPC will decide which work is to be relocated.

**GW-7.2 Preparation**

NPC shall make available and provide access to the Plant Site for the dismantling, removal, construction and/or modification works and installation activities of the Supplier. After contract award and prior to any dismantling/relocation works, the Supplier shall submit detailed schedule

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and methodology or work program for review and approval of the NPC. The work program and/or procedures shall comply with safety standards, existing environmental laws, rules, and regulations.

Any changes in any part of the approved work program/procedures shall be subject for review and approval by NPC.

The Supplier shall inspect and check properly all relative equipment and structures to ensure that these are securely disconnected from their respective main source or associated structures before the conduct of the actual dismantling activities.

Piping systems shall be totally drained prior to dismantling. Lube oil, fuel oil, chemicals and water coolant shall be properly disposed in a container with appropriate labels describing the contents. Water contents on pipes may be disposed in the existing drainage lines. Waste water found to be contaminated shall be properly treated prior to disposal.

All peripheral pipes, electrical power and control cables, conduits and cable trays including protruding steel supports that may obstruct the free movement of equipment going out from the Powerhouse shall be dismantled first and removed.

The Supplier shall identify the most convenient access and manner of moving the equipment out of a fixed structure/s. The Supplier shall provide temporary shelter/cover (tarpaulin or equivalent type of cover) on the torn down part until it is properly packed and crated. Any part of fixed structures that has to be torn down or damaged shall be brought back to its original form to the satisfaction of NPC.

All bevels, threads, flange faces and other sealing surfaces shall be suitably protected with wood, plastic or soft metal to prevent damage to these surfaces during shipping and handling.

All pipes shall be capped using plastic or soft caps or plugs. All caps shall be taped.

All packaging or crating shall be suitable for long term outdoor storage on or off the ground.

**GW-7.3 Dismantling of Existing Installations**

The Supplier shall provide all the necessary equipment, tools and labor for the dismantling, transferring and moving out of all affected equipment and its associated structures and accessories.

During dismantling works, electro-mechanical equipment shall be carefully lifted or glided using only the approved tools, equipment, and procedures that will prevent damage to the equipment. Whenever possible, the Supplier shall transport/haul the equipment by skids so as to reduce the dismantling works.

The Supplier shall engage the services of highly qualified engineer/specialist who shall be responsible for the supervision of all

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dismantling and hauling works. Suitably skilled personnel shall execute dismantling operations in an orderly sequence in such a manner as to minimize the number and size of the resulting dismantled parts/components.

To avoid pilferage, the Supplier shall maintain a well-guarded and secured area, as designated by the NPC, for all dismantled equipment and materials after each day's work.

Utmost care shall be strictly observed by the Supplier during the dismantling of the plant equipment and components up to unloading to the designated laydown areas within the Plant site or at any areas designated by authorized NPC representatives to avoid damage of any kind to equipment and installations.

The Supplier shall comply with the Plant security procedures and requirements. The Supplier shall also be liable for loss of or damage to any property (including property of NPC) or any loss, claim, damage, or expenses of whatsoever nature arising out of death, injury, illness, or disease of any person caused by the execution of all the works under this contract except to the extent that such loss or claim are due to negligence of the NPC.

**GW-7.4 Demolition**

The Supplier shall exercise due care and diligence during demolition of structures, foundations, equipment and installations, including the provision of screens and canopies to protect them from dust and debris. In the event that any such damage should occur, the Supplier shall repair, replace or otherwise make good all damaged items to the approval of NPC.

All demolition operations shall be carried out in an orderly manner so as to cause minimum interference with other activities.

**GW-7.5 Storage, Transportation and Re-Erection**

All dismantled materials and equipment shall be transported to the storage area designated by NPC within the Plant site.

The Supplier shall provide temporary shelter/cover such as tarpaulin or equivalent type of cover for protection of the equipment which require protection from rain, dust or direct sunlight during the storage.

The Supplier shall clean the area of debris and hazardous materials resulting from the removal/dismantling of the equipment mentioned herein. The areas should be free from safety and environmental hazards during and after the dismantling activities.

**GW-7.6 Disposal of Demolished Materials**

All debris and demolished materials shall be transported to a location designated by NPC and dumped or otherwise disposed of as directed by him.

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Any demolished materials which are not required to be used elsewhere have a commercial value, he may direct the Supplier to set aside and salvage such materials, the proceeds of which shall be credited to NPC.

All salvable materials shall be carefully handled to avoid damage and shall be piled neatly at a location adjacent to the work or as directed by NPC. All salvable materials shall become the property of NPC and the Supplier shall be held responsible for all materials not accounted for.

The salvable material shall not be used by the Supplier for any of his construction operations, unless otherwise authorized by NPC.

The Supplier shall clean the area of debris and hazardous materials resulting from the removal/dismantling of the equipment from the site mentioned herein. The areas should be free from safety and environmental hazards during and after the dismantling activities.

**GW-8.0      INSTALLATION REQUIREMENTS****GW-8.1      General**

The Works to be carried out at Site shall be undertaken in a safe and efficient manner in accordance with generally modern and industry accepted practice and applicable standards.

**GW-8.2      Inspection at Site**

Erection procedures and proposed erection check lists, if required, shall be submitted to NPC at least three months prior to the erection works all in English language. The erection procedures for each item of Plant shall be provided in hard-bound copies in a format and in sufficient detail to allow NPC to appreciate fully how the works are to be erected, and at which stages inspections, alignment checks, grouting, etc. are to be carried out.

For each part of the Contract Works to be erected it shall be examined and passed by NPC. This particularly applies to the accurate plumbing of all stanchions and columns, and to the leveling, setting and aligning of the various parts, and to the fitting and adjusting of bearings and other parts. NPC reserves the right to inspect all parts of equipment in the Works and/or on Site but at the discretion of NPC inspection may be waived on certain items. This shall in no way absolve the Supplier from his responsibilities.

Full assistance and facilities are to be afforded by the Supplier for NPC's representatives to check the works. The Supplier shall be required to carry out dimensional checks at various stages of completion and these shall be witness by NPC.

The maximum personal safety must be afforded to personnel directly engaged under the Contract or who in the normal course of their occupation find it necessary to utilize temporary works erected by the Supplier or who frequent the working area.



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The Supplier shall provide such protection and watchmen as he may consider necessary to safeguard the materials and stores in the area allocated to him together with the works on the site. NPC will not accept responsibility for any losses or damage which may occur during the execution of the Contract.

**GW-8.3 Installation Requirements**

The Supplier shall prepare detailed design of concrete foundations and associated structures of all his supplied equipment including construction thereof to ensure proper anchoring of the new equipment and associated structures in accordance with the Manufacturer's/Supplier's recommendation and the requirements of the relevant civil works specifications and/or drawings subject to NPC's review and approval.

All electro-mechanical equipment and associated structures shall be installed, tested and commissioned in accordance with the manufacturer's drawings, instruction manuals, and drawings provided thereto. In the event of conflict within these documents, the Supplier shall inform NPC of the conflict in writing for written resolution prior to the execution of the Work.

Materials and equipment shall be handled with care at all times to prevent damage and defects during handling, hauling, packing/crating, loading, transportation, unloading, assembly, erection and any such damage and defects shall be repaired, replaced or otherwise make good by the Supplier to the satisfaction of and at no cost to NPC.

Assembly, erection and installation of all materials, equipment and its associated structures shall be carried out by skilled and qualified personnel with special training and experience in the appropriate trade.

During installation, the Supplier shall provide adequate lifting gears and other protective devices that may be required to prevent damage to the equipment during and after erection. The Supplier shall be responsible for the correct positioning and leveling of the equipment and auxiliaries, and any checking made by NPC during the course of the work shall not relieve the Supplier from his responsibility. The equipment shall be carefully lifted or glided on their respective foundations by using only approved methods and devices on a manner that will prevent damage during erection/installation. They shall be positioned on locations as shown on the drawings.

The equipment shall be set level and checked true to grade and alignment. Foundation bolts/bed plates of the number and sizes required shall be supplied and installed by the Supplier. The cost of which shall be included in the cost for the installation of respective equipment.

The pouring of concrete to secure in place any equipment on its concrete foundation shall not be made until NPC has verified the correct location of the foundation. Should incorrect positioning be ascertained after the concrete pouring, the Supplier shall make the correction at his own expense.

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Welding works for structural steels and piping system shall be by an electric arc process. The procedure, testing and inspection shall conform generally with the relevant approved standards and to the approval of NPC. Weld joint preparations shall be in accordance with approved standard and to NPC's approval. Approval of the welding procedure, etc. shall not relieve the Supplier of his responsibility for correct welding, electrodes and for minimizing distortion in the finished structure and piping systems.

The Supplier shall identify the most convenient access and manner of moving the equipment out of a fixed structure/s. The Supplier shall provide temporary shelter/cover (tarpaulin or equivalent type of cover) on the torn down part until it is properly packed and crated as required.

Any part of existing fixed structures that has to be temporarily torn down or damaged shall be brought back to its original form to the satisfaction of NPC.

If applicable, the access area identified or used during the removal of the existing equipment and associated structures shall also be utilized in moving-in the new generating sets and auxiliaries. Any part of fixed structures that has been torn down and used as temporary access during the removal of the existing generating sets may be left open and provided with temporary tarpaulin or equivalent type of cover until the new generating sets have been unloaded and installed inside. Such temporary access shall be brought back to its original form by the Supplier to the satisfaction of NPC.

**GW-8.4 Nameboards and Advertisements**

All nameboards on and adjacent to the Site shall only be erected after written approval from NPC. Before approval is given, the Supplier shall submit details of the location, size and layout of the proposed nameboard.

The use of any advertisements, publicity photographs and the like relating to or including reference to the Project shall be required to be approved by NPC prior to publication.

**GW-8.5 Signs****GW-8.5.1 General**

All signs mentioned below shall be located at suitable location within the sight of people or the people to whom they apply. The sign shall be properly displayed. For temporary dangerous area (e.g. construction site), the signs shall be of the portable type. To avoid misunderstanding, all signs shall be complete, easy to understand and are mounted in the designated location.

The signs shall be of weather-resistant material with sufficient life span under site conditions.

**GW-8.5.2 Traffic Signs**

For the safety of traffic on Site, adequate number of warning signs and prohibiting signs are to be erected at the appropriate places by NPC working in the area. Special attention shall be considered to Right of Way,

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One-way Streets, Speed Limits, Maximum Height or Width restrictions, weight restrictions, Fire-access roads, etc.

Information signs shall be used to provide the necessary information to personnel working on site. Examples of information signs are load-carrying capacities including marking of floor areas, working loads of cranes, lifting gear and lifts, room identification, etc.

**GW-8.5.3 Signs for Emergencies**

Areas which are prone to accident shall be equipped with adequate emergency signs of appropriate size. The emergency sign shall be stored and permanently displayed at the proper place to provide correct information which will result in fast action and also safe guard of personnel working on site.

Escape routes, emergency exits, fire alarms, fire extinguishers, instruction for special fire extinguishing agents, warnings against fire-extinguishing agents, first-aid equipment, telephones, etc.

**GW-8.5.4 Warning Signs**

Refers to the existing or possible existing danger, such as inflammable substances, explosive substances, corrosive or noxious substances, suspended loads, general danger, width/height restriction, danger or trapping, steps, slipping, falling, etc.

The signs shall be coloured with appropriate black and yellow strips to attract the attention of the people working in the area by keeping them aware of such existing or possible existing danger.

**GW-8.5.5 Prohibition Signs**

Prohibition sign shall be displayed by the Supplier in areas where the following rules need to be closely adhered to prevent accidents such as the outbreak of fire, damage of equipment caused by water, etc.

Examples of prohibition signs are No smoking; no fire or no naked lights; no entry to pedestrians; use no water; no entry; do not start; etc.

**GW-9.0 INSPECTION AND TESTS****GW-9.1 General**

The Supplier shall perform at his own expense all tests required to ensure adequacy of material, workmanship and conformance of equipment to the guaranteed data and other requirements of the specifications and standards.

The Supplier shall submit five (5) copies of test procedures for NPC's review/approval for all his supplied materials and equipment covered by the

Contract at least forty five (45) calendar days prior to the conduct of actual test.

NPC and/or its duly authorized representatives shall be entitled to attend and witness all applicable tests detailed in the relevant sections. NPC shall be notified by the Supplier thirty (30) days in advance about any tests requiring the presence of NPC or at least sixty (60) calendar days for factory test to be conducted outside the country.

Tests not requiring the presence of NPC shall be, in any case, notified in advance. In such case, the Supplier shall then proceed with the tests and shall submit test reports in five (5) copies to NPC at least two (2) weeks after the conduct of the tests. NPC's acceptance of the work by waiving the inspection of tests and receipt of the Supplier's Certified Test Reports and Inspection & Testing Certificate shall in no way relieve the Supplier of his responsibility in accordance with the requirement of the Specifications.

For inspected or tested goods that fail to conform with the Specification, the Supplier shall either replace or make any alternations necessary to meet the requirements of the Specifications at no costs to NPC.

During the site test and commissioning period, the Supplier may request NPC to provide plant operations and maintenance personnel to assist in the performance of the required tests under the direct supervision and coordination of the Supplier for the purpose of on-the-job training.

Fuel oil, lubricating oil, lubricants, coolant, chemicals and other consumables required during initial filling, start-up, test and commissioning shall be borne by the Supplier. Cost of fuel consumed during the start-up, pre-testing/pre-commissioning and re-test of the performance test shall be borne by the Supplier. Fuel used/consumed during the performance and reliability tests (where generated load are already exported to the grid/consumers) shall be supplied by NPC.

NPC shall provide the fuel requirements of the generating sets during the performance/reliability tests. However, if any equipment fails to pass the performance tests, fuel oil requirements for the re-test of the genset shall be provided by the Supplier at his own cost. The Supplier shall therefore provide NPC the recommended quantity at least sixty (60) calendar days prior to the conduct of site test and commissioning.

Calibrated measuring and testing instruments, tools, and devices shall also be furnished by the Supplier. Any relevant instruments supplied and installed by the Supplier in the various systems of the diesel generator sets shall preferably be used during the fuel consumption test. However, any other applicable measuring devices other than the installed instruments may be used as mutually agreed during the witnessing of the test or as specifically described in the relevant Clauses of this Specification. The cost of all tests and relative activities shall be borne by the Supplier.

The Supplier shall carry out all tests in accordance with the requirements described in the pertinent clauses of these specifications and test procedures duly approved by NPC. Certified test reports/results of all tests

conducted at manufacturer's shop/factory and at the site/s shall be submitted to NPC for evaluation and acceptance.

The Supplier shall be responsible in compiling, recording, and submitting the relative test reports. Five (5) certified test reports shall be submitted by the Supplier within a maximum of fifteen (15) days after the completion of tests.

Provide service personnel from the equipment Manufacturer/Supplier or his authorized local representative to be assigned at the plant for selective periods stated in Clause GW-16.0 from date of completion or start of the warranty period, to perform preventive maintenance of the generating sets and auxiliaries; such as checking/evaluation of operating parameters, safety adjustment of controls, components, assessment of operating conditions, cleaning, etc. This shall include any maintenance services rendered upon request of NPC in the event of any abnormality occurs within the warranty period.

Acceptance or completion certificate shall be issued only after all the required tests are satisfactorily conducted and results are within the acceptable range and the guaranteed values are met.

## **GW-9.2 Tests at Supplier's Premises**

### **GW-9.2.1 Inspection at Supplier's Premises**

NPC reserves the right to inspect all shop and assembly work associated with the Works, verify quantities consigned to stores and inspect quality control and assurance records as well as shop and purchase order records.

When scheduled, and as often as NPC deems appropriate, progress will be monitored with respect to Milestone Dates in the Contract Schedule and the sequence of events and activities on the Supplier's Detailed Contract Schedule.

### **GW-9.2.2 Factory Acceptance Tests (FAT)**

Prior to shipment and final inspection, each equipment supplied by the Supplier shall be given the manufacturer's standard factory test and/or as required in the relevant sections of the technical specifications.

The Supplier shall carry out tests, as may be required by the specified Standards and the Quality Control and Assurance Program, as well as the entire test program approved by NPC. Prior to the witnessing of Factory Test the Supplier shall remove all faults found and correct all failures noted to the best of his knowledge such that no functional or procedural errors will occur during the test.

At the commencement of the witnessing of Factory Test, all applicable equipment and materials shall be brought together in one place, integrated, and the configuration/set-up at the factory shall be identical to that to be installed at the site and any equipment and software necessary for the proper operation of the equipment shall have reached its final form, not to

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be changed during the Factory Test and until commencement of commissioning at site.

The Supplier shall immediately advise NPC should failures occur, take remedial action subject to NPC's approval, and proceed with the Factory Test as and when directed by NPC. It shall be NPC's prerogative to order a repeat of all such tests that he deems may have been affected by the failure.

The Supplier shall ensure that during the test, all hard copies from output devices are retained and that no outside parties interfere in any way with testing, equipment or test instruments, fixtures and jigs for the entire duration of the Factory Test. Only Supplier's personnel who are needed on the testing of the equipment shall be allowed in the test area.

The Supplier shall also be responsible that an accurate record of tests are kept and each individual test is duly initialed and dated by the Supplier and stamped or marked either "passed" or "failed" with annotations of antecedents and observations concerning the test.

For each day of testing, the Supplier shall submit to NPC the proposed disposition of each criterion that failed during the previous day of testing, prior to commencement of the tests scheduled for that day.

Tests witnessed by NPC will be initialed accordingly by him on the test record. The test record and dispositions, and any other pertinent supporting data and documents shall form part of a test report to be submitted in accordance with the specification.

**a) Diesel Engine-Generator Sets**

Before leaving the factory, each diesel engine generator set shall be carefully tested, using diesel fuel oil, by the Supplier in the presence of NPC and/or its duly authorized representative.

The diesel engine shall be subjected to the following tests in direct connection with the main generator:

a.1 Starting Test and Maneuvering Test at no load

a.2 Load Test

<u>Load</u>	<u>Duration</u>
50%	0.5 hour
75%	0.5 hour
100%	1.0 hour
110 %	0.5 hour

a.3 Governor Regulation Test

a.4 Overspeed Trip Test

a.5 Engine High Temperature, Low Oil Pressure and

**SECTION VI – TECHNICAL SPECIFICATIONS****Emergency Device Trip Test****a.6 Fuel Oil Consumption Test****a.7 Test for Vibration and Sound Level at 1m distance from genset**

After the factory test, each diesel engine generator set shall be thoroughly checked and inspected to determine the condition of the external and internal parts. If defective parts are found, those parts shall be replaced or remedied and necessary adjustments shall be made at the expense of the Supplier. Emission testing on each stack is required for diesel gensets with dual stacks.

**Notes: 1. The use of Weighing Scale shall be the basis for the acceptance of Fuel Rate requirement during the conduct of Factory Acceptance Test (FAT) or as specified in the approved Test Procedures.**

**2. The conduct of Sound and Vibration Tests shall be done only once, either during Factory Acceptance Test (FAT) or at Site Acceptance Test.**

**b) Auxiliary Equipment**

Certified Test Reports of the following auxiliary equipment shall be submitted for NPC's review and evaluation:

- b.1 Pumps performance test
- b.2 Heat Exchangers hydraulic test

**c) Electrical Equipment**

Electrical equipment such as generators, circuit breakers, control and protection panels, transformers, etc. shall be subjected to factory tests in accordance with the requirements as specified in the relevant Electrical Works specifications.

**d) Sound Attenuated/Weather Proof Enclosure**

The enclosure shall be tested for Sound level @ 1-meter distance from any point of the unit which shall not exceed 85 dBA. Water tightness shall also be tested to ensure that rain water is prevented from entering the enclosure by conducting Rain Test equal to 100 mm per hour.

**Note: The conduct of Sound, Vibration and Rain Tests shall be done only once, either during Factory Acceptance Test (FAT) or at Site Acceptance Test.**

**SECTION VI – TECHNICAL SPECIFICATIONS****GW-9.3 Pre-Commissioning/Commissioning Test****GW-9.3.1 General**

After installation of the equipment and its associated auxiliaries, the Supplier shall notify NPC of the date when the plant is ready for pre-commissioning/commissioning test at site. The timing and duration of the test shall be as mutually agreed by NPC and Supplier and shall be satisfactorily completed as required under the Contract.

The Supplier shall submit personal data sheet of at least one (1) of its proposed Commissioning Engineers/technical staffs for NPC's evaluation and approval at least one (1) month prior to testing. A certification from Manufacturer/Authorized Representative to prove that the said personnel has undergone previous test and commissioning services of similar unit/s to be supplied for this project shall also be submitted.

During the test and commissioning period, NPC shall provide operations and maintenance personnel, upon request of the Supplier, who shall assist in the performance of the commissioning test. The said personnel shall be placed under direct supervision of the Supplier/Commissioning Engineer and shall also serve the purpose of on-the-job training in the field of operation and maintenance of the plant.

The Supplier, with the assistance of NPC personnel involved in the test and commissioning, shall be responsible in compiling, recording and submitting the test reports to NPC.

Calibrated measuring and testing instruments, tools, and devices shall also be furnished by the Supplier. The cost of all tests and relative activities shall be borne by the Supplier.

**GW-9.3.2 Pre-Commissioning Test**

The typical Pre-Commissioning Test shall include but not limited to the following:

- a) Alignment of engine-generator;
- b) Wiring continuity test;
- c) Megger testing of equipment and power cables;
- d) Checking of safety valve settings;
- e) Checking of settings for switches and instrument transmitters;
- f) Calibration and test of C & I equipment and measuring instruments;
- g) Checking and testing of AVR, electrical relays, CT's and PT's;
- h) H.V. test for relevant equipment;
- i) Functional test of all supplied equipment;
- j) Checking for tightness, rotation, direction of auxiliary electrical motors, etc.;
- k) Setting/calibration of relays and other protective devices;
- l) Fuel injectors, fuel injection pump calibration and settings;
- m) Conduct the following tests/works, as applicable:
  - m.1 Hydrostatic and pneumatic tests of field assembled equipment and piping
  - m.2 Lube Oil flushing of field installed engine lube oil pipe



**m.3 Chemical cleaning of field installed engine piping system****GW-9.3.3 Commissioning Test**

The Commissioning Test shall be carried-out after the Pre-Commissioning Test has been conducted to ascertain its fitness for operation and shall include the following:

- a) Trial run of individual auxiliary equipment;
- b) System sequential operation;
- c) Generating unit tripping device test;
- d) No load operation of diesel generating sets;
- e) Test of control systems safety and operating functions (Control and Protection Relays);
- f) Unit synchronization;
- g) Unit load test and load rejection test (at 50%, 75%, 100% and 110%);
- h) Unit start-up/stop tests;
- i) Automatic change-over of standby equipment;
- j) Parallel Operation and Load sharing test;
- k) Guaranteed Prime Power Output & Guaranteed Fuel Rate tests;
- l) Reliability Test (24 hours);
- m) Tests for Sound Pressure and Vibration; and
- n) Tests for Electrical Equipment per ANSI and IEC standard.

Considering the expected unavailability of reliable load at the plant site, the Supplier may conduct the performance test to determine the Guaranteed Prime Power Output and Guaranteed Fuel Consumption at 100% load and other loads (50%, 75%, and 110%) including other applicable/required tests specified above at its local facility or at any local facility acceptable to NPC. The Supplier shall provide a load bank if the performance test will be conducted after installation at the plant site. Accordingly, fuel cost to be used during the performance test at the Supplier's facility shall be borne by the Supplier.

**GW-9.4 Performance Tests**

The performance test shall be carried out during the period of commissioning test to verify the guaranteed or specified values of the supplied equipment in accordance with the requirements of the specifications which include the guaranteed Prime power output, guaranteed fuel rate, enclosure sound pressure level and water tightness, Vibration and others as required or specified in the relevant clauses of the technical specifications.

Performance test to determine the guaranteed prime power output and guaranteed fuel rate of each diesel engine generator unit shall be carried out in accordance with the approved test procedure.

All instruments, materials, and devices necessary to perform the required testing as well as to measure and analyze data shall be furnished by the Supplier. Any relevant instruments supplied and installed by the Supplier in each of the diesel generator set shall preferably be used during the fuel consumption test to verify its accuracy in comparison with the fuel rate test results taken during the FAT. Any other applicable measuring devices other

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than the installed instruments may be used as mutually agreed during the witnessing of the test.

The Supplier shall provide key test personnel who will supervise the tests and collaborate closely with NPC's representatives who are duly designated to participate in the conduct/performance of the test and commissioning.

All tests shall be coordinated with NPC and shall be timed to conform with the grid requirements. Correction factors for variations of test conditions from the specified design conditions shall be stated in the Test Procedure to be submitted by the Supplier for NPC's review and approval.

Performance Test Procedures to be submitted by the Supplier shall include the following:

- a) Introduction;
- b) Purpose of Test;
- c) Procedure for the Test;
- d) Simplified diagrams indicating test envelope, test points and measuring equipment;
- e) Test data and parameters to be measured;
- f) Step by step calculations indicating how the test data are used to arrive at the final results;
- g) Forms to be used; and
- h) Correction curves and other curves or tables to be used in the test (correction curves shall be submitted with the Bid)

Acceptance of the equipment shall be on the basis of the satisfactory results of the performance tests meeting the guaranteed values.

In the event that the guaranteed power output cannot be tested due to unavailability of the required load at the time of testing, the available loads that fall either at 25%, 50% or 75% shall be used for reference/record purposes. The results shall be used as basis for comparing with the results taken from the FAT and shall then be the basis of acceptance if found satisfactory.

#### **GW-9.4.1 Diesel Engine-Generator Set**

All tests shall be performed in accordance with the approved Test Procedures submitted by the Supplier and shall include but not limited to the following:

- a) Governing Test: gradual speed change from zero to full load and instantaneous speed change with 25% load on or off
- b) Overspeed Trip Test
- c) Low Pressure, High Temperature and Emergency Device Trip
- d) Load Test & Fuel Oil Consumption Test

50% load	0.5 hour
75% load	0.5 hour

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100% load	1.0 hour
110% load	0.5 hour

Before each test, the diesel generating set shall be stabilized at a given load for duration of thirty (30) minutes or as recommended by the Manufacturer. After the stabilization period, initial readings shall be recorded and succeeding readings shall be taken every ten (10) minutes thereafter for a period as specified above. As minimum, there shall be three (3) test runs at each test point for both the power output and fuel oil consumption. The computed results shall be the time-weighted average of related readings.

Ten percent (10%) overload test shall be carried out no more than one (1) hour every twelve hours. 100% load test may be separated in several times.

The results of the test at 100% load for one (1) hour shall be the basis in determining the required guaranteed rated power output and guaranteed fuel consumption.

- e) Test for Enclosure Sound Pressure Level, Water Tightness, and Vibration.

The above test shall be determined during the Load Test at 100% Load. *Refer also to the requirements as noted in item "d)" of Clause GW-9.2.2.*

#### **GW-9.4.2 Auxiliaries and Associated Electrical Equipment**

All applicable auxiliary equipment shall be tested to assure proper operation and performance to conform with the guaranteed and expected performance values specified in the technical data sheets. Tests shall be performed in accordance with the approved test procedures submitted by the Supplier.

#### **GW-9.5 Reliability Test (8 hours)**

After the Supplier has notified NPC that the generating set is ready for commercial service including its associated auxiliary equipment, and provided NPC is satisfied that the generating sets are ready for commercial service, the generating sets with all its associated auxiliaries are required to operate under the normal working conditions of the power plant and within the limits of output specified or at any load available at site and operating continuously without major failure for a period of eight (8) hours or at any programmed/scheduled operating hours available at the plant site.

The plant will be operated by the NPC staff under the supervision of the Supplier's Commissioning Engineer during the reliability test period.

The Reliability Test shall be carried out in accordance with the applicable codes and standards and the approved test procedures.

Should any major failure occur in the generating set or any portion of the supplied associated equipment due to, or arising from, faulty design and

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materials, sufficient to prevent safe and full commercial use of the plant, the reliability test shall be considered void and the reliability test period of eight (8) hours shall be recommenced after the Supplier has remedied the cause of defect.

Reliability Test would be considered a failure for any one of the following major causes:

- a) Plant tripping due to above causes;
- b) Failure to start-up/shut-down as and when required according to normal procedure;
- c) Major defects to warrant plant shut-down or interruption for repair which would otherwise affect safety or personnel and/or plant and equipment; and
- d) Failure to respond correctly during the run back or emergency trip when initiated accidentally.

In case of the above failure, the reliability test period of eight (8) hours or at any programmed/scheduled operating hours available at the plant site shall recommence after the Supplier has remedied the cause of defect.

In the event that the programmed or scheduled operating hours available at the site are less than eight (8) hours per day, the remaining unused reliability test hours as required shall be continued the following day to complete the required 24-hour test.

**GW-9.6 Tests Failures**

If any equipment or component fails to pass any test, NPC may direct the Supplier to make any necessary corrections or alterations for defects or order equipment/component replacement, as maybe deemed appropriate. Any and all expenses due to additional tests or retests made necessary by failure of Supplier's supplied equipment/component, i.e. failure to meet the guarantees and other requirements of the specification, shall be borne by the Supplier. The costs of witnessing the Factory Tests by NPC or its representative(s) as a result of re-test to be conducted on the equipment shall also be borne by the Supplier.

If the results of the performance test at site show that the equipment failed to meet the guaranteed Prime power output and/or the guaranteed fuel oil rate, the Supplier shall be given two (2) weeks maximum from the completion date of the performance test to make any necessary corrections or alterations of defects before conducting the retest. The Supplier may request time extension for any corrections subject to NPC's evaluation/approval of corresponding justification for such extension. One (1) retest is allowed only during the required two (2) weeks maximum period including trial runs. If the results of the latest test/retest failed to meet the guaranteed prime power output and/or the guaranteed fuel oil rate, then these results shall become the basis in applying the applicable penalties.

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Penalties specified in the relevant sections of this Specification shall be applied in case tests or retests at site for the gensets, transformers and associated equipment have failed to meet the relative guaranteed data.

NPC shall have the right to reject Diesel Generating Sets whose fuel oil rate during test deviates to more than +5% of its guaranteed fuel oil rate and/or the prime power output is less than its guaranteed power output.

NPC shall also have the right to reject the Diesel Generating Sets if it fails during tests to comply with the Standards of the Philippine Clean Air Act and Sound Pressure Level as required in the Technical Specifications.

**GW-9.7 Test Reports/Certificates**

Five (5) certified copies of the reports of all NPC's specified tests and other manufacturer standard tests shall be furnished to NPC within a maximum of fifteen (15) days following the completion of the tests.

Test certificates shall include, in addition to the test results, the following information:

- a) Date of the performance of test;
- b) Equipment data; and
- c) The equipment serial number.

The Supplier shall bear the cost of furnishing these records and reports.

**GW-9.8 Waiver of Factory Tests Witnessing/Inspection by NPC for Equipment to be Furnished by the Supplier**

If NPC opted not to witness the Factory Tests, NPC will issue a Certificate of Waiver of Tests Witnessing/Inspection for the equipment and materials. In such case, the Supplier shall proceed with the Factory Tests in accordance with the requirement of the specification and the manufacturer's test procedures as approved by NPC.

Issuance of the Certificate of Waiver of Tests Witnessing/Inspection for equipment required to be witnessed by NPC or its authorized representative(s) however, shall in no way relieve the Supplier of his responsibility to conform to the approved test procedures and the requirements of the Specifications.

**GW-10.0 TRAINING OF NPC PERSONNEL****GW-10.1 General**

The Supplier/Manufacturer shall extend all possible assistance and cooperation to NPC regarding the transfer of technology and developing expertise in the area of engineering, operation and maintenance of the generating sets and associated electrical equipment.

The Supplier shall plan, develop training module and program schedule which shall be submitted to NPC for approval and shall cover all plant

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systems such as mechanical and electrical equipment, auxiliary equipment and associated facilities, control and instrumentation system, maintenance and operational considerations.

The components of the training modules shall include but not limited to the training procedures/methodology, instructional materials such as audio visual materials, tapes and slides, and manuals for each trainee.

The training course shall be conducted in as short period as possible but enough to be able to properly train and make ready NPC technical personnel who will be responsible for the safe and reliable operation/maintenance of the plant.

The training program shall be adequate for the trainee to acquire the necessary expertise and competence in the area of engineering, operation and maintenance and as trainers for in-house technology transfer program of NPC.

Five (5) sets of materials included in the training modules shall be turned over to NPC upon completion of the training. An evaluation shall be jointly undertaken by the Contractor and NPC's representative on the adequacy, appropriateness and relevance of the training and the program effectiveness after the training.

The training program shall be conducted by expert/s who are knowledgeable and well trained by the gensets manufacturer or his authorized representative.

The Supplier shall employ qualified English speaking instructors and training coordinators during the conduct of the training program.

The Supplier shall conduct the training program preferably at the plant site or at any venue convenient and acceptable to both NPC and Supplier.

The cost of training of all involved NPC personnel at Plant site shall be borne by the Supplier and shall be included in the bid price.

Upon completion of the training, the Supplier shall issue the participants with Certificate of Completion.

**GW-10.2 Operation and Maintenance Training at Site**

The Supplier shall conduct training at the Plant Site of NPC's personnel who will be assigned to operate and maintain the plant. All the existing O & M Plant Personnel, but not less than four (4) NPC Personnel from plant, shall participate in the training program. The Supplier shall provide a comprehensive training program related to design application, operation and maintenance, including trouble shooting of the Supplier's supplied system and equipment starting from Start of Pre-Commissioning/Commissioning and thereafter up to the issuance of Certificate of Completion.

The contents of the training program shall include but not limited to:

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- a) Lectures on Diesel Power Plant principles in management and practices for operators, technicians and in maintenance personnel;
- b) Hands-On Training on Operation and Maintenance training program covering electrical, mechanical and instrumentation and control which include an understanding of the software and a working knowledge of the database for additions, modifications, deletions and the practical use of diagnostic programs.
- c) Proper maintenance during long period of standby condition.

Said training program shall be submitted to NPC for approval. The program shall contain the schedule of activities summarizing the time and duration (not less than three days) and the corresponding topics/content of the program.

The timing of the training should be such that the participants will be equipped with sufficient know-how to participate in the pre-commissioning and commissioning tests of the Plant.

During pre-commissioning, commissioning, and performance test period, the Supplier may request NPC to provide operations and maintenance personnel to assist the Supplier in the operation and maintenance of his supplied equipment under the direction of the Supplier for the purpose of on-the-job training.

NPC shall have the right to send to the Site its personnel intended to operate and maintain the equipment supplied under this Contract. The Supplier shall use his staff to instruct these personnel relative to the operation and maintenance of the equipment.

**GW-11.0 CORROSION PROTECTION AND PAINTING****GW-11.1 General**

The Supplier shall apply corrosion protection and painting to all equipment and materials to be furnished in accordance with the minimum requirements specified in this section.

Generally, the diesel engine generator set/s and associated equipment including its enclosure shall be shop primed and finish coated in accordance with the Manufacturer's standard practice. An adequate supply of touch-up paint shall be supplied by the Manufacturer/Supplier which shall be used for painting surfaces that will be damaged during transport and installation works including surfaces that show signs of corrosion. Color of Final painting shall be per Manufacturer's standard, unless otherwise specified in the pertinent provisions of the specifications. Preferably, final color shall be similar to the existing color of the equipment and structures or as directed/approved by NPC.

The Supplier shall be responsible for the adoption of preparation procedures and protective coating systems which are suitable for the environment experienced by the various components/elements of the Plant.

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Where a specific coating system is mentioned elsewhere in the specification, the Supplier shall accept responsibility for the suitability for such system. The Supplier has the option to nominate an alternative coating system for the approval of NPC.

Within sixty (60) calendar days from the award of the Contract, the Supplier shall submit for the approval of NPC, a full schedule of coating systems including the following information:

- a) Plant item name;
- b) Protective coating systems including number and thickness of coats;
- c) Short list of protective coating manufacturers and applicators;
- d) Surface preparation;
- e) Workshop action; and
- f) Final color schedule which NPC will provide during the Contract stage or as specified in the relevant sections of this specification.

**GW-11.2 Treatment for Shipping**

The various items which do not fall under the paintings or lining specifications in the documents shall be surface treated for shipping.

The various items to be shipped shall be thoroughly cleaned before shipment so as to eliminate dirt, rust and grease, all welding slugs and spatters, and loose metals.

All metallic machined surfaces shall be covered with a protective coating. This coating shall be effective against salty air and shall be easily removable at site.

All iron or steel external surfaces shall be covered with two (2) coats of protective anti-rust paint.

All internal surfaces of tanks shall be coated with an easily washable corrosion preventive compound.

Piping, valves and other parts that have undergone hydraulic tests and which cannot be completely dried should be treated with water-absorbing corrosion inhibitor before the application of protective coating.

**GW-11.3 Application of Paint**

Before any painting is made, all surfaces must be prepared properly by removing all rusts, scales, welding slugs and spatters, grease and encrustation of any nature. Steel surfaces shall be white blasted in accordance with Steel Structures Painting Council Standard. The various paints to be used shall be of approved quality and type.

No painting shall take place outdoor during the presence of rain, fog, dew or where the surfaces may be otherwise damp; in particular and no application of paint should be made on plaster surfaces that are not completely dry. No coating shall be applied unless the surface is at minimum of 3°C above dew point.



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For successive coats, first coat shall be dried hard before the second coat. The color of successive coats must be sufficiently different to allow easy identification of the sequence of painting of surfaces for control purposes.

Paint shall not be applied to machined surfaces, corrosion resistant materials or linings, unless otherwise specified in the relevant sections of the specifications.

All contact surfaces of field-welded connections shall be masked at a distance of 100 mm back from the weld joint and shall be suitably protected against corrosion.

For non-insulated surfaces exposed to high temperature two (2) coats of aluminum modified silicone with a volume solid of 42%  $\pm$  2% high temperature paint shall be applied.

For internal surfaces for the receipt of oil, three (3) coats of paint having a phenolic-base or equivalent shall be applied. As minimum, first coat shall be applied with 80 microns DFT of zinc rich polyamide epoxy primer. Second and final coat shall be applied with 100 microns DFT polyamide epoxy for each coat. External surfaces shall be painted with 80 microns DFT of zinc rich polyamide epoxy primer on first coat. On second coat, 160 microns FTF of intermediate chlorinated rubber shall be applied and 80 microns DFT chlorinated rubber topcoat as final coat.

All other equipment and piping shall be prime coated with 80 microns DFT zinc rich epoxy paint and 80 microns DFT of chlorinated rubber for each intermediate and top coat.

Exposed fabrication, erection, or shipping marks shall be cleaned off and the areas touched-up shall be painted to match the adjacent surfaces.

For surfaces where blast cleaning and a wash primer are specified, touch-up painting shall include application of the wash primer before the touch-up coats.

Equipment and auxiliaries which are shop-fabricated/assembled and have already been provided with final painting shall no longer require painting at the site except for painted surfaces which have been damaged during transport and/or installation works, shall require touch-up painting. Color of final painting shall be as designated and approved by NPC.

Final tests and inspection shall be carried out by the Supplier to ascertain the correspondence of the paintwork to the prescribed color and treatment. These tests will indicate whether or not the paintwork is correctly applied and is free from wrinkles or roughness which might affect the adhesion of the protective coating.

Should the measured dry film thickness result to less than the specified one, the Supplier shall apply additional paint to the coat inspected or shall increase the thickness of succeeding coat, as applicable, to assure the specified total dry film thickness.

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The zinc protective coat shall be adherent, smooth and free from discontinuity and imperfections such as bubble, porosity, cracks, or other irregularities of the protective layer.

The thickness of applied layer shall correspond to a minimum rate of 600 gm/m<sup>2</sup> or as approved by NPC.

**GW-12.0 SPARE PARTS AND TOOLS**

The lists of Spares and Tools in a form to be filled up by the Supplier as specified in Part II - Technical Data Sheets, are preliminary and subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard).

The Bidder shall indicate "N/A" to the respective items in the said lists if found not applicable to the brand/model of the proposed equipment. However, NPC reserves the right to request the Supplier to provide the same or its equivalent if it is determined to be "required or necessary" during the evaluation, checking and review/approval of the final lists to be submitted by the Supplier during the Contract Stage at no cost to NPC.

**GW-12.1 Spare Parts**

The Supplier must have an established local Service Center (Owned or Officially Accredited) with experienced technical personnel that will promptly and efficiently cater to the repair, maintenance and spare parts requirements of the supplied unit/s during the warranty period.

The Supplier shall supply, deliver and install as required (consumables are by supply and delivery only like filter elements, fan belts, lubricants, oils and coolants, injector tips, etc) all the spare parts including labor and travel time necessary for replacement or repair works during the warranty period. The supply shall include all the spare parts specified in the specification and Technical Data Sheets, and all other replacement parts required to sustain the operation of all the generating units during the warranty period. Quantity of specified/listed spare parts which are not sufficient and will require additional spares during the warranty period shall be provided by the Supplier at no cost to NPC.

Spare parts shall include all the items that are expected to be consumed or replaced during the test and commissioning stage and these shall be identified and submitted in the form as specified in the Spare Parts List in Part II – Technical Data Sheets. However, should the Supplier borrow any items from the supplied Spare Parts during the test and commissioning, a replacement shall be ordered immediately.

All the spare parts shall be delivered/arrived at the plant site before the start of test and commissioning, complete with markings showing the description or code numbers to facilitate identification and retrieval.

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All spare parts shall be delivered into storage areas nominated by NPC and the delivery will be deemed to be complete when the packages have been opened by the Supplier, their contents checked by NPC, and articles reprotected and replaced by the Supplier to the satisfaction of such representatives or assembled into units at NPC's option and stored as directed by NPC. Damaged or incorrect item shall be replaced by the Supplier at his own cost.

All bidders are required to submit in their proposal the detailed list of spare parts to be supplied with its corresponding costs and in the form as specified in Part II – Technical Data Sheets. This list is preliminary and subject to changes in order to conform with the final design without any additional cost. The final list of spare parts shall be submitted to NPC for approval not later than one (1) month prior to the delivery of the equipment.

**GW-12.2 Tools and Appliances**

The tools and appliances recommended by the manufacturer and are deemed required for the following specific purpose of the equipment to be supplied under this Contract shall be provided by the Supplier including tools that are specified below and in the relevant Electrical Works specifications. A complete detail shall be listed in the Schedule of Tools and Appliances and shall be submitted with the bid in the form as specified in Part II – Technical Data Sheets, of the bid document.

- a) One (1) set of special/standard tools and instruments required for start-up, test and commissioning, operation and normal/overhaul maintenance of the whole of the equipment and auxiliaries furnished by the Supplier.
- b) Any special tools or appliances required solely for erection purposes.

Special tools are defined as all tools required for installation, assembling, dismantling and adjustment of all the works and usually not available in a standard machine shop or retailing store.

Each tool or appliance is to be clearly marked with its sign for purposes of identifying the function of each tool and the specific item(s) for which it is used. Each set of tools and appliances listed above shall be fitted into a custom built lockable box clearly marked with the name of the item or equipment for which they are used and with a list of the tools contained, stamped and attached on an attached metal tab.

If the weight of any box, or its size, is such that it cannot be conveniently carried, it shall be supported on steerable rubber tired wheels. All large tools and wrenches shall be mounted on a suitable shadow board arranged for wall mounting.

Every special tool and instrument shall be accompanied or furnished with maintenance or instruction manuals in English language.

All tools and appliances supplied shall be handed over to NPC in perfect condition at the time of taking over.

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All bidders are required to submit in their proposal the detailed list of special tools to be supplied in a form specified in Part II – Technical Data sheets. This list is preliminary and subject to changes in order to conform with the final design without any additional cost. The final list with the corresponding brochures/catalogues shall be submitted to NPC for approval not later than one (1) month prior to the delivery of the equipment.

**GW-13.0 PACKING, SHIPMENT AND STORAGE****GW-13.1 Packing/Crating**

The Supplier shall effect proper packing/crating to ensure that equipment and components are adequately protected from damage during shipment and subsequent storage. Utmost care shall be observed in packing/crating delicate equipment and electronic devices such as control panels, instruments, and other sensitive parts or components.

Equipment shall be completely drained of all water and thoroughly dry prior to shipment. When such draining requires removal of plugs, drain valves, etc., the Supplier shall make sure that these parts are re-inserted or reassembled prior to shipment. Other fluids (coolant, fuel oil, lube oil, etc.) shall be drained only if the Supplier deems it necessary.

All openings and machined surfaces shall be provided with protection to prevent damage, corrosion and entrance of foreign matter during shipment and storage.

Flanged connections shall be protected by a ½ inch (13 mm) or thicker plywood disc, or suitable alternate, bolted to the face of the flange.

Threaded or socket weld connections shall be protected with screwed or snap on type, securely held plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.

Butt-weld connections shall be protected by wooden disks that cover the entire weld end area, and shall be secured by metal straps and fasteners.

Covers, straps or fasteners shall not be welded to equipment.

Equipment shall be adequately supported for shipment. All loose parts shall be crated or boxed for shipment and appropriately identified. Where shipment is braced internally, it shall be marked conspicuously, "*Remove internal braces before testing and operating*".

All large and heavy shipping units shall have suitable skids for moving. Crating shall also be adequate for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.

As the shipment may be left in open storage at the designated place, the Supplier shall ensure that the delivered items have appropriate protection from water and other elements.

**SECTION VI – TECHNICAL SPECIFICATIONS**

All delicate electrical and mechanical parts susceptible to damage from moisture shall be packed in hermetically sealed container or other approved containers within their packing cases, with all machined surfaces coated with a rust preventive compound. All sealed packages shall include bags of silica or equally moisture absorbing chemical. When electric space heaters are provided for that purpose, these should be wired to the outside of the equipment so that energization immediately upon receipt is possible without disassembly of crates, etc. This also requires that no combustible material be left inside the equipment.

All equipment belonging to the same system/skid shall be properly marked and packed in the same crate as much as practicable. The Supplier shall not mix equipment and parts of one system with another to avoid confusion during assembly.

Valves, including its bolts, nuts, and washers, shall be segregately packed and properly marked according to plant system, size, and number of pieces.

All temperature gauges, pressure gauges, switches, transmitters, and other instruments shall be properly marked and carefully packed so as not to break the associated glass and undue damage to the threaded portion.

All spare parts shall be packed in a sealed container including special and standard tools in their separate sealed toolboxes.

All packages, crate boxes, drums, bags, bundles, or other containers or any loose pieces shall carry the following identification marks on the two (2) sides in black with a stencil proof ink or paint by means of block letters not less than 30 mm high, i.e.

**NATIONAL POWER CORPORATION**

CONTRACT NO.	:	_____
ITEM NO.	:	_____
PORT OF DISCHARGE	:	_____
DESCRIPTION	:	_____
OF CONTENT	:	_____
NET WEIGHT	:	_____ kgs.
GROSS WEIGHT	:	_____ kgs.
DIMENSION	:	_____ m <sup>3</sup>
CRATE NO.	:	_____

All packages shall be forwarded with a copy of packing list placed inside the package and another copy thereof contained in a waterproof envelope placed outside the package. The packing list shall give all information on the package such as package no., packing appearance, net weight, gross weight, dimension, measurement, and description of the equipment including storage and handling instructions with descriptions for periodic inspection and/or storage maintenance to ascertain that no deterioration will occur during storage.

**SECTION VI – TECHNICAL SPECIFICATIONS**

Prior to shipment, the Supplier shall furnish NPC advance copies of all packing lists and other pertinent documents.

The Supplier shall employ methods that will warrant safe delivery of equipment to its ultimate destination, with careful consideration given to the type of commodity, method of transportation, destination, storage time, and storage facilities at point of destination.

**GW-13.2 Shipment/Transport**

The Supplier shall be responsible for the sea and land transportation of the equipment, materials and supplies required under this Specification and shall ensure that they are safely and timely delivered to the specified site. Supplier shall be deemed to have visited the plant site and other areas on the route of delivery, including port facilities, inter-island shipping facilities, island transport, access roads, bridges, railways and to have acquainted themselves with all factors that will affect the cost of shipping and freight to Site.

Any damages to the roads, bridges, railways, ports, etc. arising out of neglect of Supplier shall be the responsibility of the Supplier. Likewise, any additional claim attributable to Supplier's lack of knowledge or understanding on existing conditions of the site shall not be given due credence.

The Supplier shall ship the materials and equipment on clear commercial bill of lading and the cost of all freight, insurance, shipping, handling and road transport charges shall be included in the Bid Price.

Upon arrival of equipment and materials at site, NPC and the Supplier or their authorized representatives, shall jointly verify the plant equipment to be stored at site following the steps below:

- a) Inspection and verification of the packing list;
- b) Visual inspection of the condition of the packing and its surfaces; and
- c) Partial opening of the crates and plastic sheet protection of the plant auxiliary equipment and diesel generating sets to verify the content and its physical condition and to check pilferage or damage during shipment and storage.

A record shall be prepared carefully noting all eventual shortages, defects or damages, signed by the Supplier and concurred by NPC. All shortages and damages noted shall be immediately replaced by the Supplier at his own cost and shall ensure the timely delivery of replacement without affecting the agreed overall project implementation schedule.

The Supplier shall keep a proper store ledger carefully noting all movements of materials within the project site. NPC has the right of access to the ledger, which shall be kept by the Supplier on site at all times.

**SECTION VI – TECHNICAL SPECIFICATIONS**

Shipment of equipment and materials to be supplied by the Supplier should be through Philippine Flag Carrier. However, a non-Philippine Flag Carrier may be used, provided a certification of its non-availability is issued by the nearest port authority within ten (10) calendar days from the date the goods are ready for shipment.

**GW-13.3 Storage**

The Supplier shall be responsible for securing all his supplied equipment at a place designated by NPC until the completion of the erection/installation and test. Any loss and/or damage of said equipment at said storage area shall be the responsibility of the Supplier.

If the equipment and materials to be supplied by the Supplier will not be immediately required for installation at the specified site/s, the materials and equipment shall be carefully stored and maintained at such place and in such a manner as NPC may direct until such time as they are ready for installation/erection.

If the Supplier desires to use any storage area other than those designated by NPC, he may do so at his own expense and subject to the approval of NPC.

Any part or auxiliary equipment which are exposed to the open and need to be protected from rain, dust or other elements that may result to damage and deterioration of said equipment, the Supplier shall provide with temporary tarpaulin or equivalent type of cover until the they have been installed in their respective areas.

The Supplier shall treat the wooden equipment crates/packages and the soil under the equipment and immediate surroundings to make it impervious and toxic to subterranean termites, often referred to as white ants or "anay" by application of soil poison solutions. Materials to be used shall be a solution commonly used by licensed companies or entities engaged in pest control or pest eradication. Banned solutions must never be applied. Applications of the solution shall be in accordance with the manufacturer's recommendation.

**GW-14.0 CLEAN UP**

When the Works are completed and before the issuance of the Certificate of Completion is made, the Supplier shall remove from the Site, without expense to NPC, all temporary structures, all materials and rubbish of every sort, shall fill and dress all holes and cavities made for his convenience, and shall leave the whole area in good order and condition, all as required and directed by NPC.

**GW-15.0 CERTIFICATE OF COMPLETION AND ACCEPTANCE**

When all the works and services have been satisfactorily completed as required in the Contract, the Supplier may give notice to this effect to NPC.

The notice shall be the basis for the issuance of Certificate of Completion in respect of the works within fifteen (15) days of receipt of such notice.

After the lapse of the warranty period, provided that there are no defects found and/or pending repair works (including completion of the required Supplier's Service Personnel Services specified in Clause GW-16.0 (Guarantee) as certified by the Plant Manager), NPC shall issue the Certificate of Final Acceptance.

#### **GW-16.0 GUARANTEE**

The Supplier shall guarantee that upon receipt of NPC's Notice of Request, he will promptly repair, and/or replace, at his own expense, equipment and machineries, against defect in design, workmanship and materials and shall include labor, parts and travel time for necessary repairs at the plant site effective from date of issuance of Certificate of Completion for a period of twelve (12) months.

However, if any generating set/s or plant system/s has been put into commercial operation even before the issuance of the Certificate of Completion, the warranty period of the particular generating set/s or plant system/s shall commence on the first day of the commercial operation. Commercial operation shall mean when generated loads are already exported to the grid/consumers following the successful performance/reliability tests. Accordingly, a Certificate shall be issued by the implementing group and/or plant head stating that the Warranty Period has started for the particular genset/s or plant system/s with the date stipulated thereon.

The Supplier shall also provide the services of the equipment Manufacturer/Supplier or his authorized local representative (a service technician who has complete knowledge of proper operation and maintenance of the generating sets) for a period of not less two (2) days in two (2) separate visits which will coincide on the first two (2) scheduled periods of preventive maintenance (every 250 hours or per manufacturer's recommended hours) of at least one generating set during the warranty period at no cost to NPC to perform the following, but not limited to:

- a) Checking/inspection of installed equipment;
- b) Conduct evaluation and assessment of operating parameters;
- c) Make necessary adjustment on instruments and controls;
- d) Perform/supervise necessary cleaning, repair, trouble shooting, parts replacement; and
- e) Provide training and/or informative instructions similar to items "a)" to "d)" above to NPC Plant Operation and Maintenance Personnel. Such training/instructions shall be conducted (Hands on) in such a way that NPC Plant O & M Personnel would be able to perform reliably and satisfactorily on similar generating sets supplied under this contract.



**SECTION VI – TECHNICAL SPECIFICATIONS**

This shall include any maintenance/repair services rendered upon request of NPC in the event of any abnormality occurs within the warranty period. For minor repairs/replacements/adjustments as determined by the Supplier, plant maintenance personnel who had undergone training conducted by the Supplier may perform the necessary repairs/replacements/adjustments, if authorized by the Supplier through any means of available communications, provided that such repair shall not relieve the Supplier of its obligation under the contract if such repair is not done properly.

The guarantee period of twelve (12) months shall be exclusive of any downtime attributable to the Supplier. In case of generating set downtime occurs during the warranty period due to fault of the Supplier, the downtime hours shall be added to the 1-year warranty period which shall start upon receipt by the Supplier of NPC's Notice of Request for Supplier's Repair Services. Hence, the warranty period is extended with the equivalent downtime attributable to the Supplier.

Provided further that the release of the warranty bond/security is without prejudice to terms provided by Clause GW-15 and shall be done after the warranty period plus downtime attributable to Supplier, if any as certified by the concerned end-user.

Accordingly, the warranty bond shall be extended.

In the event that undue delay is being caused by the Supplier for failing to attend the requested maintenance/repair services within ten (10) calendar days, NPC reserves the right to attend/complete the maintenance/repair services at the risk and cost of the Supplier. The decision of NPC in this regard shall be final. Accordingly, a penalty shall be charged to the Supplier as follows:

Penalty = Prevailing electricity rate in pesos per kW-day x genset rated capacity x number of shutdown days counted from 11<sup>th</sup> day of Supplier's acknowledgement to NPC's request without action.

The Supplier guarantees that when the equipment and/or material are placed in operation and/or use, it will perform in the manner as set forth in the Contract.

**GW-17.0 MEASUREMENT OF PAYMENT**

Measurement for payment for all works shall be based on the bid price of each item as shown in the respective Schedule of Requirements. The cost shall cover all works required and described in the pertinent provisions of the specifications and for the satisfactory completion of each work.

Failure of the Supplier to submit the approved "As-Built" Drawings and "Operation and Maintenance" Manuals to NPC on the respective dates specified in Clauses GW-6.3.7 and GW-6.3.8, NPC shall withhold Five percent (5%) of contract amount from payments due to the Supplier.

# **PART I – TECHNICAL SPECIFICATIONS**

## **CW – CIVIL WORKS**

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SECTION VI – TECHNICAL SPECIFICATIONS**TECHNICAL SPECIFICATIONS****CW – CIVIL WORKS****CW-1.0 GENERAL CONSTRUCTION FACILITIES****CW-1.1 Scope**

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

**CW-1.2 Moving-in**

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

**CW-1.3 Contractor's Camp Facilities**

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

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

**CW-1.4 Water Supply**

The Contractor shall, at his own expense, be responsible for the supply, installation, operation and maintenance of a safe and adequate supply of drinking and domestic water. Whenever there is a possibility of contamination of the water supply for drinking and domestic purposes, chlorination or some other approved methods of sterilization shall be carried out. The installation and maintenance of these services shall be subject to the approval of the NPC.

**CW-1.5 Sewerage Disposal and Sanitation**

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

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

**CW-1.6 Fire Protection**

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

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

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

**CW-1.7 Construction Power**

The Contractor shall be responsible for providing his own electric power supply required for construction and erection/installation. If power is available from NPC and should the Contractor elect to utilize the NPC's power supply, he shall make an arrangement with NPC concerned group as to the billing rates and other requirements needed for direct connection to NPC.

**CW-1.8 Camp Security**

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

**CW-1.9 Construction Material Storage**

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

**CW-1.10 Removal of Camp and Construction Facilities**

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



**CW-1.11 Measurement and Payment**

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

**CW-2.0 CARE OF WATER DURING CONSTRUCTION****CW-2.1 Scope**

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

**CW-2.2 Drainage and Dewatering**

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

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

**CW-2.3 Measurement and Payment**

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

**CW-3.0 ENVIRONMENTAL REQUIREMENTS FOR CIVIL WORKS****CW-3.1 Scope**

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

**CW-3.2 General Conditions**

The Contractor shall ensure compliance with the applicable environmental and safety regulations, as well as ECC conditions, during installation/construction

of this project through the implementation of measures that include, but not limited to, the following:

- a) Designate a Safety Officer and a Pollution Control Officer who shall respectively handle all safety and environmental concerns of the project.
- b) Prepare and submit Construction Safety and Health Plan (CSHP).
- c) Properly manage debris and various waste generated during installation/construction, such as the following:
  - Dispose of demolition and construction debris in a designated or NPC approved disposal area(s);
  - Stockpile (and cover if possible) or haul to the designated and/or pre-developed dump sites (spoil disposal areas) that shall be provided with suitable drainage – equipped with sediment traps, stripped top soil, spoils from quarry/borrow sites and excavated materials;
  - Segregate solid wastes, such as empty cement sacks, scraps of tin or wood, used wires and other domestic garbage, for recycling or storage in NPC-approved temporary storage areas and further disposal to LGU-designated disposal sites.
  - Properly handle, store and dispose-off, through DENR-accredited transporter/treater, hazardous wastes i.e. used oils, paints, thinner, etc.
- d) Limit construction activities that generate excessive noise to daytime works only to prevent nuisance to nearby residents during rest hours.
- e) As far as practicable, undertake site stripping, grading and excavations during dry weather.
- f) Construction/Installation shall be carried-out in a manner where landslides and erosions are minimized.
- g) Avoid unnecessary opening/clearing of areas outside construction sites or destruction of vegetative cover, especially cutting of existing trees; and to re-vegetate disturbed areas.
- h) Implement biological control measures such as maintenance of vegetation buffers (i.e. sodding of grass, planting of creeping vines, herbs, shrubs and trees) to shield streams/rivers from sedimentation; planting of vegetative cover over erodible surfaces; and planting of exposed sloping areas with shallow-rooted species like grasses, herbs or creepers.
- i) Locate fill slopes and spoil heaps away from drainage routes and properly remove/dispose the same as soon as practicable.

- j) Preserve or replace, if practicable, natural drainage patterns (when disturbed by civil works) with appropriate drainage channels.
- k) Convey oil-contaminated wastewater from workshops, garages, or gas filling stations through an oil trap (i.e. improvised oil-water separator) prior to discharge.
- l) Spray water, wherever and whenever necessary, to minimize dust generation.
- m) Provide PPEs and other safety provisions required by DOLE, for its project/site works.
- n) Take all necessary steps to prevent the pollution of groundwater and/or water bodies in the vicinity of the project site.

### **CW-3.3 Measurement and Payment**

No separate measurement and payment will be made for the Contractor's compliance to the foregoing. The entire cost thereof shall be included in the various pay items in the Schedule of Requirements.

## **CW-4.0 STRUCTURAL EXCAVATION, FILL AND BACKFILL**

### **CW-4.1 Scope**

In accordance with the specifications contained herein and as shown on the drawings and otherwise directed, the Contractor shall perform all the required structural excavation, fill and backfill for the entire project, including the proper disposal of excess excavated materials.

### **CW-4.2 Materials**

#### **CW-4.2.1 Structural Excavation**

No classification will be made on the materials excavated. The Contractor shall determine his/her unit bid price for structural excavation based on unclassified material regardless of the nature of the materials actually encountered and excavated.

#### **CW-4.2.2 Structural Fill**

##### **a. Sand and Gravel Fill**

The material shall be of the same classification as the sand and gravel base consisting of river sand and gravel as approved by the NPC. The composite material shall be free from vegetable matter and lumps or balls of clay, and shall be uniformly graded from coarse to fine in accordance with the grading requirements shown below:

<b>Sieve Designation (Square Mesh Sieves)</b>	<b>Percentage by Weight Passing</b>
50.0 mm (2")	100

25.4 mm (1")	55-85
9.5 mm (3/8")	35-60
4.76 mm (No. 4)	25-50
2.08 mm (No. 10)	20-40
0.42 mm (No. 40)	8-20
0.074 mm (No. 200)	2-8

b. Structural Earth Fill

Structural earth fill shall consist of filling with suitable materials obtained from grading excavation or from borrow areas approved by the NPC.

**CW-4.2.3 Special Foundation, if any**

The NPC shall have the option to use one or both of the following materials for special foundations, whether or not shown on the drawings:

a. Lean Concrete

The strength of lean concrete shall be 13.79MPa or as designated by the NPC.

b. Selected Materials

Selected materials shall consist of compactable material which, when compacted, shall attain the required bearing capacity. The material could be a combination of earth and rock particles not greater than 8 cm including sandy clay, gravelly clay, or shale, all approved by the NPC.

Bed materials for water pipes and/or drainage culverts shall use sand fills.

**CW-4.2.4 Structural Backfill**

Backfill for Structures Other Than Pipes – Material for backfill shall consist of compactable and approved material taken from grading and structural excavations. Any additional material needed shall be obtained from borrow areas proposed by the Contractor and approved by the NPC.

Backfill for Sewerage and Drainage Pipes – The layer of backfill materials immediately above, up to 60 cm. from the top of pipe, and on the sides of the pipe shall consist of selected material consisting of clay soil and/or other fine materials that are free from stone particles, roots, debris. The upper layer shall consist of compactable materials taken from pipe trench and other structural excavation.

Backfill for Water Supply Pipes – Backfill for water supply pipes shall consist of compactable materials taken from trench excavation and approved by the NPC.

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**CW-4.3 Construction****CW-4.3.1 Excavation****a. General**

The Contractor shall notify the NPC sufficiently in advance before the beginning of any excavation so that a joint survey for baseline data and cross-sectional measurements can be undertaken on the undisturbed/natural ground surface. All excavation shall be carried out according to the lines, slopes and grades shown on the drawings. In case an increase or decrease in quantities occur as a result of changes made by the NPC to such lines, slopes, and grades, the provisions on Variation Orders under the General Conditions of Contract (GCC) shall apply.

After each excavation is completed or where replacement of unsuitable material below required foundation grade has been undertaken, the Contractor shall notify the NPC so that proper inspection and confirmatory test on the bearing capacity of the foundation material can be made. In no case that concrete, sewer, drainage or water supply pipe can be placed unless a written approval has been issued by the NPC.

Over-excavation performed by the Contractor due to his carelessness shall be filled and properly compacted with the suitable material approved by NPC, at no additional cost to NPC.

**b. Structural Excavation, Structure Other Than Pipes**

The Contractor shall excavate the foundations to the specified side slopes and depths shown on the drawings, after which the NPC will conduct tests on the underlying material below foundation grade to determine the actual bearing capacity at such depth. If the required bearing capacity is not attained, the NPC shall instruct the Contractor to excavate further down until, in the opinion of the NPC, the bearing capacity is adequate to sustain the applied load on the foundation.

Compliance to such instruction shall not entitle the Contractor for additional compensation over and above the unit prices for excavation regardless of the nature of material excavated. For purposes of measurement, the applicable paylines for the excavation under this condition or situation shall be as shown on the drawings that show the paylines for excavation and special foundation materials.

**c. Drainage and Sewerage Pipes and Cable Trench**

The width of trench excavation for drainage and sewerage pipes and cable trench shall be as indicated on the drawings. All trench bottoms shall be excavated to the foundation grade indicated, regardless of the foundation material classification.

**d. Water Supply Pipes**

Trenches for main or feeder lines shall be excavated to the depth of no less than 0.25 meter on open ground and 0.60 meter under roadways and parking areas, both depths measured from the finished grade surface.

Service pipes shall be buried to a depth of at least 0.15 meter below grade line.

**CW-4.3.2 Structural Foundation Fill**

No fill materials shall be placed in any part of the fill foundation unless the foundations have been inspected and approved by the NPC. Fill materials shall be placed and spread in layer covering the entire length and breadth of the section under construction, each layer not to exceed 15 cm. in loose volume thickness and compacted thoroughly to the desired compaction as determined by the NPC. No succeeding layer shall be placed until the previous layer has been tested and approved, as to compaction, by the NPC.

**CW-4.3.3 Special Foundations**

If unsuitable material is encountered or if the foundation material is unsuitable such that the required bearing capacity of the foundation cannot be attained at the required elevation, further excavation shall be performed by the Contractor as stated in CW-4.3.1b.

Excavated materials below foundation grade shall be replaced at the direction of the NPC, either by lean concrete or by selected materials as mentioned in CW-4.2.3.

Selected materials shall be placed in 15-cm layers and compacted until the required bearing capacity is attained.

**CW-4.3.4 Backfill****1. Structures, Other Than Pipes**

Excavated areas around structures for backfilling shall be backfilled with approved materials in horizontal layers, each not exceeding 15cm. (6") in loose volume thickness. Each layer shall either be moistened or dried as directed and thoroughly tamped with tampers having no less than 160 cm<sup>2</sup> of tamping area and weighing not less than 20 kg. The last layer shall be neatly brought up to the level of the adjoining finished grade surface.

In no case shall backfill be placed around concrete structures until after fourteen (14) days from placement of the concrete.

**2. Drainage and Sewerage Pipes**

After the pipes have been installed and grouted joints sufficiently cured, but in no case less than seven (7) days allowed for curing as specified in NSCP and the whole pipeline inspected, backfill materials specified herein shall be placed in layers as directed, each layer either dried or moistened as directed and

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thoroughly tamped. The backfill shall be brought up evenly on both sides of the pipe up to the top of the pipe and finally up to the finished grade surface.

**3. Water Supply Pipes**

After the pipeline has been installed and tested it shall be backfilled in layers as directed and compacted to the satisfaction of the NPC.

**CW-4.4 Measurement and Payment****CW-4.4.1 Structural Excavation**

Measurement of payment for structural excavation performed by the Contractor for structures (except drainage, sewerage and water supply pipes, and appurtenances of which cost of excavation and backfill is included in the cost of installed pipe and constructed appurtenances) will be based on the number of cubic meters of materials excavated.

For purpose of payment, all authorized excavation below foundation grade (like in the case of unsuitable materials encountered) shall be included in the measurement.

Payment will be made at the contract unit price for Structural Excavation in the Schedule of Requirements, which payment shall constitute full compensation for furnishing all labor and equipment necessary for excavation work and proper disposal of excess material excavated.

**CW-4.4.2 Structural Foundation Fill**

Measurement for payment for Structural Foundation Fill will be based on the number of cubic meters of fill materials placed within the neat lines as shown on the drawings.

Payment will be made at the contract unit price for the item, Sand and Gravel Fill/Base, in the Schedule of Requirements, which payment shall constitute full compensation for furnishing, placing and compacting fill materials; labor which include spreading, compacting, etc., equipment and other incidentals necessary to complete the item.

**CW-4.4.3 Special Foundations**

Measurement for payment for lean concrete and/or selected materials placed within the pay lines for excavation will be based on the number of cubic meters in-place and accepted.

Payment will be made at the contract unit price for the corresponding item shown in the Schedule of Requirements, which payment shall cover all costs for furnishing all labor, materials, equipment and tools necessary to complete the item.

**CW-4.4.4 Structural Backfill**

Measurement for payment for Structural Backfill (except backfill for drainage and sewerage pipes, appurtenances and other structures of which cost of backfill is included in the cost of installed pipes and appurtenances) will be based on the number of cubic meters of approved materials, backfilled, satisfactorily compacted and accepted. Any backfill material placed outside the pay lines for excavation to replace slides or over-excavation will not be paid.

Payment will be made at the contract unit price for the item, Structural Backfill, in the Schedule of Requirements, which payment shall constitute full compensation for furnishing all labor, materials and equipment necessary for backfilling work.

**CW-4.4.5 Trench Excavation and Backfill for Sewerage, Drainage and Water Supply Pipes and Cable Trench**

No separate measurement and payment will be made for trench excavation and backfill for all sewerage, drainage and water supply pipes. Payment for trench excavation and backfill for pipes shall be included in the payment pertaining to pipes as shown in the Schedule of Requirements.

**CW-5.0 CONCRETE****CW-5.1 Scope**

In accordance with the specifications contained in this section, the Contractor shall furnish all materials, labor, equipment and tools and perform all concreting works in accordance with the drawings, or as otherwise directed.

**CW-5.2 Class of Concrete**

Class of concrete or strength shall be as indicated on the drawings, which shall conform to the minimum requirement for compressive strength indicated on the provision of NSCP for Concrete and, in no case, shall not be less than 20.7 MPa.

**CW-5.3 Materials****CW-5.3.1 Cement**

Cement for concrete works shall be furnished by the Contractor and shall conform to the requirements of the latest edition of the Standard Specifications for Portland Cement (ASTMC150).

Unless otherwise specified, cement shall be ordinary Portland Cement. Type I for general construction which concrete is not in contact with soils or ground water and Type II for concrete in contact with soil or ground water.

Changing of brand or type of cement within the same structure will not be permitted unless with prior permission and approval obtained from the NPC.



**CW-5.3.2 Reinforcing Steel**

The Contractor shall furnish all reinforcing steel of the sizes shown on the drawings and in accordance with the herein specifications for reinforcing steel.

**CW-5.3.3 Water**

Water for use in concrete shall be subject to the approval of the NPC. It shall not be salty and shall be reasonably clear and free from oil, acid, injurious alkali or vegetable matter.

**CW-5.3.4 Aggregates**

All coarse and fine aggregates shall consist of hard, tough, durable and clean, uncoated particles. All foreign materials and dust shall be removed by processing. Aggregates shall generally be rounded and reasonably free from thin, flat and elongated particles in all sizes and well graded from coarse to fine.

**CW-5.3.5 Formwork**

Timber, lumber and plywood to be used for falsework and formwork shall be sound and shall comply with the requirements of this specifications. Use forms where a smooth form finish is required. Lumber shall be square-edged or tongue-and-groove boards, free or raised grain, knotholes and the other surfaces defects. Steel when used shall conform to the requirements of the ASTM A36. Steel form surfaces shall not contain irregularities, dents, or sags.

Forms shall be wood, plywood, or steel. Wood forms for surfaces exposed to view in the finished structure and requiring a smooth form finish, shall be plywood. For unexposed surfaces, undressed square-edge lumber may be used. Forms for surfaces requiring special finishes shall be plywood, or shall be lined with plywood, a non-absorptive, hard-pressed fiberboard, absorptive-type lining or other suitable material. Plywood, other than for lining, shall be concrete-form plywood free of raised grain, torn surfaces, worn edges, patches, or other surface defects, which would impair the texture of the concrete surface. Surfaces of steel forms shall be free from irregularities, dents, and sags.

**CW-5.4 Storage of Materials****CW-5.4.1 Cement and Aggregates**

All cement shall be stored, immediately upon delivery at the Site, in weatherproof building that will protect the cement from dampness. The floor shall be adequately raised from the ground and in buildings placed in the locations approved by NPC. Provisions for storage shall be ample, and the shipments of cement as received shall be separately stored in such a manner that allows the earliest deliveries to be used first and to provide easy access for identification and inspection of each shipment. Storage buildings shall have capacity for storage of sufficient quantity of cement to allow sampling at least twelve (12) days before the cement is to be used. Bulk cement, if used, shall be transferred to elevated air tight and weatherproof bins. Stored cement shall meet the test requirements at any time after storage when NPC orders retest. At the time of use, all cement shall be free flowing and free of lumps.

Handling and storing of concrete aggregates shall be such that segregation or inclusion of foreign materials is sufficiently prevented. NPC may require that aggregates be stored on separate platforms at satisfactory locations.

In order to secure greater uniformity of concrete mix, NPC may require that the coarse aggregate be separated into two or more sizes. Different sizes of aggregates shall be stored in separate bins or in separate stockpiles and relatively away from each other to prevent the material at the edges of the piles from intermixing.

#### **CW-5.4.2 Reinforcing Steel**

Reinforcing steel shall be stored in accordance with the specifications for reinforcing steel.

#### **CW-5.5 Concreting**

##### **CW-5.5.1 General**

The written approval of the NPC shall be secured prior to any concreting work. All concrete shall be poured on dry and cleaned surfaces.

##### **CW-5.5.2 Formwork Construction**

Forms shall be installed mortar and watertight, true to the dimensions, lines and grades of the structure and with the sufficient strength, rigidity, shape and surface smoothness as to leave the finished works true to the dimensions shown on the drawings or required by NPC and with the surface finish as specified.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms, which will subsequently be removed, shall be thoroughly coated with a release agent or coating prior to its use. The release agent shall be commercial quality form oil or other approved coating which will permit the ready release of the forms and will not discolor the concrete.

Formwork for concrete placed underwater shall be watertight.

Forms shall be constructed so that the form surface of the concrete does not undulate excessively in any direction. Undulations exceeding either 2 mm or 1/270 of the center distance between studs, joints, form stiffeners, form fasteners, or wales will be considered to be excessive. Should any form of the forming system, even though previously approved for the use, produce a concrete surface with excessive undulations, its use shall be discontinued until modifications, satisfactory to NPC's Representative, have been made.

Portions of concrete structures with surface undulations in excess of the limits herein stated may be rejected by the NPC.

Form fasteners consisting of bolts, clamps or other devices shall be used as necessary to prevent spreading of the forms during concrete placement. The use of ties consisting of twisted wire loops to hold the forms in position will not be permitted.

All formworks shall be provided with adequate clean-out openings to permit inspection and easy cleaning after all reinforcement has been placed. Where forms for continuous surfaces are placed in successive units, the forms shall be fitted over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Panel forms shall be constructed so that they can be removed without damaging the concrete. All exposed joints, edges, and external corners shall be chamfered a minimum of 20 mm unless specified otherwise herein. Forms for heavy girders and similar members shall be constructed with a proper camber.

Coating: Before placing the concrete, the contact surface of forms shall be coated with a non-staining mineral oil or suitable non-staining form coating compound or shall be given two coats of nitrocellulose lacquer, except as specified otherwise. Mineral oil shall not be used on forms for surfaces, which are to be painted. For surfaces not exposed to view in the finished structure, sheathing may be wetted thoroughly with clean water. All excess coating shall be removed by wiping with cloths. Reused forms shall have the contact surfaces cleaned thoroughly. Those that have been coated shall be given an additional application of the coating. Plaster waste molds shall be layered with two coats of the thin shellac or lacquer and coated with soft or thinned non-staining grease.

Tolerance and Variations: The Contractor shall set and maintain concrete forms to ensure that, after removal of the forms and prior to patching and finishing, no portion of the concrete work will exceed any of the tolerances specified. Variations in floor levels shall be measured before removal of supporting shores. The Contractor shall make the necessary corrective measures for the variations resulting from deflection, or when the latter affects concrete quality or curing. The tolerances specified shall not exceed by any portion of the concrete surfaces; the specified variation for one element of the structure shall be considered unacceptable when it permits another element of the structure to exceed its allowable variations. Except as otherwise specified herein, tolerances shall conform to ACI 347.

#### **CW-5.5.3      Placing Reinforcement**

Reinforcing steel and embedded items shall be properly and securely installed prior to the placing of concrete.

In no case shall concreting start without prior inspection and approval by the NPC of the placed reinforcement and other embedded items.

#### **CW-5.5.4      Mixing Concrete**

Mixing of concrete shall conform to the requirements of ACI Code for Concrete Construction.

#### **CW-5.5.5      Placing Concrete**

Concrete shall be conveyed from mixers to the forms or to the place of deposit as rapidly as possible and by methods that will prevent segregation or loss of ingredients. There shall be no vertical drop greater than 1.5 meters except where suitable equipment like metal pipe or tremie is used. The pipe or tremie

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shall be kept full of concrete and its end shall be kept buried in the newly placed concrete. Chutes through which concrete is delivered to the structure in a thin, continuously exposed flow will not be permitted except for very limited or isolated sections of the work.

Earth surfaces, upon which concrete shall be placed, shall be cleaned, dry and thoroughly compacted before placing the concrete.

Rock surface, upon which concrete shall be placed, shall be thoroughly cleaned of loose or semi-detached or unsound rock particles. Before placing concrete, all surfaces shall be wetted thoroughly to keep them in a completely moist condition, after which leveling mortar of the same cement ratio as the concrete mix complete contact between concrete and the leveled surface.

**CW-5.5.6 Finishing Concrete**

After the concrete has been deposited, distributed and vibrated, the concrete shall be struck off and screened by mechanical means approved by the NPC. The finishing machine shall be of the screening and troweling type designed and operated both to strike off and to consolidate. Hand finishing may be employed when suitable finishing machines are not available. Finishing of concrete shall be done, as directed, to the satisfaction of the NPC.

All finished surfaces shall be tested with 3 meters straight edge and any variation of the surface from the desired crown or cross section shall be properly corrected.

**CW-5.5.7 Removal of Forms**

Formwork shall not be removed without the permission of NPC; where such permission, however, shall not relieve the Contractor of its responsibility for the safety of the work. Blocks and bracing shall be removed at the time the forms are removed and in no case shall any portion of the wood forms be left in the concrete.

Falsework removal for continuous structures shall be as directed by NPC but in which case shall be temporarily supported such that the structure is gradually subjected to its working stresses. False work shall not be released in any span until the strength specified hereunder is attained.

When concrete strength tests are to be used as basis for the removal of forms and supports, the compressive strength of concrete must meet the following minimum requirements:

	Min. Time	Min.% Strength
Centering under girders and beams	14 days	80%
Sides of beams and all vertical surfaces	1 day	70%
Floor Slabs	14 days	80%

The site shall be cleared of all debris and refuse resulting from work.

**CW-5.5.8 Curing and Protection**

Concrete shall be cured for a period of not less than fourteen (14) consecutive days by keeping the surfaces of concrete continuously (not periodically) wet. Where tongue and groove forms were used and left in place of curing, they shall be kept wet at all times prevent opening at the joints and drying out of the concrete.

**CW-5.5.9 Sampling and Testing of Concrete**

The Contractor shall furnish all materials, either separately or mixed, as required by NPC. Selection of materials and the making of test specimens shall be made under the supervision of NPC and delivered to NPC laboratory or any NPC-accredited testing agency at the Contractor's expense.

The expense of making and curing all concrete specimens including the materials comprising the concrete specimens shall be borne by the Contractor. The cost of shipping and testing the concrete shall likewise be at the expense of the Contractor.

No concreting work on the project will be permitted to be done until NPC signifies in writing that, following the performance of the necessary tests, he gives his approval to the use of all materials involve in making the concrete.

As work progresses, test cylinders shall be fabricated from the concrete samples and tested in accordance with ASTM C31 and ASTM C39. At least one set of four (4) cylinders shall be made from each 10 cu.m of the concrete placed of each class. Also at least one set shall be made per day for each class of concrete placed each day.

Two (2) cylinders shall be tested at 28 days for specification compliance and one shall be tested at 7 and 14 days respectively for information. The acceptance test result shall be the average of the strength of the two cylinders tested at 28 days.

The compressive strength of the concrete shall be deemed acceptable if the averages of the three consecutive strength test results is equal to or exceeds the specified strength and no individual test falls below the specified strength by more than 3.50 MPa.

Concrete deemed to be not acceptable using the above criteria maybe rejected unless the Contractor can provide evidence, by means of core tests, that the quality of concrete represented by the failed test result is acceptable in place. Three (3) cores shall be taken in accordance with ASTM C42 and soaked for 24 hours prior to testing. Concrete in the area represented by the cores will be deemed acceptable if the average strength of the cores is equal to at least 85% of and no single core is less than 75% of the specified strength.

**CW-5.5.10 Tolerances and Repair for Concrete Construction**

Concrete structures shall be constructed to the lines shown on the drawings or where so required to suit actual field requirements. Any structure that does not

conform to such lines shall be repaired or removed and made anew by the Contractor at no additional cost to the Corporation.

Repairs shall be made at surface imperfections due to faulty placing of concrete and cuts on the structures due to the removal of excess concrete on the lines shown on the drawings. Such repairs shall be made immediately after early stripping of the forms, after the imperfections have been identified and the methods of repair appropriately established.

#### **CW-5.5.11 Second Stage Concrete**

The second stage of concrete finishing shall be done only after the final installation of all pertinent equipment, anchorages, pipings, conduits and other embedded items as may be required for all electromechanical works.

#### **CW-5.6 Measurement and Payment**

Measurement for payment for Concrete, except concreting works that are associated to various construction and/or installation/erection works (i.e. equipment foundation and pedestals, perimeter wall footing and posts, etc.) included in the Schedule of Requirements under separate pay item, will be based on the volume of concrete placed and accepted within the neat lines of the structure as shown on the drawings or in accordance with the manner of measurement set forth in the various sections of the Technical Provisions. No deduction will be made for rounded or beveled edges or space occupied by the metal items 10 sq. cm. or less in cross section, embedded in concrete.

Payment will be made at the corresponding pertinent pay items of concrete shown in the Schedule of Requirements. Payment shall cover all costs for furnishing all labor, materials, including equipment and tools required for concreting work. Payment shall also include non-shrink cementitious grout and epoxy grout inside foundation block out and above engine base plate and care of water.

No separate measurement for payment will be made for formworks of which the cost shall be included in concreting works.

#### **CW-6.0 REINFORCING STEEL**

##### **CW-6.1 Description**

This work shall consist of furnishing, fabricating, and placing of steel reinforcement of the type, size, shape and grade required in accordance with these specifications and in conformity with the requirements shown on the Drawings or as directed by the NPC.

##### **CW-6.2 Material Requirement**

All material shall conform to the requirements hereinafter given. Certified test reports (mill test or other) shall be submitted to the NPC for all reinforcement steel used. These tests shall show the results of all chemical and physical tests made.

**CW-6.2.1 Bar Reinforcement**

Reinforcement bars for concrete shall be hot-rolled, weld able, deformed billet-steel bars conforming to the requirements specified in ASTM A615 and PNS 49 unless shown on the Drawings or as required by the NPC. The use of the cold twisted bars is not permitted. Bar reinforcement shall be shipped in standard bundles, tagged and marked in accordance with the Code of Standard Practice of the Concrete Reinforcement Steel Institute.

**CW-6.2.2 Sampling**

The NPC's Representative will sample reinforcement bars at the source of supply or at the point of distribution, and the Contractor shall notify the NPC in sufficient time in advance to permit sampling and testing before shipment is made. Three (3) samples from each size shall be taken at random representing five (5) tons or fraction thereof of each size.

**CW-6.3 Construction Requirement****CW-6.3.1 Order List for Bent Bars**

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

Shop Drawings for Reinforcing Steel (ACI 315): Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions and details of bar reinforcing, accessories and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing steel.

**CW-6.3.2 Fabrication**

Bent bar reinforcement shall be cold bent as shown on the drawings or as required by the NPC. Bars shall be bent around circular pin having the following diameters (D) in relation to the diameter of the bar (d):

Bars 6mm $\Phi$ to 20mm $\Phi$ inclusive	D=6d
Bars 25mm $\Phi$ and 28mm $\Phi$	D=8d
Bars 32mm $\Phi$ and greater	D=10d

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

**CW-6.3.3 Protection of Material**

Steel reinforcement shall be protected at all times from injury. When placed in the work, it shall be free from dirt, detrimental scale, paint, oil or other foreign matter. However, when steel has on its surface easily removable and

detrimental rust, loose scale or dust, it shall be cleaned by a satisfactory method, approved by the NPC.

Store reinforcement of the different sizes in racks raised above the ground with accurate identification. Protect reinforcing steel from contaminants such as grease, oil and dirt.

#### **CW-6.3.4 Placing and Fastening Reinforcement & Miscellaneous Material (ACI-301)**

All reinforcement bars, stirrups, hanger bars, wire fabric, spirals and other reinforcing materials shall be provided as indicated in the drawing or required by the specification, together with all necessary wire ties, chairs, screws, supports, and other devices necessary to install and secure the reinforcement properly. All reinforcement, when placed, shall be free from rust, scale, oil, grease, clay, and other coatings, and foreign substances that would reduce or destroy the bond. Rusting of reinforcement shall not reduce the effective cross sectional area of the reinforcement to the extent that the strength is reduced beyond specified values. Heavy, thick rust or loose, flaky rust shall be removed by rubbing with burlap or other approved method, prior to placing. Reinforcement that has bends not shown on the project drawings or on approved shop drawings, or is reduced in section by rusting such that its weight is not within permissible ASTM tolerances, shall not be used. All reinforcement shall be supported and wired together to prevent displacement by construction loads or by the placing of concrete. Unless directed otherwise by the NPC, reinforcement shall not be bent after being partially embedded in hardened concrete. Detailing of reinforcing shall conform to ACI 315. Where cover over reinforcing steel is not specified or indicated, it shall be in accordance with ACI 318.

All steel reinforcement shall be accurately placed in position shown on the drawings or as required by the NPC and firmly held there during the placing and setting of the concrete. Bars shall be tied at all intersections except where spacing is less than 30 mm in each direction, when alternate intersections shall be tied. Ties shall fasten on the inside.

Distance from the forms shall be maintained by means of stays, blocks, hangers or other approved supports. Blocks for holding reinforcement from contact with the forms shall be pre-cast mortar blocks of approved shape and dimensions or approved chairs. Layers of bars shall, be separated by pre-cast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks or metal chairs shall not be permitted. Unless otherwise shown on the Drawings or required by the NPC, the minimum distance between bars shall be 40mm. Reinforcement in any member shall be placed and then inspected and approved by the NPC before the placing of concrete commences. Bundled bars shall be tied together at not more than 1.80 meters intervals.

Reinforcement shall be placed accurately and secured. It shall be supported by suitable chairs and spaces or by metal hangers. On the ground, and where otherwise subject to corrosion, concrete or other suitable non-corrodible material shall be used for supporting reinforcement. Where the concrete surface will be exposed to the weather in the finished structure or where rust



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would impair the appearance or finish of the structure, all reinforcement supports, within specified concrete cover, shall be galvanized or made of a suitable non-corrodible material.

All placement or movement of reinforcing steel after placement, to positions other than indicated or specified, shall be subject to the approval of the NPC.

Concrete protection for reinforcement shall be as indicated, or if not indicated, in accordance with ACI 318.

The minimum concrete cover for reinforcement specified in the bid documents shall take precedence over all permissible reinforcement placement variations; nothing in the variations listed below is to be constructed as permitting violation or compromise thereof:

- |  |                  |
|--|------------------|
| a. Height of bottom bars                 | ±6mm above form  |
| b. Lengthwise positioning                | ±50mm of bars    |
| c. Spacing bars in walls and solid slabs | ±25mm            |
| d. Spacing bars in beams and footings    | ±6mm             |
| e. Height of top bars                    | ±6mm             |
| f. Stirrup spacing:                      |                  |
| (1) For any one stirrup                  | ±25mm            |
| (2) For over-all group                   | ±25mm of stirrup |

Anchors and bolts; including but not limited to those for the machine and equipment bases: frames or edgings, hangers and inserts, door bucks, pipe supports, pipe sleeves, pipe passing through walls, metal ties, conduits, flashing reflects, drains and all other materials in connection with the concrete construction shall, where practicable be placed and secured in position when the concrete is placed. Anchor bolts for machines shall be set to templates, shall be plumbed carefully and checked for location and elevation with an instrument, and shall be held in position rigidly to prevent displacement while concrete is being placed.

**CW-6.3.5 Splicing**

Splicing of reinforcement shall be in accordance with ACI 318, except as indicated otherwise or modified herein. Where splices in addition to those indicated on the drawings are necessary, they shall be approved by the NPC prior to their use. Splices shall not be made in beams, girders, and slabs at points of maximum stress. Butt Splicing shall preferably be used over lapping for bar sizes larger than 32 mmΦ. Splices to be welded shall conform to AWS D1.4; certification of weld ability of the reinforcement by the manufacturer, shall be submitted to the NPC. If the Contractor elects to use butt splicing of reinforcing, he shall submit complete details of the process to be used by the NPC. If the butt splices are used the Contractor shall ensure that the splice meets the requirements specified herein by performing at least three splices which shall be submitted for tests to a testing laboratory that has been approved for such testing by the NPC. The cost of these shall be borne by the Contractor.

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

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

<u>Splice Type</u>	<u>Grade 40 Min.Lap</u>	<u>But Not Less Than</u>
Tension	24d	300mm
Compression	20d	300mm

Where d is the diameter of the bar. In lapped splices, the bars shall be placed in contact and wired together. Lapped splices will not be permitted at locations where the concrete section is insufficient to provide a minimum clear distance of one and one-third the maximum size of coarse aggregate between the splice and the nearest adjacent bar. Welding of reinforcing steel shall only be done if detailed on the Drawings or if authorized by the NPC in writing. Spiral reinforcement shall be spliced by lapping at least one and half (1 1/2) turns or by butt-welding unless otherwise shown on the drawings.

**CW-6.4 Measurement and Payment**

The quantity to be paid for shall be the calculated theoretical number of kilograms of reinforcement steel bars as determined from the net length of the steel shown on the drawings, incorporated in the concrete and accepted. The weight of deformed bars will be computed from the theoretical weight of the same nominal size as shown in the following tabulation:

<u>Designation</u>	<u>Size (mm)</u>	<u>Weight (kg/m)</u>
#2	6	0.222
#3	10	0.616
#4	12	0.888
#5	16	1.579
#6	20	2.468
#8	25	3.854
#9	28	4.833
#10	32	6.313
#11	36	7.991

Clips, ties, separators and other and related materials used for positioning and fastening the reinforcement in place as required by the NPC shall not be included in the weight-calculated payment under this item. If bars are substituted upon the Contractor's request and as a result, more steel is used than specified – only the amount specified shall be included.

When laps are made for splices, other than those shown on the drawings or required by the NPC and for the convenience of the Contractor, the extra steel shall not be measured nor paid for.

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The accepted quantity shall be paid at the pertinent pay items for Reinforcing Steel as shown in the Schedule of Requirements which price and payment shall be made in full compensation for furnishing materials, labor, equipment and incidentals necessary to complete this item.

**CW-7.0 STRUCTURAL STEEL****CW-7.1 General**

This section covers the fabrication, erection, and shop painting of structural steel in accordance with the AISC "Manual of Steel Construction" referred to herein. In the AISC "Manual of Steel Construction" referred to herein, the Specification for Design, Fabrication, and Erection of Structural Steel for Buildings," and "Structural Joints using A325 or A490 Bolts" shall be considered a part thereto.

**CW-7.1.1 Submittals**

Shop Drawings of all structural steel in five (5) copies for approval prior to fabrication of structural steel with complete information necessary for the fabrication and erection of the component parts of the structure including the location, type and size of all bolts and welds, member sizes and lengths, camber & connector details, blocks, copes, and cuts. Include all welds by standard welding symbols.

Erection Plan consists of descriptive data to illustrate the structure steel erection procedure including the sequence of erection and temporary shoring and bracing, and written description of the detailed sequence of all welding, including each welding procedure to be performed.

Certificates of Conformance for the following:

- Bolts, Nuts and Washers
- Welding Electrodes and Rods
- Paint
- Steel
- Certified Test Reports

Chemical Analysis and Tensile Strength Test of structural steel in accordance to ASTM A53.

For high strength bolts and nuts, the Contractor shall also submit chemical analysis, including tensile strength and hardness tests as required by ASTM A325.

**CW-7.1.2 Delivery and Storage**

All materials shall be handled, shipped and stored in a manner that will prevent distortion or other damages. Materials shall be stored in a clean and properly drained location and out of contact with the ground. Damaged materials shall be replaced or, when permitted by NPC, may be repaired in an approved manner at no additional cost to NPC.

**CW-7.2 Materials**

All the materials shall be of the best quality of their kind, well graded and within the allowable distortions. They shall be free from flakes, corrosion, scale of fragments that could reduce the resistance and durability or injure the external appearance.

Except as modified herein, blast clean surfaces in accordance with SSPC SP6. Wash clean surfaces that become contaminated with rust, dirt, oil, grease or other contaminants with solvents until thoroughly clean. Ensure that steel to be embedded in concrete and surfaces when assembled, are free from rust, grease, dirt and other foreign matter.

**CW-7.2.1 Steel**

Materials shall conform to the respective specifications specified herein. Materials not otherwise specified herein shall conform to the AISC "Manual of Steel Construction".

Structural Steel:	ASTM A36
Steel Pipe:	ASTM A53, Type E or S, Grade B, ASTM A501
Steel W-Shape Piles (Soldier Piles):	ASTM A328

**CW-7.2.2 Bolts, Nuts and Washers:**

All bolts, nuts and washers shall be of hot-dip galvanized steel, in accordance with the following:

Bolts:	ASTM A307, Grade C or ASTM A36 for Anchor Bolts; ASTM A325 for Fastening Bolts
Nuts:	ASTM A563, Grade A, heavy hex style, except nuts less than 38mm may be provided in hex style
Washers:	ANSI B18.22.1, Type B

**CW-7.2.3 Accessories:**

Welding electrodes and steel structural members shall use:

Rods	E70XX electrodes
Non-shrink Grout	ASTM C827, non-metallic

**CW-7.3 Execution****CW-7.3.1 Fabrication**

Structural steel fabrication shall be in accordance with the applicable provisions of the Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings as set forth in the AISC "Manual of Steel Construction".

**CW-7.3.2 Welding of Structural Steel Work:**

All welding works shall be as indicated in the drawings and shall conform to AWS D1.1 - 77 "Structural Welding Code". Unless specified on the drawings, fillet welds shall be a minimum of 5 mm (3/16") and welding electrodes shall be with a tensile strength of 485 MPa.

All welding works shall be executed by the AWS D1.1 qualified welders, welding operators and trackers, whose workmanship shall be subject to the approval of NPC.

**CW-7.3.3 Shop Painting**

Except as otherwise specified, shop prime surfaces of all structural steel, except steel to be embedded in concrete or mortar. Surfaces to be welded shall not be coated within 12 mm from the specified top of the weld prior to welding. Insure that the surfaces are thoroughly dry and clean when the paint is applied. Do not paint on wet weather except under cover. Do not apply paint to steel, which is at a temperature that will cause blistering or porosity, or will otherwise be detrimental to the life of the paint. Apply paint with high quality workmanship, and coat all joints and crevices thoroughly. Prior to assembly, paint all surfaces that will be concealed or inaccessible after assembly.

Shop prime coat surfaces as soon as possible after cleaning. Apply one coat of inorganic zinc to a minimum dry film thickness of 100 microns.

- **Field painting:** When the erection work is complete, the heads of field bolts, all welds and any surface from which the shop coat of paint has become worn off or has otherwise become defective, shall be cleaned and thoroughly covered with one coat of shop coat paint. When the paint applied for touching up bolt heads and abraded surfaces has become thoroughly dry, apply two field coats of marine epoxy paint subject to the approval of NPC.

- **Marking:** Prior to erection, members shall be provided with a painted erection mark. In addition, connecting parts assembled in the shop for remaining holes in field connections shall be matched marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate erection markings in areas that will decrease member strength or cause stress concentrations.

**CW-7.3.4 Erection**

Except as modified herein, erect steel in accordance with the AISC "Manual of Steel Construction". Where parts cannot be assembled or fitted properly as a result of errors in fabrication or of deformation due to handling or transportation,

report such condition immediately to the NPC's Representative and obtain approval there from for the methods of correction for straightening, including members of steel conforming to ASTM A514.

Drain Steel work properly; fill pockets in structures exposed to the weather with an approved waterproof material.

Provide safety belts and lines for workmen aloft on high structures unless safe working platforms or safety nets are provided.

When calibrated wrenches are used for tightening bolts, calibrate them at least one each working day using not less than three typical bolts of each diameter. Do not use impact torque wrenches to tighten anchor bolts set in concrete.

Connections: Connections shall be executed as shown on drawing. In case, connections are not detailed, it shall be designed in accordance with AISC "Manual of Steel Construction". Build connections into the existing work. Punch, sub-punch and ream, or drill bolt holes.

Tolerances: Structural steel shall be furnished and installed to the lines and levels as shown on the drawings.

Any structure that does not conform shall be repaired, removed and/or erected anew by the Contractor at no additional cost to NPC.

Tolerances on structural steel shall be in accordance with the "Code of Standard Practice" of the AISC "Manual of Steel Construction".

#### **CW-7.3.5 Tests and Inspections**

Visual Inspection of Welding: After the welding is completed, hand or power wires brush welds, thoroughly clean them before the inspector makes the check inspection. Inspect welds with magnifiers under strong, adequate light for surface cracking, porosity, and slag inclusions; excessive roughness; unfilled craters; gas pockets; undercuts; overlaps; size and insufficient throat and concavity. Inspect the preparation of groove welds for adequate throat opening and for snug positioning of backup bars.

Non-Destructive Testing<sup>1</sup>: In accordance with AWS D1.1 Twenty-five percent (25%) of the total number of joints, as selected by the NPC, shall be tested. If more than 20 percent of welds contain defects identified by testing, then all welds shall be tested by radiographic or ultrasonic testing, and to be approved by the NPC. When all welds made are required to be tested, magnetic particle testing shall be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

#### **CW-7.4 Measurement and Payment**

Measurement for payment for structural steel shall be based on the total kilogram of structural steel placed and accepted.

<sup>1</sup> Not applicable on non-critical structures/joints and as directed/required by NPC Design Engineer.

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Payment will be made at the corresponding unit price for the item structural steel at the Schedule of Requirements. The entire cost of furnishing of all materials, labor, equipment and tools shall be included in the pertinent pay items in Schedule of Requirements.

**CW-8.0 REINFORCED CONCRETE FOUNDATION AND ASSOCIATED  
STRUCTURES FOR EQUIPMENT AND OTHER COMPONENT  
(DESIGNED/CONSTRUCTED BY CONTRACTOR)**

**CW-8.1 Scope**

In accordance with the specification contained in this section, the Contractor shall design and furnish all materials, labor, equipment and tools to construct all reinforced concreting and relevant works based on the approved drawings or as directed by NPC.

**CW-8.2 Design and Construction**

The design and construction of reinforced concrete foundations and other elements for equipment and related component to be furnished by the Contractor shall be the responsibility of the Contractor. Reinforced concrete foundations shall be designed based on the actual weights, dimensions and relevant design parameters of the equipment and structures subject to NPC's evaluation and approval. No foundation and structural elements shall be constructed unless its design is duly approved in writing by NPC.

The minimum design parameters to be considered by the Contractor are as follows:

1. Compressive strength of concrete shall be 20.7 MPa at 28 days
2. Reinforcing steel shall conform to Philippine National Standards grade DSB 275
3. Compacted sand and gravel bedding shall be 150 mm thick
4. Soil bearing capacity shall be subject to the Contractor's determination and verification at the site
5. Concrete pad or pedestal shall extend 150 mm beyond the equipment skid/base on all sides or at least 50 mm beyond the base plate of equipment supports
6. Top of foundations/pedestals shall be 300 mm above the finished ground elevation
7. Anchor bolt materials shall be A325 with nuts and washers. Sizes and number of anchor bolts shall be designed to safely withstand all forces acting on the equipment/structures. Anchor bolts and other embedded items shall be properly and securely installed prior to the placing/pouring of concrete.

All works and materials shall be constructed, installed and/or erected to conform with the relevant sections of this Specifications and in accordance with the generally accepted engineering techniques and methodologies.

**CW-8.3 Measurement and Payment**

Unless otherwise indicated in the Schedule of Requirements, no separate measurement and payment will be made for the design and construction of reinforced concrete foundation and/or other structural elements of the equipment and their related components. The entire cost of furnishing of all materials, labor, equipment and tools shall be included in the pertinent pay items in the Schedule of Requirements.

**CW-9.0 DRAINAGE SYSTEM AND APPURTENANT STRUCTURES****CW-9.1 Scope**

In accordance with the specifications contained herein, the Contractor shall furnish all materials, labor, equipment and tools, perform all required excavation and backfill, install all pipes and construct canals and ditches, as the case may be, where indicated on the drawings or where directed conforming with the lines and grades as established in the field by the NPC. The Contractor shall also construct or install, where required, appurtenant structures like street inlet, street inlet-catch basin combination, manhole, catch basin for downspouts, catch basin for intersecting perforated PVC pipes, septic tank, drain pit, drainage outlets, etc. as well as joints and connections as may be required to complete the system.

**CW-9.2 Materials****CW-9.2.1 Non-Reinforced Concrete Drainage Pipes**

Non-reinforced concrete drainage pipes shall meet the requirements of ASTM C14-68.

One pipe length shall be taken at random representing a group of fifty (50) pipes or fraction thereof of the same size and shall be submitted for test. Any group represented by corresponding test specimens that do not meet the strength and other test requirements shall not be used in the work.

**CW-9.2.2 Reinforced Concrete Drainage Pipes**

Reinforced concrete drainage pipes shall meet the design and test requirements for Class II Reinforced Concrete Pipes in accordance with ASTM C76-68 and ASTM C497-67.

One (1) pipe length shall be taken at random representing a group of fifty (50) pipes or fraction thereof of the same size and shall be submitted for test. Any group represented by corresponding test specimens that do not meet the strength and other requirements shall not be used in the work.

**CW-9.2.3 PVC Pipes**

Polyvinyl Chloride (PVC) Pipes shall be unplasticized conforming to ISO4435 or equivalent. Details/scheme of perforation shall be as indicated in the bid drawing or as directed by NPC.



**CW-9.2.4 Concrete Covered Rectangular Ditch**

Cement, reinforcing steel, aggregate and water to be used for the construction of concrete covered rectangular ditch and open rectangular canal shall conform to the requirements set forth in Section CW-5.0 – Concrete. Foundation base material for concrete canal shall be sand and gravel as described in Section CW-4.0.

**CW-9.2.5 Bedding Material****A. For Stable Soil and Rock Foundation**

Bedding material for sewerage and drainage pipes in stable soil and rock foundation, as determined by NPC, shall consist of sand or natural sandy soil in which all the materials passes a 9.5 mm (3/8") sieve but not more than 10% passes a 0.074 mm (No. 200) sieve.

**B. For Unstable Foundation**

Bedding for sewerage and drainage pipes in soft and unstable foundation as determined by the NPC, shall consist of 13.79MPa concrete cradle in conformity with the dimensions shown on the drawings, or as determined by the NPC.

**C. Foundation under Roadways and Parking Areas**

Bedding for sewerage and drainage pipes crossing under roadways and parking areas with pipe cover (excluding concrete or asphalt pavement) of 60.9 cm (2 ft.) or less shall consist of 13.79MPa concrete cradle in conformity with the dimensions shown on the drawings, or as determined by the NPC.

**CW-9.3 Construction****CW-9.3.1 Trench Excavation and Backfill**

Trench excavation and backfill work shall be done in accordance with the pertinent provisions of Section CW-5.0.

**CW-9.3.2 Concrete Canal**

Concrete canal, open or covered, shall be constructed in accordance with the lines and grades shown on the drawings. Class of concrete shall be as indicated on the drawings or directed by the NPC.

**CW-9.3.3 Appurtenant Structures**

Appurtenant structures like street inlet, street inlet-catch basin combination, manhole, catch basin for downspouts, catch basin for intersecting perforated PVC pipes, septic tank, drain pit, drainage outlets, etc. shall be constructed at locations indicated on the plans or at the other convenient locations designated by the NPC. All appurtenant structures shall be of 17.30 MPa concrete unless otherwise shown on the drawings.

**CW-9.4 Pipe Installation****CW-9.4.1 General**

Before any drain pipe is installed, the sand or concrete bedding shall have been prepared and approved in accordance with the grade, shape, and dimensions shown on the drawings, or as directed by the NPC. No pipe over 45.7 cm (18") in diameter shall be laid on concrete bedding until seven (7) days have been elapsed after placing the concrete bedding. Pipes under 45.7 cm (18") in diameter may be laid after five (5) days elapsed after placing the concrete bedding.

All drain pipes shall be laid carefully, hubs upgraded, ends fully and closely jointed, and true to the lines and grades given. Succeeding pipe shall be jointed to the previously laid pipe, correct in alignment and grade. Any pipe, which has been damaged during installation or before acceptance of the work, shall be replaced and laid by the Contractor at his expense.

**CW-9.4.2 Non-Reinforced and Reinforced Concrete Drainage Pipes**

Whenever possible, concrete pipes shall be handled and installed with the aid of mechanical equipment and not just rolled or pushed into the trench from the bank. For small pipes, rope slings may be placed at both ends of the pipes and the rope slowly paved out until the pipe rests on the trench bed. proper and careful handling and laying should be observed at all times to prevent unnecessary structural damage to the pipe, especially at the pipe ends.

For pipes on sand bedding, before joining the next pipe length to the last pipe already laid, the bottom of the trench shall be excavated to the shape, size and location of the collar below the joint. The next pipe section shall then be securely attached to the previously laid pipe seeing to it the correct alignment and grade is always attained. Same procedures shall be observed for the remaining pipes.

All pipe joints shall be filled with stiff mortar composed of one (1) part cement and two (2) parts clean sand and enough water. The inside part of the joint shall be plastered properly to bring the inside surfaces of jointed pipe ends flush even. Sufficient mortar shall be placed on the outside surface of joint to form a bead around the joint. Plastering work shall be as directed and approved by the NPC. After initial set, the mortar on the outside surface shall be protected from air and sunlight with a cover thoroughly wetted earth or burlap. Curing of the joint shall be done for a period of at least seven (7) days within which no backfill shall be placed on the installed pipeline.

**CW-9.5 Measurement and Payment****CW-9.5.1 Concrete Rectangular Ditch**

Measurement for payment for rectangular ditch and other channels will be based on the number of linear meters of canal constructed and accepted.

Payment will be made at the corresponding contract unit price per linear meter of the pertinent items shown in the Schedule of Requirements. Payment shall

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constitute full compensation for furnishing all labor, materials, equipment and tools necessary for the construction of the concrete canal including attendant excavation and backfill.

**CW-9.5.2 Concrete Drainage Pipes and PVC Pipes**

Non-reinforced and reinforced concrete drain pipes, and PVC pipes in place and accepted will be measured by the linear meter along the centerline of the pipeline.

The quantities measured as provided above, completely installed and accepted, will be paid at the contract unit price for each size and kind of pipe shown in the Schedule of Requirements. Payment shall constitute full compensation for furnishing all labor, material, equipment and tools for fabricating, hauling, installing and jointing of pipes. Payment shall also include the cost of attendant excavation, bedding and backfilling.

**CW-9.5.3 Appurtenant Structures**

Measurement for payment of appurtenant structures like street inlet, street inlet-catch basin combination, manhole, catch basin for downspouts, septic tank, drain pit, drainage outlets, etc. will be based on the number of structures constructed/installed and accepted.

The Contractor will be paid at the contract unit price for the pertinent item for each appurtenant structure shown in the Schedule of Requirements. Such payment shall cover all costs for furnishing all equipment, labor, materials and tools necessary to complete the construction of the aforementioned appurtenant structures. Payment also includes the cost of attendant excavation and backfill, furnishing, scheduling, cutting, bending and placing of reinforcing steel.

**CW-9.5.4 Bedding**

Measurement for payment for sand or natural sandy soil bedding and concrete cradle will be based on the number of cubic meters of materials placed and accepted.

Payment will be made at the corresponding contract unit price for the item. Sand Bedding for Pipes, and item, Concrete Cradle for Pipes, in the Schedule of Requirements, which payment shall constitute full compensation for furnishing all labor, materials, equipment and tools necessary to complete the items.

**CW-10.0 STEEL POLE WITH CROSS-ARMS AND BRACES****CW-10.1 Description**

This specification covers the technical and associated requirements for the supply and erection of steel pole complete with cross arms and braces.

**CW-10.2 Pole Requirements**

The poles shall be manufactured and supplied with the required holes, rigging accessories, insulator attachment plates, lugs for bolted steps, guying attachments, ground clamps complete with bolts, nuts, washers and miscellaneous fittings, whenever necessary, and shall have the following properties of steel poles:

Description	40' (12.20 m)	35' (10.65 m)	30' (9.15 m)	25' (7.62 m)
Steel Material	ASTM A572	ASTM A572	ASTM A572	ASTM A572
Tip Diameter	200 mm	200 mm	200 mm	150 mm
Butt Diameter	320 mm	300 mm	260 mm	240 mm
Thickness	4 mm	4 mm	4 mm	4 mm
Shape	Octagonal	Octagonal	Octagonal	Octagonal
Minimum Yield Strength	345 MPa	345 MPa	345 MPa	345 MPa

The tip and butt shall be covered with plate similar to body thickness.

Cross arm and brace members, if required in the Bid Drawings, shall be of the same material as pole body and shall conform to NPC's general arrangement drawings. The strength of the attachment of cross arms to the body shall be sufficient to develop the full capability of the cross arm.

Hole location and diameters for steel poles and cross-arms/braces shall be referred to EEICD drawings.

All structural steel, bolts, nuts and washers shall be hot-dip galvanized after fabrication in accordance with ASTM A123 with minimum zinc thickness of 85 microns. Exposed welds shall be mechanically cleaned.

**CW-10.3 Pole Erection**

The Supplier shall use standard and accepted practice and method of erecting the poles depending on their location. The Supplier shall excavate holes for poles setting to a depth indicated below:

Depth of Pole Setting					
Length of Poles		In Earth		In Rock	
Meter	Feet	Meter	Feet	Meter	Feet
12.20	40	1.80	5.9	1.22	4.0
10.67	35	1.65	5.4	1.22	4.0
9.15	30	1.52	5.0	1.22	4.0
7.62	25	1.40	4.6	1.22	4.0

All holes shall be dug in the correct locations and shall be large enough to provide for the use of tamping bars all around the poles to the full depth of the holes.

All poles shall be set truly vertical and exact in alignment. After the poles have been set and aligned properly, the holes shall be backfilled with materials consisting of 20% sand AND 80% gravel. The gravel and sand material shall

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be filled around the holes and compacted thoroughly at 30 cm (12 inches) layer by tamping tools before placing the next 30 cm layer of gravel and sand, until the backfill material reaches the ground surface level. Materials from the excavated holes shall be placed and tamped around the poles to a height of 30 cm. (12 inches) above ground line and shall be spread sloping radially outward until it intersects with the ground surface.

The cross-arms and hardware shall be assembled and installed properly in accordance with the drawings. All nuts and locknuts shall be adequately tightened.

Braces such as flat and x-braces, shall be attached where required. The braces shall be attached by the Supplier in accordance with the drawings. All nuts shall be tightened adequately.

**CW-10.4 Measurement and Payment**

Measurement for payment for steel pole shall be based on the total quantity of steel pole supplied, erected and accepted by NPC.

Measurement for payment for cross-arms and braces shall be on lot basis of cross-arms and braces supplied, installed to the respective poles and accepted by NPC.

Payment will be made at the contract unit price for the items, Steel Pole and; Steel Cross-arms and Braces in the Schedule of Requirements, which payment shall constitute full compensation for furnishing of all materials, labor and hardware and accessories necessary to complete the items.

# **PART I – TECHNICAL SPECIFICATIONS**

## **MW – MECHANICAL WORKS**

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SECTION VI – TECHNICAL SPECIFICATIONS**MW - MECHANICAL WORKS****MW-1.0 GENERAL**

The Work to be done under this section shall include the furnishing of all labor, materials, equipment, tools, and other incidentals for all mechanical works enumerated hereunder or as otherwise directed by NPC for the **Supply, Delivery, Installation, Test and Commissioning of 1x120 kW and 2 X 90 kW Modular Diesel Gensets and Associated Electrical Equipment for Tagubanhhan DPP.**

All equipment and materials to be supplied by the Supplier shall be new and unused, of current manufacture, and of the highest grade and the best of their respective kinds, and free from defects and imperfections. They shall be suitable for their intended purpose and shall comply with all applicable regulations, quality, and dimension standards.

The work shall be performed and completed with high quality workmanship in accordance with generally accepted modern practice in the design, supply, delivery, installation, test and commissioning of mechanical equipment and associated works for the safe and reliable operation of the **Three (3) Units** of Modular Diesel Generating Sets and Auxiliaries.

The Supplier shall strictly observe the requirements specified in this Specific Technical Specifications (Mechanical Works) in conjunction with the General Technical Specifications (General Works). The Specific Technical Specifications shall take precedence over the General Technical Specifications in case of any inconsistency.

**MW-2.0 SCOPE OF WORK**

The scope of work shall cover mainly of, but not limited to the supply, delivery, installation, test and commissioning of 1 x 120 kW and 2 x 90 kW (Prime Rated Power) Modular Diesel Generating Units, 1800rpm, In-line multi-cylinder arrangement, 480V, 3-phase, 60 hertz, equipped with turbocharger and aftercooled, air-to-air charge air cooler, electronic governor, direct fuel injection and complete with auxiliary equipment and devices, control/monitoring and protection system, including other works and services specified in Clause GW-2.0 of the General Works specifications.

The Works shall include the preparation of design, technical specifications and data, detailed drawings and construction of foundations for all the supplied equipment, and all other essential information of the equipment to be supplied under this contract.

The Supplier shall supply all anchor/machine bolts, special tools and accessories required for mounting/installation of the generating set/s including structural steel supports and appurtenances for auxiliary equipment.

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shall be carefully lifted or glided on the foundation by using only approved methods and equipment, and in a manner that will prevent damage to the equipment and foundation. The equipment shall be positioned on a location as shown on the drawings and shall be leveled and checked true to grade and alignment before final grouting. The Supplier shall strictly adhere to the installation procedures/manuals provided by Manufacturers of the equipment.

Prior to equipment mounting and grouting, the surface area and blackouts of concrete foundation shall be cleaned of all dirt by any approved means. Chipping of concrete surface to the required thickness shall be done by any approved methods without damaging the concrete structure as a whole.

The pouring of concrete to secure in place any equipment on its concrete foundation shall not be made until the NPC has verified the correct location of the foundation. Should incorrect positioning be ascertained after the concrete pouring, the Supplier shall make the correction at his own expense.

The concrete foundation surfaces shall be free of any loose materials, oil, water or any other contaminants that would prevent the grout from bonding. The concrete shall be chipped to expose a minimum aggregate so as to remove all laitance and provide a rough surface for bonding. The exposed surface shall be blown with compressed air free of oil to remove dust.

**MW-3.3 Piping System****MW-3.3.1 General**

The piping system shall be furnished to provide a complete and acceptable installation necessary for the safe and efficient operation of each system and equipment. All required piping shall be furnished complete with flanges, joints, gaskets, packing, drains, vents, insulation if required, hangers, guides, and all auxiliary steel and anchors required to complete the various piping systems.

The Supplier shall submit for NPC's review and approval detailed drawings covering the arrangement, actual layout, route and interface connections. Any required modification from the approved drawings or specification to suit actual site conditions, shall be permitted only with prior consent of NPC. Such modifications shall be reflected/incorporated in the as-built drawings which shall be submitted by the Supplier for NPC review and final approval.

Piping shall be properly arranged such that it will result in neat appearance and convenient to operate and maintain. Items requiring periodic attention shall be readily accessible from floors or platforms. Pipe shall neither obstruct passageways of any kind nor interfere with access to other valves or equipment.

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The Supplier shall install the piping system in a thorough manner and with good workmanship, in accordance with the construction drawings and specifications or as directed by NPC.

All pipes, fittings, valves and appurtenances shall be free from dirt or other foreign matters before laying. In the installation of the pipes, care shall be taken to prevent the pipes from becoming clogged during the progress of the work; should any pipe become either partially or wholly clogged before final acceptance of the work, it shall be cleaned out by the Supplier in a manner satisfactory to NPC or shall be replaced by and at the expense of the Supplier. Open ends shall be temporarily plugged, otherwise, suitably closed when necessary. Special care shall be taken in carrying out the installation of joints, branches, valves and other fittings.

Pipe sleeves shall be provided for pipe and tubing which penetrates platforms, floors, roofs and partitions. Proper flashing shall be provided to ensure tightness and water-proofing, where required.

Piping installation shall be sloped to prevent trapping of air bubbles. Where required, suitable venting system with valve shall be provided.

Where pipeline are laid underground, the trench shall be provided with a cushion pad of at least 150 mm sand and sandy soil bedding materials prior to pipe laying, unless otherwise shown on the drawings.

All pipeline excavation shall be backfilled up to the level of the finished grade surface in layers of 150 mm and thoroughly compacted, unless otherwise shown on the drawing. Backfill materials shall be compactable soil taken from trench excavation and approved by NPC. Trench excavation, backfilling, concrete works and construction of valve manhole shall be done in accordance with the pertinent provisions of the relevant Civil Works Specifications.

Pipes to be placed underground shall not be covered prior to the approval of NPC. Underground pipes shall be embedded as shown on the drawings.

Steel piping to be installed underground shall generally be applied with tape wrapping with minimum finished thickness of 1 mm and applied spirally with overlap of 50% in all parts of the pipe and fittings or asphalt jute of 6 mm thickness, unless otherwise specified. Bitumen-based primer shall be applied to pipe before applying the tape. The tape wrapping brochures shall be submitted for NPC approval prior to procurement and application. The wrapping shall extend for 300 mm beyond the buried portion.

All pipes that cross roadways or concrete pavement shall be provided with pipe sleeve of steel material or reinforced concrete pipe to protect the pipe from various load imposed by passing vehicles, unless otherwise shown on the drawing. The pipe sleeves shall extend 600 mm beyond shoulder of each pavement side.

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After considering site conditions, and in case execution cannot be done according to the piping route in the design drawings, on-site changes may be acceptable subject to the approval of NPC.

Flexible joints as well as vibration isolation joints shall be installed as near as possible to equipment and devices and shall not be forced to expand, extend and compressed. In case flexible joints are long and sagging due to own weight, it shall be suspended or supported.

Pipe fittings and unions for screwed piping are to be installed in such a way as to be easily accessible for repair and maintenance.

For water piping, after installation, pipe insides shall be washed thoroughly using high pressure cleaning pump. Water for washing must be clean enough not to damage the equipment.

For oil pipes, after installation, pipe insides shall be thoroughly blown with compressed air to remove all dirt, rust and the likes. If necessary, pipes insides shall be soaked thoroughly using acid solution to remove all dirt, rust and the likes. All equipment shall be disconnected from the pipes to be washed to avoid damage to the units. Acid solution shall be disposed in a manner that will not pose hazard to the environment. Thoroughly flush the pipe insides with a clean water to wash away all acid solutions and let dry before re-connecting the pipes.

All existing facilities, if applicable, which are affected and damaged during the installation of piping shall be replaced and/or restored to its original appearance by the Supplier at its own expense.

The Supplier shall strictly observe the safety requirements/regulations of existing plants during the performance of the work.

**MW-3.3.2 Pipe and Fittings**

All piping works shall be coordinated with other works at site and with existing installation so that interference between piping and other structural features will be avoided. In case interference occurs, NPC will decide which work is to be relocated.

Unless otherwise specified, all pipes to be used shall generally conform to ASTM A 53, Grade B, seamless with a minimum wall thickness equivalent to Schedule 40.

All steel piping, 65 mm and above, shall be butt-welded or flanged. All piping, 50 mm and under, shall be joined by socket welded or screwed where specified or other approved joint specifications.

Pipe fittings for 65 mm pipes and above shall be seamless, butt weld, minimum of Schedule 40 conforming to ASTM A 234 Gr. WPB with dimensions to ANSI B16.9. Fittings for 50 mm pipes and below shall be forged, socket weld or threaded (minimum of 3000 lb and 2000 lb rating, respectively) and conforming to ASTM 105 with dimensions to ANSI B16.11.

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Malleable iron, galvanized screwed fittings conforming to ANSI B16.3 (Malleable iron threaded fittings, Class 150) may be used for Potable Water System.

Gaskets shall be selected based on the nature of the fluid or its temperature to be handled. Gasket materials shall not contain asbestos in any form.

Flanged bolts shall be hexagonal head machine bolts conforming to ASTM A 307 Gr. B with dimensions in accordance with ANSI B18.2.1 and complete with heavy semi-finished head nuts conforming to ASTM A 194, Gr. 2H and ANSI B18.2.2.

Equipment and auxiliaries shall be furnished with all required bolts, screws, anchor bolts with sleeves, nuts, washers, locking devices, washers, gaskets, and other accessories to complete the piping system.

Generally, all gaskets, bolts, nuts and washers to be used in the various piping systems shall be new and free from defects and imperfections. Materials to be used shall be suitable for the liquid to be handled.

Threads shall be metric. Where required they shall be adequately treated against corrosion before dispatch from the works. All threads shall be greased carefully during installation except where otherwise specified. Split pins or other approved locking devices generally shall be provided for nuts which may become loose due to vibration, etc.

Any such rivets, bolts, screws, gaskets, etc., which are considered surplus, but not more than 10% of the permanent installation, after the installation of the equipment has been completed shall become spare parts and shall be wrapped, marked and handed over to NPC.

**MW-3.3.3 Piping Accessories**

Strainers shall be of simplex type with body stainless steel material and flanged ends. Body drain and vent connections shall be included. Drain plugs shall be threaded. Screen elements shall be of stainless steel construction with minimum 60-mesh size or shown on the drawings. Magnets shall be included to trap small iron and steel particles for use in fuel oil lines.

Pressure gauges for fuel oil system shall be provided with dampener. Each pressure gauge shall be provided with isolation valve. Pressure gauge shall be of bourdon tube type with solid front case, and minimum size of dial gauge shall be of 100mm Ø.

**MW-3.3.4 Drains and Vents**

Not all piping system vents and drains may be shown on the piping drawings. The Supplier shall provide and install vent and drain connections at all high and low points, respectively, and as required for suitable operation.

Where practicable, all pipelines shall be sloped in the direction of flow and shall be adequately trapped at low points and vented at high points in the pipe runs.

The minimum valve size for vents and drains shall be 15 mm nominal diameter. In general, the piping for drain and vents shall be the same material as the main lines.

All piping shall be arranged to permit complete drainage when a particular unit or system is shutdown for maintenance.

All vent lines which are normally operated shall be terminated at least 3 m or higher above the highest service platform.

All drain lines which run to waste shall be routed to a suitable drain trench, floor drain or sewer.

#### **MW-3.3.5 Pipe Supports**

Pipe supports shall be fabricated and installed as required by the piping system configuration. If pipe supports required are not shown on the accompanying drawings the Supplier shall provide detailed drawings and submit to NPC for review and approval.

Pipe supports shall be fabricated and assembled to permit the free movement of piping caused by thermal expansion and contraction. The design of elements for supporting or restraining piping systems, or components thereof, shall be based on all the concurrently acting loads transmitted into the supporting elements. Where resonance with imposed vibration and shocks occur during operation, suitable dampers, restraints, anchors, etc., shall be added to remove these effects. Pipe supports shall be spaced as far apart as economically possible, with due consideration to assure that the sag of the pipe between supports is within limits that will permit drainage and also avoid excessive bending stresses from concentrated loads.

All piping shall be installed with supporting devices selected and located to insure that the finished system will provide uniform continuous slope for draining, that expansion will be so directed as to minimize stresses in the piping material, and that all elements will be suitably and substantially supported, guided and anchored. Supports at floor or wall sleeves will not be permitted.

Riser pipes shall be individually supported. To reduce riser loads, the riser supports may be supplemented by the nearest support on a horizontal pipe. The horizontal length of pipe between the nearest support and risers shall not be longer than the length of the riser supplemented by the nearest support. Bends shall have the supports no further away from the riser than the radius. Where two rods are used in a solid rod riser hanger, each rod shall be capable of taking the entire load.

Piping systems, where flexibility is not required, shall be supported by rigid hangers. It shall be designed and fabricated so that they will not become disengaged by pipe movement.

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Hanger rods shall be provided with suitable sockets or eyes to permit lateral piping movement without imposing a bending moment on the hanger rod. The eyes in the rods shall be welded shut. Safe loads for hanger rods shall be calculated on the root area of the threads. In no case shall hanger rods of less than 10 mm diameter be used for support of piping 50 mm and smaller or less than 15 mm diameter rod for supporting pipe 65 mm and larger.

When the pipe is covered with insulation and is to rest on the support, protection saddles shall be used whenever possible. Protection saddles shall be welded to the piping to prevent slipping and/or falling. The saddle material shall be the same as the pipe material, however, alloy saddles shall not be welded to alloy piping in the field. On lines of 50 mm diameter and below where service temperatures are 100 °C and under, the pipe shall slide or rest directly on the support and shall be left bare of insulation at such locations.

The location and provision of temporary supports required during hydrostatic testing shall be the responsibility of the Supplier.

Temporary construction supports shall not be welded to the pipe except with approval of NPC and shall be attached in a manner that will not damage the pipe. These supports shall be completely removed upon completion of construction.

Equipment connections shall not be used to support piping either for temporary or permanent support.

**MW-3.3.6 Welding**

All welding shall be performed by welders and procedures qualified in accordance with the requirements of ANSI Code B31.1 "Power Piping" or, where applicable, ASME Boiler and Pressure Vessel Code, Section IX.

All welding shall penetrate to the full depth of the pipe. The slag shall be cleaned from each weld bead and any defects be removed before the next bead is applied. The completed weld shall be cleaned of slag and spatter metal on all surfaces.

Welding, preheat and post-weld heat treatment for piping shall be in accordance with the requirements of ANSI B31.1 or where applicable, the ASME Boiler and Pressure Vessel Code.

All welding, except for small pipe, shall be performed by the electric-arc method and where practical, with process controlled automatic machines. All pipe weld joints for piping 50 mm and smaller shall be socket weld, unless otherwise approved by NPC.

Where weld metal is deposited in successive layers, each layer shall be thoroughly peened before the next layer is applied.

Particular care shall be taken in aligning and separating the edges of the members to be joined by butt welding so that complete penetration and

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fusion at the bottom of the joint will be ensured. Pipe and tubing shall be accurately cut to measurements shown on the drawings by proper means such as machining, grinding or by thermal cutting. Burrs shall be removed by reaming.

Welding fittings shall be of the same material and wall thickness as the pipe to which they are attached. Where there is a difference in wall thickness, the component shall have a gradual transition in accordance with the applicable standard.

Nozzles or branch pipes shall be carefully shaped and welded to the header or run pipe in such a manner that the nozzle, the branch pipe, or any weld material shall not extend into the run pipe to cause obstruction of flow.

All surfaces for welding shall be clean and free from paint, oil, rust, scale and other materials detrimental to welding.

All filler materials including consumable insert materials and shield gases shall comply with requirements of the Applicable Codes and Standards. All welding rods shall be stored in accordance with the Supplier's instructions. The electrodes for arc-welding shall be classified on the basis of mechanical properties of the as-welded deposited weld-metal, type of covering, hydrogen absorption, welding position of the electrodes and type of current.

Steel piping shall be fusion welded using manual, automatic and semi-automatic welding processes whereby the arc and the deposited weld are protected from atmospheric conditions during welding. Pipes shall be properly aligned using line-up clamps or alignment jigs prior to butt welding.

**MW-3.4 Valves and Accessories**

All valves and accessories to be supplied under this contract shall generally conform with the requirements in this specification. All valves supplied by NPC shall be installed in accordance with the requirements specified herein.

The Supplier shall select valves, valve drives and accessories which are suitable for the operating conditions of the systems in which they are to be used, and shall be responsible for the pressure and temperature ratings of the selected components. The selected components shall meet the requirements of trouble free and safe operation under maximum load, part load and transient conditions.

Generally, all valves shall be leak-proof in either flow direction (except for non-return valves) when the nominal pressure is applied.

Valves, valve drives and accessories which are of similar make, size and type shall be interchangeable with one another. The Supplier shall standardize the types and the sizes of the valves as far as possible, in order to facilitate maintenance and limit the stock of spare parts. The manufacturer of valves shall be well known.



All regularly operated isolation valves and control valves shall be accessible from a permanent floor or access platform.

All valve bodies shall be of the same nominal size as the adjacent piping, unless otherwise specified. The internal diameter of valve ends adjacent to the pipe work shall be the same as the internal diameter of the connecting pipe.

All valves shall be located and designed so that the maintenance and change of valve internals is possible without removing the valve casing from the pipe.

The stems of all valves for outdoor service shall have weatherproof protection covers of approved construction.

Valves other than outside screw and yoke type, in size larger than 50 mm are to be provided with gate position indicators. Valves shall close clockwise.

The drive units of motor-driven valves shall also be provided with handwheels for manual operation. The handwheel shall be operable under all conditions and shall be independent of the motor drive. It shall not be rigidly coupled to the motor drive and shall not compulsory turn when the motor is energized.

All valves 65mm and larger shall have a body and bonnet material of at least cast iron. Cast steel material shall be used for high pressure or temperature applications. Stem, seat ring & seat, wedge or disc shall be made of bronze, for high pressure or temperature applications stainless steel shall be used. Valves 50mm and below shall be made of bronze unless otherwise other materials are approved by NPC.

Gate or globe valves shall generally be used for isolation in the piping system. Ball valves or butterfly valves may be used if specified or shown on the drawings.

All gate and globe valves, 65mm and over shall be of OS & Y rising stem, solid wedge type disc for gate valves and plug type disc for globe valves, bolted, bonnet, bolted gland and have flanged ends with the following materials of components:

- |    |                  |   |                        |
|----|------------------|---|------------------------|
| a) | Body & bonnet    | - | Cast iron              |
| b) | Stem             | - | Bronze or brass        |
| c) | Seat ring & seat | - | Bronze or bronze faced |
| d) | Wedge or disc    | - | Bronze or bronze faced |

Gate and globe valves, 50mm and smaller shall be made of bronze or stainless steel, rising stem, union bonnet, inside screw, solid wedge or plug type disc, with screwed or flanged ends. Valves installed in valve boxes shall have flanged ends for easy replacement or if valves with screwed ends are used, appropriate unions shall be installed.

Valves of all sizes shall have a rating of not less than Class 150.

Garden hose connection valves or hose bibs shall be of bronze material, 20 mm size and outfitted with male thread hose connections.

#### **MW-3.5 Bolts, Screws, Nuts and etc.**

All bolts, screws, anchor bolts, with sleeves, nuts, washers, locking devices, etc., required for all equipment and accessories to be supplied under this Contract shall be furnished.

Threads shall be metric. Where required they shall be adequately treated against corrosion before dispatch from the works. All threads shall be greased carefully during installation except where otherwise specified.

Split pins or other approved locking devices generally shall be provided for nuts which may become loose due to vibration, etc.

All bolts, nuts, screws and other devices used to fix, clamp or adjust any parts which are exposed to water or high humidity, or subjected to frequent adjustment or frequent removal shall be of corrosion resistant steel or bronze or hot-dipped galvanized. All other bolts and pins shall be of carbon steel.

When in position, all bolts or screwed rods shall project through the corresponding nuts, but this projection shall not exceed three threads, unless more length is required for adjustment.

#### **MW-3.6 Drives and Gears**

All moving parts of machinery including shafts, couplings, collars, projecting key heads, gear wheels, rope/belt-drives shall be completely guarded to provide full protection. All set screws on revolving shafts shall be countersunk or suitably protected. The guards shall be of approved design and shall be fitted, where necessary, with inspection doors/openings. All guards shall be arranged so that they can be removed without disturbing the parts of the gears and equipment which they protect.

Where practicable gear wheels shall be forced fit on the shaft and in addition, shall be keyed adequately to prevent any relative motion between the wheel and shaft. Where gears and couplings are secured in position by means of keys, they shall be accessible for tightening or removal. All keyways shall be machine cut. Couplings and collars shall be the shrouded or protected-type, free from projections of any kind.

All bearings shall be mounted in dustproof housings. Base of bearing supports shall be machined and shall rest on machined-surfaces.

**MW-4.0 DIESEL ENGINE-GENERATOR****MW-4.1 General**

The Diesel Engine-Generator Units shall be designed and manufactured for maximum safety and reliability in accordance with ISO 9001 quality specifications.

The Diesel Engine-Generator Units shall have the following characteristics at Specified Reference Site Conditions:

- |    |  |   |  |
|----|--|---|--|
| a) | Prime Rated Power Output                   | : | 120 kW and 90 kW   |
| b) | Nominal Voltage                            | : | 480 Volts  |
| c) | Power Factor                               | : | 0.80   |
| d) | Frequency                                  | : | 60 Hz  |
| e) | Number of Phases                           | : | 3  |
| f) | Rated Speed (diesel engine and generator)  | : | 1800 RPM Maximum   |
| g) | Fuel Consumption @ 100 % load (guaranteed) | : | 0.30 Li/kW-hr (max) for 120kW<br>0.32 Li/kW-hr (max.) for 90kW |

***Specified Reference Site Conditions***

- Total Barometric Pressure : 100 kPa
- Air Temperature : 40 °C
- Charge Air Coolant Temperature : 40 °C
- Relative Humidity : 80%

For different test conditions, the measured prime power output and fuel consumption of the Diesel Engine Generator Units shall be adjusted to Specified Reference Site Conditions using the adjustment formulas in ISO 3046/1 or other applicable standards.

**Prime Power Output** shall mean the power delivered and measured at the generator terminal under Specified Reference Site Conditions.

Each diesel generating unit shall be capable of producing the Prime Power Output under the most adverse combination of ambient tropical temperature, pressure and humidity as specified in Clause GW-3.0 of the General Works specifications. In addition, the units shall be able to operate with ten (10) percent overload for a period of one (1) hour every twelve (12) hours operation.

Each diesel-generating unit shall also comply with the Emission Standards of the Philippine Clean Air Act as specified in Clause GW-3.4 of the General Works specification.

The engine shall be capable of starting from "Cold" condition and operating at specified period (Supplier to specify) under load without available external AC power for motor driven auxiliaries, except starting DC power.

The Diesel Engine Generator Sets shall be of the same Brand and Model.

Each diesel engine shall be directly coupled to the generator and shall be designed for installation within an enclosure which is weatherproof and sound attenuated to conform with the requirements of Clause GW-3.3 of the General Works specification and Clause MW-6.0 of this specification.

Each unit shall be complete with all auxiliary equipment required to operate the unit including generator control and protection panel (GCPP). The GCPP shall be supplied separate from the unit which will be installed inside the control room and shall be in accordance with the requirements specified in the relevant Electrical Works specifications and as shown on the bid drawings. Push buttons for start/stop, emergency stop including selective monitoring/metering instruments shall also be provided at the local control panel mounted on the engine skid per manufacturer's standard, except otherwise specified. Monitoring/metering devices on the local panel mounted on the engine skid shall have simultaneous reading with those on the GCPP during operation.

All associated electrical control equipment required for operation of the unit as specified in the relevant technical specifications shall be furnished by the Supplier and ready for installation and wired in the unit's GCPP.

All auxiliary equipment shall be mounted within the confines of the common steel base or within the sound attenuated and weatherproof enclosure, except as otherwise specified. Auxiliary pumps required for the operation of the diesel engine-generator set shall be engine-driven except otherwise specified. All interconnecting piping and wiring for equipment mounted on the steel base or within the enclosure shall be supplied and shop-installed.

The diesel engine-generator set shall be mounted on a common heavy fabricated steel skid type base frame complete with anti-vibration mounting pads ensuring complete vibration isolation of the rotating assemblies and shipped to the plant site in a weather/soundproof enclosure.

Each diesel engine-generator set shall be provided with fully weatherproof and sound proof enclosure incorporating preferably an internally mounted exhaust silencers (residential type or approved equivalent meeting the specified maximum sound level @ 1 meter) and shall be of extremely rugged construction in order to withstand rough handling during transport and installation.

Provisions for Crane and Forklift unloading of the complete generating set shall be engineered, designed, and manufactured as a heavy duty, welded steel construction with four point lifting provisions and forklift pockets as used on heavy duty construction installations. Details of construction and manufacturer's certification of the lifting provision shall be included in the drawings to be submitted with the Bid.

The Supplier shall be responsible for the design and construction of equipment foundations for the modular generating sets and associated auxiliary equipment to ensure proper mounting/anchoring of the units, including necessary site grading and development of the location area,

subject to the approval of NPC. The Supplier shall supply all anchor/machine bolts, special tools and accessories required for mounting/installation of the generating set/s including structural steel supports and appurtenances for auxiliary equipment. The engine foundation shall be designed such that waste oil water can be collected and to be discharged/interconnected to the nearest existing oil water separator.

All piping systems that are an integral part of the unit shall be included in the scope of supply of the Supplier including connection bolts, nuts and gaskets for equipment, valves and other devices with flanged end connections. Unless otherwise specified or approved, all pipes to be used shall generally conform to ASTM A 53, Grade B, seamless with a minimum wall thickness equivalent to Schedule 40.

All piping shall be butt-welded or flanged. Pipe fittings for 65 mm pipes and above shall be seamless, butt weld, minimum of Schedule 40 conforming to ASTM A 234 Gr. WPB with dimensions to ANSI B16.9.

Flanged joints, when required for removal of the equipment, shall be in accordance with ANSI B16.5.

All integral piping 50 mm Ø and below shall be socket-welded in accordance with ANSI B16.11, except otherwise approved. All fittings 50 mm Ø and below shall be 2000 lbs. minimum and in accordance with ANSI B16.11.

All oil piping, fittings, and valves shall be shop-fitted, chemically cleaned, and oiled.

Gaskets shall be selected based on the nature of the fluid or its temperature to be handled. Gasket materials shall not contain asbestos in any form.

Flanged bolts shall be hexagonal head machine bolts conforming to ASTM A 307 Gr. B with dimensions in accordance with ANSI B18.2.1 and complete with heavy semi-finished head nuts conforming to ASTM A 194, Gr. 2H and ANSI B18.2.2.

Equipment and auxiliaries shall be furnished with all required bolts, screws, anchor bolts with sleeves, nuts, washers, locking devices, washers, gaskets, and other accessories to complete the piping system.

Generally, all gaskets, bolts, nuts and washers to be used in the various piping systems shall be new and free from defects and imperfections. Materials to be used shall be suitable for the liquid to be handled.

All valves shall be designed, fabricated, and tested in accordance with ANSI B31.1 and shall conform to the pressure and temperature ratings of ANSI B16.34 based on the conditions specified in Clause GW-3.0, Design and Duty Conditions of the General Work specifications.

All genset-skid mounted piping that requires outside connection such as for fuel, water, exhaust and lubricating oil systems shall be provided with

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flexible joints and/or expansion bellows and matching flange including bolts and nuts, as applicable.

The relative experience of the Manufacturer of diesel generator sets shall comply with the following:

- a) The Manufacturer/Assembler should have been in the business of manufacturing the equipment for not less than five (5) years; and
- b) The Manufacturer of diesel engine should be in the business of manufacturing the equipment for not less than ten (10) years.

**NOTE: Experience less than what is required will be ground for rejection of equipment being offered.**

**MW-4.2 Diesel Engine****MW-4.2.1 General**

Each diesel engine shall be of heavy duty compression ignition type, water-cooled, pressure-lubricated, four-stroke cycle, In-line type multi-cylinder arrangement, trunk piston design equipped with exhaust gas turbocharger and charge air cooler, electronic governor, direct fuel injection, capable of operating the type of fuel oil specified in this specification without entailing frequent maintenance and replacement of engine components other than the scheduled maintenance at fixed interval.

The engine shall be operated at a rated speed of 1800 rpm using Distillate Fuel No. 2 under the site conditions specified in Clause GW-3.0 of the General Works specification. However, for the purpose of determining the guaranteed prime power output and guaranteed fuel consumption of the Diesel Engine Generator units, the Specified Reference Site Conditions described in Clause MW-4.1 shall be used.

**MW-4.2.2 Crankcase and Cylinder Block**

The crankcase and cylinder block or blocks shall be of high tensile strength cast iron and stressed relieved prior to any machining works. The block shall be of ample strength and stiffness, and be of proven design. The crankcase block shall incorporate mounting feet for bolting down the engine. Removable side covers for inspection purposes and relief valves incorporating flame traps to guard against damage or injury from crankcase explosions shall be included.

**MW-4.2.3 Cylinder Liners**

The cylinder liners shall be renewable wet type honed to minimize piston ring wear, fitted into the cylinder block with suitable seals and with the head in position, locked firmly in position.

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The cylinder heads shall be of cast construction, suitably cored for water cooling passages and included preferable two inlet and two exhaust valves per cylinder as applicable. Means shall be provided to prevent the valve from dropping far enough to cause damage and double springs shall be provided. The valve seats shall be renewable. The valves and seats particularly on the exhaust shall be of materials such as stellite to be able to resist the severe duty.

Preference will be given to engines with individual heads for each cylinder and where the manifolds are left in unit with the removal of one or more heads.

Allow for the fitting of maximum cylinder pressure indicator for checking of compression and maximum firing pressures of each cylinder. A lever or handwheel, which decompresses all cylinders simultaneously, shall be provided. Tappet covers shall be separately removable for setting clearances.

**MW-4.2.5 Piston and Connecting Rods**

The pistons shall be designed to withstand the temperatures and pressures encountered and machined to produce the correct shape under normal operation and incorporate a proven combination of compression, oil control and scraper rings. The rings shall be treated by chromium plating or otherwise for long life. The gudgeon pin shall be hardened and ground and positively restrained within the piston boss.

The connecting rods shall be of high tensile strength forged steel construction and incorporate a removable end cap which shall be interlocked and/or dowelled to the rod. The piston and connecting rod shall be removable either through the cylinder bore or through crankcase doors.

Lubricated oil shall be conveyed to the gudgeon pin by drilling the connecting rod or spraying oil into the underside of the piston.

**MW-4.2.6 Fuel Injection**

Fuel injection system shall be of well-proven design, self-compensating for wear, and for varying fuel viscosity. The fuel pumps shall be designed and positioned so that their performance is unaffected by the engine heat. The engine and fuel system shall be suitable for a wide range of fuels. Individual injectors are to be fitted for each cylinder head with identical high pressure seamless steel pipes from injection pump/s to its appropriate injector.

Damping shall be provided in the fuel supply manifold to the injection pumps to avoid the possibility of high pressures being set up in this manifold due to surging.

The fuel pumps are to be controlled by electronic type governing system. Suitable drip trays and drain pipes are to be provided to avoid

contamination of the lubricating oil. Drain pipes shall be provided from these trays to collecting tank. Fuel leak-off pipes from the injectors shall be taken to the fuel day tank.

#### **MW-4.2.7 Crankshaft and Camshaft**

Each crankshaft and camshaft shall be of single high tensile strength alloy steel forging with hardened and ground bearing surfaces. Unless other approved provisions are made, the crankshaft shall be drilled to provide lubrication for the connecting rod bearings and incorporate balance weights. The shaft diameters shall be sufficient for several regrinds. The camshafts shall be gear-driven. The cam followers shall be of the roller type.

#### **MW-4.2.8 Fuel System**

The basic specification for the diesel fuel oil to be used by the diesel engine units shall be as specified in Clause GW-3.5 of the General Works specifications.

Although the specified fuel specification is the base specification that will be used for Performance Test, NPC prefers that the engine be able to run on a wide range of fuels.

Bidders shall state the range of fuel specifications for satisfactory operation of the engine.

A fuel system shall be furnished to regulate fuel flow to maintain constant rated engine speed regardless of load variations.

The fuel system shall include separate elevated fuel day tank, electronic engine governor, direct fuel injection, fuel metering equipment, primary filter/strainer, secondary filter/strainer as required per manufacturer's standard, necessary valves, relief valve, pressure gauges and fuel cut-off valves.

Primary fuel filter shall be of type to remove both solid and liquid impurities with replaceable element to protect the injection system. Secondary fuel filters shall be of replaceable canister type filters.

Simplex strainer with minimum 60 mesh size and stainless steel filter element shall be provided.

Each diesel engine-generator set shall be provided with separate fuel day tank of 1,000 liters minimum capacity complete with accessories, associated structural supports, isolation valves, 50 liters per minute @ 10 meters discharge head cast iron double acting rotary hand pump with flexible hose of appropriate materials and size, instruments and other accessories as shown on the bid drawings. The fuel day tank shall be provided with high and low level alarm contacts for annunciation in the generator control and protection panel.

The fuel oil day tank shall be a shop-fabricated, all welded construction, rectangular or any approved shape and shall be designed and



constructed in accordance with the requirements of applicable standards complete with manholes; inlet and outlet nozzles; and nozzles for vent, overflow, drain, sounding, level gauge and switches. Included in the supply of the day tank are its structural steel supports with sufficient height as required by the diesel engine operating system or as recommended by the engine manufacturer and complete with mounting/anchor bolts. The structural steel supports shall be pre-fabricated ready for assembly at site. The tank material shall be of carbon steel conforming to ASTM A36 or approved equal with minimum shell thickness of 5 mm. Nozzles shall be fitted with flanges, raised face conforming to ANSI B16.5. The tank shall be provided with an interior and exterior coating. The supply shall include all the necessary materials for fixing and installation.

#### **MW-4.2.9 Lubricating Oil System**

The lubricating system shall be of forced-feed type to supply oil under pressure to all working points such as main bearings, crank pins bearings, piston, piston rings and pins, camshaft drive and other moving parts.

The lubrication system shall incorporate full flow oil filtration thermostatic valve, pressure and temperature indicators, system pressure regulator, oil cooler, gear-driven pressure oil pump, oil sump and may include a gear-driven scavenge oil pump.

Oil Pressure switches shall be provided to prevent the engine from increasing speed above idle if the oil pressure is below normal and closes down the engine if satisfactory pressure is not achieved within a given period.

On start-up, adequate lubricating oil shall be supplied to the engine and turbo/supercharger bearings. If required, a DC motor-driven pre-lube oil pump shall be provided. The DC motor shall be fed from the 24 volt DC system to be supplied by the Supplier.

Each diesel engine-generator set shall be provided with free jet centrifuge type lube oil purifier. The lube oil purifier shall have adequate capacity to allow the proper treatment of lube oil circuit.

The Supplier shall provide NPC after award of Contract the recommended grade of lubricating oil and the names of at least three (3) suitable manufacturers and their trade name. Prior to delivery, the lubrication piping system of the unit shall be cleaned with flushing oil and the first fill of lubrication oil and lubricants to be used during the Testing and Commissioning shall be included in the supply.

#### **MW-4.2.10 Cooling System**

The cooling system shall be of sufficient capacity to provide engine jacket water, lubricating oil and charge air cooling when the unit is delivering full-rated load under the specified conditions.

The system shall comprise all necessary valves, integral pipe works on the engine, lubricating oil and charge air coolers, radiator, cooling water

pump, expansion tanks as applicable, thermostatic valves and instruments such as thermometers, pressure gauges and switches, water level detectors and other necessary protection devices.

The cooling water pump shall be engine mounted gear driven of sufficient capacity to provide engine jacket water cooling, lubricating oil and charge air cooling when the unit is delivering full-rated load under the specified conditions.

The radiator shall be designed to permit easy maintenance and cleaning of the interior and preferably vertically mounted. Radiator shall be of industrial finned tube type for closed circuit cooling system. It shall be equipped with an engine driven blower type fan complete with fan guard and the fan belts shall have a tension adjustment and belt guard. The radiator fan shall have sufficient capacity to maintain the desired cooling requirements of the diesel engine. Ball tap valve of bronze material shall be provided to interconnect/feed fresh water into the cooling water system or expansion tanks, if applicable.

Fan blades shall be of aluminum alloy material or approved equivalent. The assembled motor shall be certified as having been statically and dynamically balanced and having been non-destructively tested by x-ray or other approved method.

The framework of the radiator and other steel parts except machined surfaces shall conform to ASTM A36, hot-dipped galvanized, with a minimum application rate of 600 g/m<sup>2</sup>. Bolts and nuts used for the structural parts shall also be hot-dipped galvanized. A flexible connecting section shall be provided between the radiator and discharge louver frame.

Radiator fan discharged air shall be directed upwards from top of the genset's enclosure. Where modular gensets are installed in an available space inside the existing powerhouse, radiator fan discharged air shall be directed horizontally through an open area on the wall of the powerhouse.

#### **MW-4.2.11 Intake Air and Exhaust System**

Intake air filter and exhaust silencer shall be adequately sized to prevent excessive pressure drop.

Heavy duty dry type intake air filter shall be provided to protect the engine from dust and solid particles. Filter shall preferably be mounted on the engine and provided with service indicator to show that the filters need to be cleaned.

The exhaust system shall be constructed of corrosion and heat resisting material conforming to ASTM A 106 or approved high grade material suitable for the exhaust temperature of the unit. Exhaust system shall include residential type silencer, stainless steel expansion bellows, tail end pipe terminating in a horizontal plane and cut at a 45° angle or per manufacturer's installation standard, and necessary bracing needed for mounting to prevent transmission of engine vibration to the enclosing structure. Exhaust pipe/silencer installed within the enclosure shall be

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thermally insulated. Exhaust silencer shall preferably be installed inside the enclosure, except otherwise installed per manufacturer's standard/recommendation and approved by NPC.

Exhaust gas pipe shall be provided with flanged connection and mounting supports, and all the required connection bolts, nuts, washers and gaskets.

For modular generating sets installed at available space within the existing powerhouse, extension of exhaust pipe complete with expansion joints, spring hangers, pipe supports and associated structures, pipe fittings and accessories, and pipe insulation for pipe inside the powerhouse shall be provided by the Supplier.

A suitable size of turbochargers for ample supercharging shall be provided complete with axial turbine wheel, centrifugal compressor, gas inlet casing, air filtration and lubricating system.

**MW-4.2.12 Starting System**

Each diesel generator set shall be capable of being started, synchronized to the system and loaded to the full rating of the unit without dependence upon the AC auxiliary power supplies.

Electric starting system shall operate on a 12V or 24V electrical circuits per manufacturer's standard, energized by storage batteries. Circuit ground shall be negative.

Electric cranking motors shall be heavy-duty, with capacity to crank the engine at sufficient speed to start when conditioned to, and in an ambient temperature of 40°C, in conjunction with the specified range of fuel and lubricants. The drive mechanism for engaging the starting motor with the engine flywheel shall be inherently designed to operate and release without the application of heat. Starting system including battery shall be adequate to crank the engine for a minimum of three (3) cranking periods without overheating. Each cranking period shall consist of 30 seconds of constant cranking followed by a 2-minute rest. To protect the engine and electric cranking motors, Over Crank and Failure to Crank relays shall be provided to prevent excessive cranking period and cranking stress, respectively.

Storage battery shall be lead acid type or approved equivalent complete with battery tray and intercell connectors. The battery capacity shall be compatible with the cranking duty described in the preceding paragraph, in an ambient temperature of 40°C. Battery tray shall be constructed of fiberglass or approved corrosion resistant material and so treated as to be resistant to deterioration by battery electrolyte. Construction shall be such that any spillage or boil-over of battery electrolyte shall be contained within the tray to prevent a direct path to enclosure floor.

Battery charger shall be adequate to recharge the fully-depleted battery as required and shall automatically control the rate of charge, providing a high charge rate to a depleted battery and reducing to a trickle-charge rate when the battery charger indicate charging rate. Charging rate shall

be adjustable. Battery charger shall be solid-state full wave rectifier type rated 480V or 230V and 60 hz. The nominal output voltage shall be determined by the Manufacturer. The charger and battery shall be mounted and wired within the enclosure of the generating set.

#### **MW-4.3 Governing system**

The engine speed shall be controlled by an electronic governor capable of isochronous or droop type speed regulation and 115 percent overspeed shutdown. The governing system shall be able to maintain engine speed within 4% of rated speed from no load to full load generator output. The control shall be capable of switching between isochronous or droop speed regulation remotely. The frequency at any constant load, including no load or idling during start-up, shall remain within a steady state band width of rated frequency. The engine governor shall be provided with a generator loading control unit.

The Governing system shall have at least the following response characteristics or better:

Load Variations at rated speed	Maximum change of speed as a percentage of rated speed	Maximum recovery time to within steady state tolerance (seconds)
a) On full load rejection	Temporary change 15%  Permanent change Dependent on droop Setting	15  -
b) On a change of load, both on and off, by any step of 25% of the rated load	Temporary change 4%  Permanent change Dependent on droop Setting	5  -

The steady load speed band shall not exceed 1% of the rated speed. The speed droop shall be adjustable from 1 to 8 percent.

The governing system shall allow safe manual, local, and/or remote control of the no-load, non-synchronized running speed of the engine from 90% to 110% of nominal speed to allow synchronizing of the generator.

Microprocessor based modular engine-generator control and governing system shall be supplied with portable programmers and driver software necessary to operate the units satisfactorily in isochronous or in parallel operation.

#### **MW-4.4 Control and Instrumentation**

The controls and monitoring of the generating set shall generally be performed remotely from the generator control and protection panel (GCPP) to be installed inside the existing control room, but selective monitoring/metering with start, stop and emergency stop push buttons shall also be provided in the local panel mounted on the engine skid or at

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appropriate location within the modular generating set. These selective monitoring/metering instruments shall have simultaneous reading with those on the GCPP during operation. The GCPP shall conform to the requirements specified in the pertinent Electrical Works Specifications.

The diesel generator unit's control system shall be designed for remote start-up and speed control including automatic and manual control. It shall be equipped with all necessary instrumentation to provide adequate monitoring of the unit under all operating conditions including "standby". The GCPP shall conform to the requirements specified in the relevant Electrical Single Line Diagram.

The generating sets shall also be tripped manually from the control room or from the engine in case of emergency.

Instrumentation selected shall be suitable for the application per Manufacturer's standard subject to approval by NPC including those specified in the relevant sections of these specifications. Process fluid corrosion effects, pressure surge and ambient temperature ranges shall be considered in material and housing selection so as to provide safe design margin.

The unit shall be capable of being started, synchronized to the system and loaded to the full rating without dependence upon the AC auxiliary power supplies. The unit shall be capable of accepting load within specified time after receiving a start signal. After the unit has been running for specified time at full load it may be assumed the AC power supplies will be again available.

The unit shall accept the load applied to it up to the overload rating and shall automatically control the voltage and frequency during loading and unloading.

The locally mounted control panel shall be fitted with a lockable safety glass viewing window for easy monitoring or operation. The control panel and cable terminal shall be side-mounted or at location per manufacturer's standard and shall accept a complete range of factory designed and installed attachments. Emergency stop button shall be provided and mounted on the enclosure exterior.

The lockable safety glass viewing window located at the genset enclosure shall be provided with the following monitoring indicators/control points but not limited to:

- a) RPM meter
- b) Hours Run Counter
- c) Oil Pressure Gauge
- d) Oil Temperature Gauge
- e) Cooling water Temperature Gauge
- f) Start/Stop Pushbuttons
- g) Emergency Stop Pushbutton

The genset's GCPP (floor-mounted pedestal type to be installed in the existing control room) shall be of manufacturer's standard design and

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shall contain the monitoring/control points and other measuring/supervisory/electrical instruments as specified in the pertinent Electrical Technical Specifications which shall include but not limited to the following:

- a) RPM Meter
- b) Hours Run Counter
- c) Oil Pressure Gauge
- d) Oil Temperature Gauge
- e) Cooling Water Temperature Gauge
- f) Number of Starts
- g) Battery Voltage
- h) Ready to Start Light
- i) Remote Control Position Indicating Light
- j) Generator Breaker Position, close and open

Included in the genset's control and protection panel are the following Human Machine Interface Indicators such as:

- a) Manual Start/Stop
- b) Auto/Remote Start
- c) Test Run-Auto
- d) Emergency Stop Button
- e) Alpha/Numeric Screen
- f) Discrete Status Indicators
- g) Fault Reset
- h) Local/ Remote Selector Switch

Alarm devices shall be provided for all abnormal conditions that may endanger the unit or prevent its starting or running satisfactorily as specified in Part II – Technical Data Sheets and relevant Clauses of the Electrical Works specifications.

The GCPP shall also be provided with annunciating window complete with acknowledge and test lamp push buttons and an audible device located on top of the panel. It shall be of modular design, microprocessor-based designed for operation on a DC supply.

The alarm points shall include but not limited to the following:

- a) Engine overspeed
- b) Lube oil pressure low
- c) Lube oil temperature high
- d) Cooling water high temperature
- e) Exhaust gas temperature high
- f) High and low battery Voltage
- g) High and low fuel level
- h) Failure to Crank Shutdown
- i) Over Crank (failure to start)
- j) Electrical alarms as required in the pertinent Electrical Works Specifications
- k) Other Miscellaneous alarms as required for safe and reliable operation of the plant

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- l) Control Switch for Engine Start, Stop and Emergency including its auxiliary/associated equipment

**MW-4.5 Engine Protection Device**

Sufficient protection devices shall be provided for each diesel engine-generator set to shut down the engine and simultaneously trip the generator circuit breaker in the event of overspeed, high cooling water temperature, low oil pressure and other manufacturer's specified mechanical and electrical type of faults. The cut-out devices shall incorporate indicating instruments with cut-out contacts adjustable over the whole range of the instruments. The Supplier shall submit annunciation data indicating the measurement and source for all conditions which will initiate protective unit alarm or shutdown.

An overspeed shutdown device, operating independently of the governing system, shall be provided. This device shall operate in either the manual or automatic mode of operation of the diesel generator unit.

The following accessories, as a minimum, shall be provided to safeguard the engine from being damaged by dangerous operation thereof:

- a) A mechanical operated type overspeed trip device to cut-off the fuel oil supply to the engine not more than thirteen percent (13%) above the rated engine speed;
- b) A signal generator type electrical overspeed trip relay operated at an adequate speed not more than fifteen percent (15%) above the rated speed;
- c) An emergency shutdown trip solenoid;
- d) A device to shut down the engine in the event of excessive low lubricating oil pressure, excessive rise in the engine cooling water or lubricating oil temperatures; and
- e) Other items in accordance with the Manufacturer's standard.

**MW-5.0 GENERATOR**

The generator shall be close-coupled to the engine through an SAE flange arrangement for perfect alignment and is self-exciting. Output voltage is controlled by automatic voltage regulator. The generator and exciter shall conform with the requirements specified in the relevant Electrical Works Specifications.

**MW-6.0 SOUND ATTENUATED/WEATHERPROOF ENCLOSURE**

Each diesel generator set shall be fully enclosed in a sound attenuated and weatherproof enclosure designed to provide a sound pressure level of not more than 85 dBA at 1-meter distance measured at any point of the unit.

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The enclosure shall be designed to withstand wind velocity of not less than 156 MPH (250 KPH) or as specified in the latest edition of National Structural Code of the Philippines and accurately dimensioned in compliance with the National Electrical Code (NEC), the National Fire Protection Association (NFPA) for clearance of all specified items included therein, and all applicable fire codes for a structure and application of this type. They shall be designed on modular principles with many interchangeable components permitting on site repair.

The enclosure shall have elegant appearance that includes acoustic baffles for the air inlet and outlet, walls with sandwich mineral wool attenuation of reliable quality made of galvanized steel material conforming to ASTM A-36 and painted finish. It shall be coated in accordance with manufacturer's standard.

The design and construction shall be modular with side panels, doors, louvers and for all component parts to have minimum thickness of 2mm (gauge 14). The roof of the enclosure shall meet or exceed the minimum gauge requirements specified but, in addition, shall be strengthened in such a manner as to support the largest commercially available exhaust silencer recommended by the Manufacturer for this application.

Wide opening access doors for easy maintenance of all main components shall be provided. The joints of the enclosure shall be of bolted or screwed design to allow easy disassembly and assembly during major maintenance of the diesel engine generator sets and its auxiliaries. All access doors shall be fully lockable to prevent unauthorized access.

All components of the enclosure shall be assembled utilizing stainless steel bolts, nuts and washers, hinges and locks. Watertight neoprene flat washers shall be used on all roof bolts.

The enclosure shall incorporate internally mounted exhaust residential silencers with mounting brackets and are of extremely rugged construction in order to withstand rough handling and installation. Tail pipe extension shall be provided, terminating in a horizontal plane and cut at a 45° angle or other means per recommendation of the manufacturer to prevent the entrance of water. Stainless steel, seamless flexible exhaust pipe and necessary bolts, flanges and gaskets to match the engine and exhaust silencer shall be provided.

The genset-mounted control panel shall be fitted with safety glass viewing window for easy monitoring of operation and located in a lockable access door. The monitoring/control points shall be as specified in Clause MW-4.4 of this specification. The control panel and cable terminal shall be side or front-mounted and shall accept a complete range of factory designed and installed attachments. Emergency stop button shall be provided and mounted on the enclosure exterior.

The enclosure shall be provided with necessary louvers designed to meet engine air requirements and proper ventilation. All louvers with bird screen shall be designed to prevent the entrance of driving rainwater but shall have sufficient free area to allow for 120% of the total genset air requirements or per manufacturer's standard. To guarantee that the



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enclosure is free from any leak and can prevent entrance of rain water, Rain Test shall be conducted.

All necessary fittings, hoses, shut-off valves, etc., shall be provided to facilitate fuel oil/lube oil filling, lube oil and water drain at the exterior of the enclosure. Engine crankcase breather pipes shall terminate at the exterior of the enclosure directly under the radiator air discharge louver.

The base of the enclosure shall be designed and manufactured as a heavy duty, formed steel construction with four (4) point lifting provision to support the calculated weight. Details of the base construction shall be included with the drawings to be submitted.

Auxiliary interface box shall also be provided which houses the electrical/instrument connection terminals for interfacing to the control panel external to the generating set.

The enclosure shall contain the battery racks, battery cables, battery charger and 12-volt or 24-volt battery capable of delivering at least 3 cold-cranking. The battery rack shall be welded to the sub-base with hold down bolts with cross over strap.

**MW-7.0 INSPECTION AND TESTS**

All tests and inspections (shop test, site test and commissioning) shall be carried out in accordance with the requirements specified in Clause GW-9.0, Inspection and Tests of the General Works Specifications, relevant sections of the specific technical specifications (Civil, Mechanical & Electrical Works specifications) and respective test procedures duly approved by NPC.

When the generating sets are ready for commercial service, reliability test shall also be conducted continuously without major failure for a period of eight (8) hours or at any programmed/scheduled operating hours available at plant site which the generating sets and all its associated auxiliaries are required to operate under the normal working conditions of the power plant.

Prior to the tests, the Supplier shall submit five (5) copies of test procedures for NPC's review/approval for all equipment covered by the Contract at least forty five (45) calendar days prior to the conduct of actual test. No tests shall be conducted unless relevant test procedures are submitted and approved by NPC.

**MW-8.0 SPARE PARTS AND TOOLS**

Spare Parts and Tools for the generating sets and its auxiliaries shall be supplied by the Supplier in accordance with the requirements specified in Clause GW-12.0 of the General Works Specification.

The lists of Spares and Tools in a form to be filled up by the Supplier as specified in Part II - Technical Data Sheets, are preliminary and subject to

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changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard).

The Bidder shall indicate "N/A" to the respective items in the said lists if found not applicable to the brand/model of the proposed equipment. However, NPC reserves the right to request the Supplier to provide the same or its equivalent if it is determined to be "required or necessary" during the evaluation, checking and review/approval of the final lists to be submitted by the Supplier during the Contract Stage at no cost to NPC.

**MW-8.1 Spare Parts**

Spare parts shall be provided to ensure reliable operation of the supplied equipment for one (1) year and shall include spares that will be used during the Pre-commissioning/Commissioning Test.

The Spare Parts List to be submitted with the Bid shall be in a form specified in Clause GW-12.1– General Works Specifications or in Part II – Technical Data Sheets.

The spare parts listed in relevant Sections/Items of Part II – Technical Data Sheets are minimum requirements which the Supplier shall include in the spare parts list that contain the recommended spare parts for one (1) year operation.

**MW-8.2 Tools**

The standard and recommended tools for normal/overhaul maintenance of the generating sets and associated auxiliary equipment shall be supplied for the plant in accordance with the Manufacturer's standard practice including those specified/listed in relevant Sections/Items of Part II – Technical Data Sheets.

The Supplier shall submit a detailed Tools list with the Bid in a form specified in the Bid form and the corresponding brochures/catalogues of the respective tools for approval of NPC prior to delivery at the Plant Site.

All tools shall be handed over to NPC in perfect condition at the time of taking over.

**MW-9.0 PAINTING**

The Supplier shall be responsible for the application of protective coating of all equipment and materials supplied by the Supplier in accordance with the manufacturer's recommendation or otherwise specified in Clause GW-11.0 of the General Works specifications.

The scope shall include adequate supply of touch-up coating which shall be used for painting of all supplied equipment and materials that will be damaged during shipment, unpacking and installation works including surfaces that show signs of corrosion.

Final color to be used for the generating sets and auxiliaries shall conform to Manufacturer's standard, unless otherwise specified. Application of

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painting shall be in accordance with the recommendation of the coating manufacturer.

Final Color of the Pedestal or Free Standing type control panel shall conform to Munsell No. 5 Y 8/1 or as directed/approved during contract stage. Application of painting shall be in accordance with the recommendation of the coating manufacturer.

Before any painting is made, all surfaces must be prepared properly, removing rust, scale, welding slugs and spatters, grease and encrustation of any nature. The various paints to be used shall be of approved quality and type.

**MW-10.0 MEASUREMENT OF PAYMENT**

Measurement of payment for all mechanical works shall be based on the bid price of each item as shown in the Schedule of Requirements – Mechanical Works, Section VII of the Bid Document. The cost of each item shall cover all works required and described in the pertinent provisions of the specifications.

# **PART I – TECHNICAL SPECIFICATIONS**

## **EW – ELECTRICAL WORKS**

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**SECTION EW - ELECTRICAL WORKS****EW-1.0 GENERAL**

This section covers the technical and associated requirements for the Supply, Delivery, Installation, Test and Commissioning of 1x120 kW AND 2 X 90 kW Modular Diesel Gensets and Associated Electrical Equipment for Tagubanhhan DPP.

It is not NPC's intent to specify all technical requirements nor to set forth those requirements adequately covered by applicable codes and standards. The Supplier shall furnish high quality diesel generating set and its associated electrical equipment meeting the requirements of this specification and industry standards.

All electrical equipment shall be installed in accordance with the relevant sections of this specification. The Supplier shall submit all related drawings and document deemed necessary, prior to the execution of the work, subject to the approval of NPC.

The works shall be performed and completed in a workmanlike manner in accordance with generally accepted modern engineering practice.

**EW-2.0 SCOPE OF WORK**

The scope of electrical work covers the furnishing of all labor, materials, equipment, tools and other necessary incidentals required for each project site which shall essentially consist of all electrical equipment and materials enumerated herein:

1. Supply, Installation and Test of 1 x 120 kW, 480V, 3-phase, 60 Hz AC Generator and associated auxiliary electrical equipment including grounding materials;
2. Supply, Installation and Test of 2 x 90 kW, 480V, 3-phase, 60 Hz AC Generator and associated auxiliary electrical equipment including grounding materials;
3. Supply, Installation and Test of Generator Control and Protection Panel (GCPP) for 1 x 120 kW D/G set equipped with monitoring, metering, control, protection and synchronizing equipment/devices;
4. Supply, Installation and Test of Generator Control and Protection Panel (GCPP) for 1 x 120 kW D/G set equipped with monitoring, metering, control, protection and synchronizing equipment/devices;
5. Supply of One (1) Spare Circuit Breaker for 120 kW D/G Set;
6. Supply of One (1) Spare Circuit Breaker for 90 kW D/G Set;



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7. Supply, Installation and Test of 1 x 150 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
8. Supply, Installation and Test of 1 x 112.5 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
9. Supply, Installation and Test of 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
10. Supply, Installation and Test of Bus Conductor and Line Materials and Hardware;
11. Supply, Laying and Test of Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the interfacing of supplied equipment;
12. Supply and Installation of Electrical Conduit and cable tray system;
13. Supply, Installation and Test of grounding conductors, ground connectors, ground rods and other accessories required for the interfacing of all equipment to the existing grounding system;
14. Construction of New Cable Trench/es;
15. Supply, Delivery and Test of Two (2) sets of Job Site Cameras to be installed before the start of construction and/or installation of equipment; and
16. All other works and services including those not specifically detailed herein but are required to fully complete the project.

In addition, the following shall be provided by the Supplier:

1. Provision of services of highly qualified and competent engineers for the direct supervision during the test and commissioning of all supplied equipment.
2. Submission of drawings and documents i.e., Equipment Manufacturer's drawings, Operation and Maintenance Manuals, etc.
3. Conduct inspection to verify and assess the extent of the related and incidental works needed to implement the project competently and efficiently.

The Supplier shall bear full responsibility that the equipment has been designed and fabricated in accordance with all codes, standards, and applicable governmental regulations and performs under the conditions and to the standards specified herein.

The equipment to be furnished shall be complete, with all parts in excellent working conditions, of new and high grade materials and produced with first class workmanship. All materials though not expressly called for in this

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7. Supply, Installation and Test of 1 x 150 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
8. Supply, Installation and Test of 2 x 112.5 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
9. Supply, Installation and Test of 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
10. Supply, Installation and Test of Bus Conductor and Line Materials and Hardware;
11. Supply, Laying and Test of Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the interfacing of supplied equipment;
12. Supply and Installation of Electrical Conduit and cable tray system;
13. Supply, Installation and Test of grounding conductors, ground connectors, ground rods and other accessories required for the interfacing of all equipment to the existing grounding system;
14. Construction of New Cable Trench/es;
15. Supply, Delivery and Test of Two (2) sets of Job Site Cameras to be installed before the start of construction and/or installation of equipment; and
16. All other works and services including those not specifically detailed herein but are required to fully complete the project.

In addition, the following shall be provided by the Supplier:

1. Provision of services of highly qualified and competent engineers for the direct supervision during the test and commissioning of all supplied equipment.
2. Submission of drawings and documents i.e., Equipment Manufacturer's drawings, Operation and Maintenance Manuals, etc.
3. Conduct inspection to verify and assess the extent of the related and incidental works needed to implement the project competently and efficiently.

The Supplier shall bear full responsibility that the equipment has been designed and fabricated in accordance with all codes, standards, and applicable governmental regulations and performs under the conditions and to the standards specified herein.

The equipment to be furnished shall be complete, with all parts in excellent working conditions, of new and high grade materials and produced with first class workmanship. All materials though not expressly called for in this

Specification but are necessary for the complete and proper operation of the diesel generator shall be furnished by the Supplier at no additional cost to NPC.

### **EW-3.0 CODES AND STANDARD**

The equipment furnished shall be in accordance with, but not limited to, the latest issues of the following codes and standards, including all addenda, in effect at time of purchase order unless otherwise stated in this specification:

**ANSI/IEEE** American National Standards Institute and/or Institute of Electrical & Electronic Engineers

C37.60 Requirements for Overhead, Pad-mounted, Dry Vault and Submersible Automatic Circuit Reclosers and Fault Interrupters for AC Systems

C57.12.20 Standard for Overhead-Type Distribution Transformer 500kVA and Smaller: High Voltage 34500V and Below; Low Voltage, 7970/13800Y V and below

**NEMA** National Electrical Manufacturers Association

MG 1 Standard for Motors and Generators

WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

AB 1 Molded Case Circuit Breaker

ICS2 Industrial Controls and Systems: Controllers, Contactors and Overload Relays rated 600Volts

ICS General Standards for Industrial Control and Systems

MG-1 Motors and Generators

MG-2 Safety Standard for Construction & Guide for Selection, Installation and Use of Electric Motors and Generators

**UL** Underwriters Laboratories, Inc. (all parts apply)

44 Rubber-Insulated Wires and Cables

83 Thermoplastic Insulated Wires and Cables

508A Industrial Control Equipment

1063 Machine Tool Wire (MTW) for Stranded Conductor Only

**IEC** International Electro-Technical Commission

60255 Electrical Relays

60044 Instrument Transformer

60071 Insulation Coordination

60076 Power Transformers, Parts 1-5

60060 High Voltage Test Technique

62271 High Voltage Switchgear and Control Gear

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- 60502 Power cables with extruded insulation and their accessories for rated voltages
- 60694 Common Specification for High Voltage Switchgear and Control Gear Standards

NFPA National Fire Protection Association

- 272 Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables

ASTM American Society for Testing and Materials

ISO International Standards Organization

- 9001 Quality System Model for Quality Assurance in Design/Development, Manufacture and Testing
- 9002 Quality System Model for Quality Assurance in Production, Installation & Servicing

PEC Philippine Electrical Code

The latest edition of each standard shall mean the latest edition available at the date of contract signing.

In addition to the above codes and standards mentioned, the Supplier shall comply with all National and local laws, codes, regulations, statutes and ordinances.

Equipment or materials meeting other internationally accepted standards, which ensure an equal or higher quality than the standards mentioned, will also be accepted.

In the event of any apparent conflict among standards, codes or this specification, the Supplier shall refer the conflict to NPC for written resolution before start of fabrication. Final decision regarding the acceptance of proposed standards is the prerogative of NPC.

Standards listed in the equipment specification are used mainly for NPC's references. Other internationally known standards however, shall also apply, provided such standards are equivalent in all respect to the standard prescribed and to the specific requirements described in the individual equipment specification. The Supplier shall submit copies of such standards for NPC's review and approval.

#### **EW-4.0 GENERATOR AND AUXILIARIES**

##### **EW-4.1 AC Generator**

##### **EW-4.1.1 General**

This specification covers the technical and associated requirements for the supply of diesel generator and associated auxiliary equipment, complete in every respect suitable for safe and satisfactory operation of the equipment.

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The continuous load capability of the generator shall be the specified nominal rating measured at the terminal. However, the generator shall be designed for continuous operation under normal conditions for 110% of its rated capacity without exceeding temperature rise in accordance with ANSI standard or equivalent applicable standard.

The generating sets shall be designed to meet the local conditions as specified in clause GW-3.0 of the General Works specifications.

The generator design characteristics shall be as follows:

Type	:	Rotating Field Synchronous AC Generator
Rated Continuous Output	:	Refer to Technical Data Sheets
Number of Phase	:	Three (3)
Power Factor	:	0.8 lagging (min.)
Frequency, Hz	:	60
Angular Speed, rpm	:	1800
Voltage, V	:	480
Excitation Class	:	Brushless, Separately Excited, Permanent Magnetic Generator (PMG) or equivalent
Allowable Voltage Variations	:	At rated output, frequency, voltage and power factor, the generator can operate satisfactorily though the terminal voltage at $\pm 5\%$ of rated value

**EW-4.2 Other Characteristics**

The three-phase synchronous generator shall be drip-proof, revolving field, self-ventilated, directly connected to the engine and shall conform to applicable standards and additional requirements hereinafter stated. All the generator phase leads, neutral and the terminals for the temperature monitor shall be brought out to the terminal box mounted solidly on the generator frame.

The generator bearings shall be designed to allow minimal stress induced in the shaft. Generators rated 500kW and below shall have a single or double bearing design. However, generators rated above 500kW shall adopt a double bearing design.

Design shall be such as to protect mechanical, electrical and thermal damage due to vibration, 25% over speed, or voltages and temperature at 10% overload.

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Space heaters shall be installed on the generator frame to maintain temperature of the entire generator above the dew point while not in use. Power supply shall be 240VAC single phase and shall be sourced from the existing station service transformer. Automatic control for space heaters shall be integrated in the Generator Control and Protection Panel (GCPP).

**EW-4.4 Unbalanced Load**

The generator shall be capable of carrying an unbalanced load of 10% continuously without abnormal overheating or causing damage to any parts of the generator. The generator shall be capable of withstanding transient fault conditions which give a rise to a value of  $I_2^2t$  not exceeding 30 where:

$I_2$  is the negative phase sequence per unit current

$t$  is the time in seconds.

**EW-4.5 Parallel Operation**

The generating set/s to be supplied shall be capable of parallel operation both at regulation and base load with existing and future generator set/s of different make/manufacturers and rating/s.

**EW-4.6 Generator Stator****EW-4.6.1 Stator Frame**

The stator frame shall consist of strong housing built by electrical welded steel plates of suitable thickness which have a sufficient degree of sturdiness to prevent the occurrence of undue noise or vibration and shall be explosion proof.

The supply shall include the bedplate, foundation bolts and all other embedded steel parts necessary for erection works.

**EW-4.6.2 Stator Core**

The stator core shall be constructed from the highest grade silicon steel sheets for the lamination. Special attention shall be paid to the insulation of the lamination and to the finishing of the edges after stamping.

The stator core lamination shall form several segments, separated by vent ducts and each segment shall be perfectly compacted to avoid vibration.

**EW-4.6.3 Stator Winding**

The stator winding of copper materials shall be formed by coils with Class H insulation. Each coil shall be composed by insulating with thermo setting resin base insulation in order to prevent the mica migration phenomenon. During

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manufacturing, the coils shall be subjected to special treatment to prevent air intrusion between single conductors and insulating materials.

The part of the coil to be embedded in the slots shall be varnished with semi-conducting varnish, in order to distribute in a uniform manner, the potential gradient and to eliminate the potential difference between the slots wall and the coil surface.

The stator coils shall be adequately clamped with external rings to prevent any deformation or damaged in case of short circuit at the stator terminals. The coil end clamp device and covers shall be designed so as to avoid vibrations and minimize additional losses.

Temperature detectors shall be provided in the stator slots and at the end of the ventilating ducts arranged to receive heat from the hottest spot of the windings with appropriate contacts for monitoring, alarm, detection and protection of the windings provided at the GCPP. At certain pre-set temperature (alarm setting), the temperature detector will trigger an alarm so that an adjustment or action before any insulation damage occurs may be done. The circuit breaker for the alternator will automatically trip in the event that the temperature detectors measure the winding temperature to be above the (shutdown setting) value.

**EW-4.7 Generator Rotor****EW-4.7.1 Rotor Core**

The rotor core shall be made of one solid forging with high mechanical strength characteristic and designed to have a large margin between the critical and running speeds (both normal and over speed). The rotor forging shall be fully examined by radiographic and ultrasonic techniques to determine its soundness.

**EW-4.7.2 Rotor Winding**

The choice of materials for winding and the design, manufacture and fitting of the winding coils shall be such as to prevent and avoid permanent deformation of the winding during service, considering the conditions of operation. The Supplier shall show how their design of the rotor winding accommodates thermal expansion and how damage to insulation is prevented in condition of thermal cycling of the rotor considering the rotational forces involved. The rotor shall be tested at over speed and carefully inspected before assembling into the stator.

**EW-4.8 Excitation System****EW-4.8.1 General Description**

The generator shall be equipped with state of the art digital brushless excitation system with high overload and short circuit capability.

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The Supplier may offer an alternative excitation system in which according to his experience has superior performance. Technical description pertaining to the alternative system shall be submitted with the proposal.

**EW-4.8.2 Operating Requirements**

The excitation system shall provide a positive signal to the unit master start-up sequence relay panel. Upon execution of signal automatically or by manual mode, an initial excitation system shall ensure voltage build-up.

During operation on automatic mode voltage control by automatic voltage regulator (AVR), the terminal and the reactive load of the generator shall be kept stable, without hunting, within the specified limits of accuracy at the prevailing set point and shall be self-adjusting, to any point within permissible area of the generator capability diagram during steady state and transient condition.

The terminal voltage of the generator shall be kept within safe limits of the AVR during extra ordinary transient or abnormal operating conditions arising at governor, generator and/or charging of transmission line. These particular conditions shall be guarded by the control. Limiting or protective devices shall be included in the supply.

In automatic operation mode, the generator terminal voltage shall automatically build-up reaching 95% rated speed and capable of synchronization to the grid by synchronizing system.

The AVR shall maintain generator output voltage within  $\pm 0.5\%$  for any constant load between no load and full load. The regulator shall be totally solid state design which includes electronic voltage build-up, volts per Hz regulation, three phase sensing, over-excitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup and shall be environmentally sealed.

**EW-4.8.3 Design Consideration for Excitation System**

The excitation system shall be designed for "manual" and "automatic" voltage control with AVR unit. The equipment shall be mounted in the excitation cubicles. Voltmeter and ammeter shall be provided for generator DC excitation parameters.

All electrical equipment/devices, electronic and control circuits in modular form shall operate satisfactorily within the supply voltage limits and tested according to the required insulation levels.

All components shall be tropicalized and all printed circuit board for electronic circuits shall be sealed with suitable resin resistant for tropical conditions.

**EW-4.9 Generator Control and Protection Panel (GCPP)**

The Generator Control and Protection Panel (GCPP) to be furnished shall be mounted with selector switch for REMOTE and LOCAL operation including



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indication functions necessary for monitoring, metering, control and protection of the diesel generating set/s. The GCPP to be supplied shall be designed with Generator Circuit Breaker included in the panel. Generator Circuit Breaker mounted on the D/G set container is not acceptable. The GCPP will be installed inside the plant's existing control room along with the existing GCPP's.

The Generator Control and Protection Panel shall be equipped with the following minimum requirements for the operator interface with the diesel engine generator in addition to those specified in the Single Line Diagram.

a. **Protection and Control**

The generator control & protection module (GCPM) shall be designed to trip generator circuit breaker for electrical and mechanical fault according to calculated tripping parameters. It shall be provided with adequate number of input/output contacts of suitable rating to carry out the prescribed tripping functions, alarm indication, fault recording function and supplementary signaling functions as maybe necessary for the initiation of automatic closing/tripping or switching control.

The protection relays shown on the drawings are the minimum protection required. The Supplier may offer different protection scheme in which based on his experience should be included for the specified rating of the Diesel Generator set/s subject to NPC approval.

The microprocessor based GCPM for the engine-generator shall be designed for automatic and manual operation and indication such as synchronization and load sharing of unit generators. All interface devices and other accessories necessary for the automatic and manual control function shall be provided by the Supplier.

b. **Monitoring and Metering**

All indicating instruments shall fulfill the requirements for accuracy class 0.3 (or better) except for the frequency meter which shall have  $\pm 0.01\text{Hz}$ . The panel shall be equipped with the following minimum required metering devices and indicating instruments:

1. Metering (current, voltage, power (kW, kVAr), energy, frequency, power factor) capable to measure single and three phase parameters through respective control switches;
2. Event Recorder (to be able to capture the latest events);
3. Data Logger (all data is stored in non-volatile memory so that information is retained even when power to the unit is lost);
4. User Programmable Fault Reports; and
5. Other metering and indicating instrument as specified in Mechanical Work Specifications.

**c. Synchronizing Equipment**

The panel shall be equipped with manual and automatic synchronization of unit generators, selector switch for automatic and manual mode, and the necessary indicators, metering, and other required appurtenances.

When specified in the Technical Data Sheets, a manual synchronizing equipment or controller separate from the generator controller built-in synchronizing function shall be provided for the plant for controlling manual closing of circuit breakers.

A synchronizing switch, if required for manual operation, shall be provided for each circuit breaker which will automatically connect the voltage circuits related to the breaker being closed to the synchronizing equipment. The equipment system shall be designed in such a way that it shall not be possible to inadvertently interconnect the voltage circuits, even when two or more synchronizing switches are closed at the same time. The manual synchronizing equipment shall be mounted on the GCPP.

All interface devices and other accessories whether or not expressly called for or indicated on the bid drawings but are necessary for the remote control and synchronization function of the new diesel generating unit shall be provided by the Supplier. All instruments, scales, relay coils contacts and other features shall be suitable for the apparatus controlled or for the purpose intended.

All DC and AC power supply required for annunciation, control, monitoring and protection of the system shall be integrated in the GCPP. The power and voltage requirements will be determined by the manufacturer in accordance with the ratings and consumption of its equipment/device.

The Supplier may offer a generator control and protection panel with proprietary standard design of the manufacturer containing the required functions suitable to the offered generating sets.

**EW-4.9.1 Panel Construction**

The panel shall be constructed from a minimum of 2.0 mm thickness steel sheet with edges formed into a rectangular pattern welded steel sheets so that each section is rigid, self-supporting and enclosed. It shall be adequately protected and suitable for indoor and outdoor application and all climate condition.

The panel shall be labeled with ISO symbols and comply with IP 65 for external environmental resistance and IP 44 and NEMA 12 for the resistance of the internal sealed modules.

The panel shall be designed with dimensions not to exceed the size shown on the Bid Drawing.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-4.9.2 Fault Annunciator System (Alarm System)**

The annunciator system shall distinguish any abnormal conditions during operation by means of visual and audible warning. It shall be of modular design, preferably microprocessor-based designed for operation on a DC supply. It shall consist of window cabinets, mounting chassis, plug-in assemblies, flashers, alarm relays, isolating relays, lamps, test buttons, acknowledged and reset buttons. Each alarm relay shall have an auxiliary relay with multiple contacts for local alarm and spares. In addition, group alarms for engine-generator and transformer shall be available.

The supply voltage for the annunciator system shall be monitored and must give an alarm in case of interruption of the alarm equipment power supply. All DC and AC power supply required for annunciation, control, monitoring and protection of the system shall be an integral part of the GCPP.

**EW-4.9.3 Communication Ports**

Communication ports shall be provided available in the local panel of the diesel generator sets and Generator Control and Protection Panel (GCPP) exclusively intended for control, protection, synchronization, communication, monitoring and metering. The communication to be established between various equipment in the entire power plant (e.g. other generator sets and power generating equipment, Power Plant Control System (PPCS), protection and control devices, instrumentation equipment, SCADA systems, etc.) shall be MODBUS and Ethernet-based protocol.

**EW-4.9.4 Terminal Blocks**

Terminal blocks shall be mounted so as to give easy access for external wiring and termination and shall give clear view of the arrangement of the cable tails to allow for future extensions and alterations with an approximately 25% extra terminals per terminal block.

Every terminal point shall have individual and complete identification on the wiring diagram.

**EW-4.9.5 Nameplate**

The panel shall be provided with adequately sized nameplate made of black surface exposing the white core. In addition, each piece of equipment mounted on or inside the panel shall also be provided with nameplate for easy and convenient identification.

**EW-4.10 Generator Circuit Breaker**

The generator circuit breaker shall be as stated in the Technical Data Sheets. Circuit breakers with a rating of 800 A and above shall be of the Air Break Type, spring storage device powered by a 125 VDC motor, suitable for hand operation and provided with an appropriate tripping mechanism to be actuated by the protective relays.

**SECTION VI – TECHNICAL SPECIFICATIONS**

Circuit breakers with a rating below 800A shall be of the Molded Case Type, 3-pole with 240 VAC control mechanism and auxiliary switch and 12/24 VDC equipped with electronic shunt trip mechanism. The circuit breaker shall be capable of "switching-in" the generator when synchronizing with one or more units in parallel operation.

Means shall be provided for locally closing and tripping electrically operated breakers without opening the door of the breaker compartment.

Where applicable, circuit breaker derating factors shall be applied to compensate for factors such as ambient temperature, altitude, frequency, duty cycle and enclosure loading.

**EW-4.11 Equipment Wiring**

Equipment interfaced wiring shall be 600V, stranded copper with thermoplastic insulation and shall comply with the requirements of IPCEA standard. Minimum size shall be 2.0 mm<sup>2</sup> or larger for control circuit except annunciator wire which shall be 1.2 mm<sup>2</sup> or larger. The minimum size of current transformer wire shall be 3.5 mm<sup>2</sup>.

All wiring shall be neatly run marked at both ends and securely fixed in such a manner that whenever practicable, wiring can be easily identified and checked against diagram.

The panel shall be provided with earth wiring and connection to create an environment that meets the requirements of electromagnetic compatibility.

**EW-4.12 Equipment Grounding**

All major equipment such as generator, transformer, generator control and protection panels, and all other metallic parts shall be equipped with at least two (2) terminals or suitable grounding pads of adequate size to accommodate at least two fixing screws for proper connection to the grounding conductors or ground connections to the plant existing grounding system as required.

**EW-4.13 Spares Parts and Tools**

Spare Parts and Tools for the generating sets and its auxiliaries shall be supplied by the Supplier in accordance with the requirements specified in the General Works Specification and Part II-Technical Data Sheets.

If found not applicable to the proposed equipment model/design, the Supplier shall submit a Manufacturer's certification indicating that the spare parts and standard/special tools listed is not applicable to the equipment being offered.

However, NPC reserves the right to request the Supplier to provide the same or its equivalent if it is determined as deemed necessary during the evaluation, checking and review/approval of the final lists to be submitted by the Supplier during the Contract Stage at no cost to NPC.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-4.14 Inspection and Testing****EW-4.14.1 General**

The Supplier shall carry out at his own expenses and all tests necessary to ensure the satisfactory design and manufacture of all equipment is in accordance with NFPA 110 to show it is free from defects and will start automatically and could operate efficiently at full load.

The Supplier shall include in his bid the cost of test and commissioning of the diesel generating set. Hence, the Supplier shall bear full responsibility that the equipment has been properly installed, tested and commissioned in accordance with the manufacturer's recommendation, applicable codes and standard required including all applicable government rules, regulations and ordinances.

**EW-4.14.2 Shop Test**

Routine, design, quality and conformance test and other necessary tests shall be performed in accordance with ANSI Standard or equivalent IEC Standard. Design tests is required if the equipment is Supplier's new design or previous design with significant design changes. In this case, certified test report of duplicated production type is acceptable.

The Supplier shall make all preparation for tests and provide the required test apparatus and personnel and shall notify NPC in advance of the test schedule.

The test methods, measurements and computation shall be in accordance with the latest applicable requirements of ANSI and IEC standard and shall be submitted for NPC's approval.

**EW-4.14.3 Routine Test**

The following Routine Test shall be conducted on the alternator at the workshop:

- a. For the generator armature, generator field, excited armature and exciter field:
  1. Measurement of Resistance
  2. Measurement of Insulation Resistance
  3. High Voltage Test
- b. Phase Sequence Test and Voltage Balance Check;
- c. Open Circuit Characteristics with generator line voltage recorded against exciter field current;
- d. Short Circuit Characteristics with generator current recorded against exciter field current;
- e. Voltage Regulation Test to be conducted with AVR in the circuit with reactive loads;
- f. Standard Routine Tests as per relevant ISO standard shall be performed.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-4.15 Data and Information to be Submitted After Award of Contract**

The following documents (in addition to the documents/drawings specified in Clause GW-6.0 of the General Works specifications) shall be submitted after award of contract for NPC's review and approval prior to procurement and installation of the supplied equipment and materials:

- a. Documentation for Electrical System such as the following:
  1. Single Line Diagram showing the Diesel-Generator Set and related equipment including basic equipment data;
  2. Outline drawings showing all critical dimensions and weights;
  3. Schematic and wiring diagram of all power and control circuits for the engine-generator set and auxiliary equipment showing interconnect points and logic diagrams;
  4. Engine-generator Control and Protection panel;
  5. Section and detail drawings of cable terminations and connections.
- b. Brochures/Catalogues of the AC Generator and GCPP;
- c. Manufacturer's Technical Data Sheets of the AC Generator and GCPP in accordance with EW-12.3;
- d. Service Manuals and Parts Books
  1. Operating Instructions – with description and illustration of all switchgear control and indicators and engine and generator controls and indicators.
  2. Parts Books – that illustrates and list all assemblies, sub-assemblies and components, except standard fastening hardware (nuts, bolts, washer, etc.)
  3. Preventive Maintenance Instructions – on the complete system that covers the daily, weekly, monthly, bi-annual and annual maintenance requirements.
  4. Routine Test Procedure – for all electronic and electrical circuits and for the main AC generator.
  5. Troubleshooting Chart – covering the complete generator set showing description of trouble, probable cause and suggested remedy.
- e. Certified Design and Routine Test Results; and

**SECTION VI – TECHNICAL SPECIFICATIONS**

- f. Field Tests to be performed and Certified Test and Inspection Reports duly signed and witnessed by NPC representative.

**EW-5.0 TRANSFORMERS****EW-5.1 General**

This specification covers the technical and associated requirements for the generator step-up transformer and accessories for use in electric generating plants. Station service transformer, if to be provided, shall be Overhead-type Distribution Transformer and shall be in accordance with the latest revision of IEEE Std. C57.12.20.

**EW-5.2 Technical Description**

The transformer(s) covered by this specification is (are) for use in an electric generating station. The application details are stated in the Technical Data Sheets.

**EW-5.3 Design Requirements****EW-5.3.1 Rating**

Transformer rating, specified in the Technical Data Sheets shall be the basis of the Supplier's guarantee as to performance and temperature rise. The ratings indicated are based on actual load requirements at the service and operating conditions specified herein.

**EW-5.3.2 Voltage**

The transformer to be supplied shall be designed to withstand the over voltages for the duration of voltage excursions which may be expected as a result of full load rejection of the generator.

**EW-5.3.3 Frequency**

Frequency for operation shall be 60 Hz.

**EW-5.3.4 Overload Requirement**

The overload rating and operation shall be in accordance with all cyclic loading duties as specified in IEC 60354. The overload capability of any auxiliary equipment such as bushings, LTC's, CT's, oil expansion tanks, leads, etc. shall not be less than the transformer overload rating. If other considerations will limit the overload capability of the transformer, the Supplier shall specify these limitations in his proposal.

**EW-5.3.5 Short Circuit Withstand Capability**

The transformer shall withstand the mechanical and thermal stresses produced by external short-circuit currents specified in IEEE Std. 57.12.00 (latest revision).

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-5.3.6 Transformer Loss Evaluation**

Depending on the requirement stated in the Technical Data Sheets, the Supplier is required to fill-in all the information for the transformer losses in the Technical Data Sheets for the generator step-up and station service transformer in order for the NPC to fully determine the most cost effective of the proposed transformer(s) to be supplied considering both cost of losses and first cost.

Failure of the Supplier to completely fill- in all the information needed for proper evaluation by the NPC shall be a ground for rejection of his bid.

The transformer shall be designed for the most economical loss ratio (copper loss/iron loss) for the application as specified in the Technical Data Sheets for the transformer.

**EW-5.3.7 Impedance and Reactance**

The impedance and reactance shall be stated in the Proposal.

**EW-5.3.8 Audible Sound Level**

Sound levels decibels (dB) at rated voltage and frequency for liquid immersed generator step-up and station service transformers shall be as below. The average sound level of the transformer shall not exceed these values when measured in accordance with the conditions outlined in the latest ANSI/IEEE C57.12.90 or IEC 60551 for oil-immersed transformers or ANSI/IEEE C57.12.91 or IEC 60726 for dry-type transformers.

<b>Equivalent Two-winding, kVA</b>	<b>Average Sound Level, dB</b>
1-50	48
51-100	51
101-300	55
301-500	56
750	57
1000	58
1500	60
2000	61
2500	62

**EW-5.3.9 Tolerances**

The transformer shall be designed and manufactured with tolerances in accordance with applicable ANSI/IEC/IEEE standards.

**EW-5.3.10 Electrical Insulating Oil**

The Supplier shall furnish oil with quality suitable as an insulant and coolant for transformers. The oil shall be new naphthenic based mineral oil meeting the requirements of the latest ASTM D3487 (Specification of Mineral Insulating Oil Used in Electrical Apparatus).



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Insulating liquid must not contain more than 2PPM of Polychlorinated Biphenyl (PCB), classified as "PCB free".

A Certification from the Manufacturer that the insulating oil is PCB free and laboratory analysis results conducted on a DENR-accredited laboratory shall be submitted to NPC.

**EW-5.4 Design and Construction Features****EW-5.4.1 General**

The transformer design, manufacture and assembly shall minimize vibration and shall prevent damage by inherent vibration and stress during operation, transportation and short circuits.

**EW-5.4.2 Cores**

Cores for the transformers shall be constructed of the highest quality, non-aging high permeability grain oriented silicon steel. The steel shall be in thin laminations, annealed after cutting and rolled to ensure smooth surface at the edges.

The laminations must be free from impurities and must receive stress relief treatment after punching. The laminations shall be accurately flattened, especially at the edges and insulated by suitable procedures with long life heat resistant insulating coat.

Both sides of each sheet shall be insulated with a durable, heat resistant insulation. The cores shall be held firmly by core clamp and brace to ensure adequate mechanical strength to support the winding and to withstand without damage or deformation, the forces, caused by short circuit stresses, transportation or handling to prevent shifting of the core laminations.

The core shall be solidly grounded to the tank and shall be provided with approved lifting devices or lifting lugs at suitable points of the core assembly for core lifting.

**EW-5.4.3 Windings**

Windings for transformer shall be of the best modern design of conductor having constant cross-section and uniform insulation or graded insulation as required. The coils shall be wound and supported in a manner to provide sufficient oil ducts which will be maintained without constriction.

End coils shall have extra insulation. Coils shall be made up, shaped and braced to provide for expansion and contraction due to temperature changes in order to avoid abrasion of insulation and provide rigidity to resist movement and distortion caused by abnormal operating conditions.

Adequate barriers shall be provided between windings and core and between high and low voltage windings. End coils shall have extra protection against abnormal line disturbances. Permanent current-carrying joint for splices shall

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be welded or brazed, properly formed and finished, and insulated to conform to the basic insulation.

Winding conductor shall be free from scars, burrs and splinters and shall be uniformly insulated. Permanent current-carrying joint for splices shall be welded or brazed, properly formed and finished, and insulated to conform to the basic insulation.

The completed assembly of core and coils shall be vacuum dried, immediately impregnated and immersed in dry oil. They shall be adequately braced to withstand ocean shipment, short-circuit forces and earthquakes.

**EW-5.4.4 Bushing**

All porcelains used in bushing shall be wet process, homogenous, and free from cavities or other flaws. The glazing shall be uniform in color and free from blisters, burrs and other defects. All porcelain parts shall be one piece. The bushings of the same rating shall be interchangeable.

Bushing up to 110 kV BIL shall be porcelain bulk type whereas bushings above 110 kV BIL shall be condenser-type. In the latter case, the bushing shall be provided with capacitance test tap.

Bushings shall have the continuous current-carrying capacity necessary to carry the full 65°C rise current. The bushings shall also be capable of carrying overload currents as required by EW-5.3.4.

The terminal pads shall be of high conductivity bronze or copper and shall be plated with hot flowed electro silver or electro-tin. Whenever a larger terminal pad is required for higher current rating, the mounting holes shall conform to NEMA Standards.

The HV and LV terminations of the generator step-up transformer shall be fitted with suitable insulating shroud. The insulating shrouds shall be manufactured through dip molding process and shall be made from flexible polyvinyl chloride (PVC) material, suitable for low voltage to high voltage applications. The insulating shroud shall be flame retardant, conforming with the UL 94 Standards. They shall be type tested for electric strength in accordance with IEC 60243 - 1 or approved equivalent standards.

**EW-5.4.5 Gasket**

Gaskets shall be unaffected by hot insulating oil, retain their resiliency during the life of the associated equipment, and be unaffected by weather while maintaining oil and gas tightness. Nitrile rubber gaskets are acceptable. Gaskets of neoprene and/or any kind of impregnated/bonded cork or cork only are not acceptable. Gasket flanges shall have grooves or metal stops to prevent over compression of gaskets. All bolted transformer tank or accessory openings shall be gasketed.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-5.4.6 Tank**

The transformers shall be housed in a steel tank with all permanent joints molded, backed up by a sturdy steel structure as required to obtain the desired rigidity and strength. The material shall be of high grade steel plate having good welding qualities. All seams, flanges, lifting and jacking lugs, braces and other parts attached to the tank shall be welded. No rivets shall be used. The cover shall be bolted type. The tank shall be able to withstand an internal pressure with oil at operating level.

All openings such as joint between the case and cover, bushings insulation mountings, etc., shall have welded on flanges to provide gaskets surfaces and allow for bolt holes. No bolts shall pass to the inside of the case and cover. Flanges shall have gaskets which will remain oil-tight and will not deteriorate under severe conditions. The tank with radiator fitted shall be tested for leaks before painting.

For station service transformer, if to be provided, the transformer tank shall be made of steel. It shall be of sealed-type construction with a steel cover. The tank cover shall be provided with a reusable gasket. The tank cover shall be grounded to the tank body using a copper strap adequately sized for the short - circuit of the transformer. The tank shall be provided with a tank grounding connector located near the base of the tank. The connector shall be eyebolt-type, made from tinned copper alloy material. Standard support lugs shall be provided on the tank wall for securely mounting the transformer on the pole. The type support lug to be provided corresponding to the transformer size shall be as shown in IEEE Std. C57.12.20, latest revision. Lifting lugs shall be permanently attached near the top of the transformer tank to allow for balanced vertical lift. The design of the lifting lugs shall incorporate a safety factor of 5. Lifting facilities for the core-oil assembly shall be provided.

**EW-5.4.7 Radiators**

Radiators, if to be provided, shall be bolted to the main transformer tank and readily detachable. Isolation valves shall be fitted to the tank to permit radiator removal without draining the main tank. Separate filling plugs, air bleed plugs and drain plugs shall be fitted to each radiator section. Radiators shall be galvanized externally prior to etching and painting. Particular attention shall be given to their internal cleaning and painting to ensure that the radiators arrive in a serviceable condition. All radiators shall be completely sealed with blanking plates and neoprene seals for transport. They shall be thoroughly dried before shipment.

**EW-5.4.8 Hardware**

All energized hardware, i.e., bolts, nuts and washers shall be made of tinned copper alloy material such as silicon bronze or equivalent. All other hardware shall be hot-dip galvanized.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-5.5 Fittings and Accessories**

The following transformer accessories shall be included:

1. HV Bushing
2. Oil Level Indicator
3. Oil Sampling Plug
4. Oil Drain Valve
5. Oil Temperature Indicator
6. Pressure Relief Valve
7. Lifting Lugs
8. Anchor Bolts
9. Earthing Terminals
10. HV/LV Insulating shroud

**EW-5.6 Equipment and Marking**

The transformer shall be provided with a stainless steel nameplate in accordance with the latest standard of IEC60076-1, fitted in a visible position showing the information indicated below. The entries on the plate shall be indelibly marked.

1. Kind of transformer
2. Number of this standard
3. Manufacturer's name
4. Manufacturer's serial number
5. Year of manufacture
6. Number of phases
7. Rated power (in kVA or MVA)
8. Rated frequency (in Hz)
9. Rated voltages (in V or kV) and tapping range
10. Rated currents (in A or kA)
11. Connection symbol
12. Connection diagram
13. Short circuit impedance (in %Z)
14. Type of cooling (i.e. OA, ONAN, etc.)
15. Insulation voltage (withstand voltages)
16. Insulating liquid
17. Temperature rise (in °C)
18. Total mass, kg
19. Mass of insulating oil

The minimum recommended dielectric strength of oil filling the transformer shall also be engraved on this plate. The rating plate and any other instructions or designations shall be in the English language.

**EW-5.7 Standard and Common Tools**

The Manufacturer of transformer shall provide standard/common tools for use in the installation of transformer.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-5.8 Tests**

All tests shall be performed as per latest revision of ANSI C57.12.90 Factory Test shall include, but not limited to the following:

**EW-5.8.1 Routine Test**

1. Ratio, Polarity and Phase Relation Test
2. No Load Losses and Excitation Current at rated Voltage and Frequency
3. Induced Potential Test (Low-frequency Dielectric Test)
4. Mechanical (Leak Test)

**EW-5.8.2 Design Test**

1. Winding Resistance Measurement Test
2. Impedance Voltage and Load Loss Measurement
3. Temperature Rise
4. Lightning Impulse
5. Audible Sound Level
6. Mechanical (Lifting & Moving Devices, Pressure Test)

**EW-5.8.3 Miscellaneous Test**

1. Insulation Power Factor
2. Insulation Resistance
3. Short Circuit Capability

**EW-5.8.4 Site Test**

The Supplier shall perform all tests specified by the equipment Manufacturer, applicable standards and as necessary to verify the proper operation of the equipment in the presence of NPC representatives.

1. Check level and alignment of the installed transformer;
2. Check tightness of connections and fastenings;
3. Check proper grounding;
4. Check oil level monitors, nameplate, vent plugs;
5. Check wire and cable connections;
6. Check cable glands and entrance; and
7. Check on the proper installation of transformer accessories.
8. Winding resistance
9. Insulation Resistance & Polarity Index/Dielectric Absorption Ratio
10. Transformer Turns Ratio
11. Oil Dielectric Breakdown Voltage Test
12. Insulation Power Factor of Dissipation Factor

**EW-5.9 Failure to Meet Guarantees**

Depending on the requirement stated in the Technical Data Sheets, the transformer will be tested for compliance with the Manufacturer's guaranteed losses. If the transformer losses, as determined by test, at rated voltage,

frequency and 100% rated kVA exceed the guaranteed total losses, the excess in losses shall be evaluated at the following rated cost and the resulting amount shall be deducted from the contract price.

$$S = 2 [(N_{L-L}) (N_{LM} - N_{LG}) + (L_L) (L_{LM} - L_{LG})]$$

Where:

S	=	Amount to be deducted from the Contract Price
N <sub>L-L</sub>	=	Cost of No load losses equivalent to Php 300/Watt
N <sub>LM</sub>	=	Measured no-load losses expressed in Watt
N <sub>LG</sub>	=	Guaranteed no-load losses as stated on the Technical Data Sheets
L <sub>L</sub>	=	Cost of Load Losses equivalent to Php 250/Watt
L <sub>LM</sub>	=	Measured load losses expressed in Watt
L <sub>LG</sub>	=	Guaranteed load losses as stated on the Technical Data Sheets

When the excess of the total losses reaches five percent (5%), NPC shall have the right to reject the transformer for which such excess is verified during the factory acceptance test.

Successful Bidder shall promptly provide NPC one (1) original and three (3) certified copies of all test data and reports on the transformer.

#### **EW-5.10 Data and Information to be Submitted After Award of Contract**

The following documents shall be submitted after award of contract for NPC's review and approval prior to procurement and installation of the supplied equipment and materials:

1. Brochure/Catalogues of the transformer;
2. Manufacturer's Technical Data Sheets of the transformer in accordance with EW-12.3;
3. Outline drawings of transformer and accessories showing the following:
  - a. General Dimensional Drawing
  - b. Sectional Drawing
  - c. Nameplate Drawing
  - d. Marshaling box with connection diagram
4. Description and instructions covering the installation, operation and maintenance of the transformer and accessories;
5. Duly signed Routine Test Results; and
6. Field Test to be Performed and Certified Test and Inspection Reports duly signed and witnessed by NPC representative.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-6.0 SWITCHYARD EQUIPMENT AND APPURTENANCES**

The switchyard equipment and appurtenances shall be installed as shown on the bid drawing. The equipment shall be securely fastened (as applicable) to the structure to avoid movement during transient fault and manual operation. The required clearance in between equipment during installation shall be observed. All equipment and materials not specifically mentioned herein but are necessary for proper erection, assembly and safe operation of the switchyard shall be identified and furnished by the Supplier at no additional cost to NPC.

**EW-6.1 Fuse Disconnect Switch with Lightning Arrester Combination**

This specification covers the supply and delivery of fuse disconnect switch with lightning arrester combination for use in various diesel power plants.

The materials furnished shall be in accordance with, but not limited to, the latest issues of the Applicable Codes and Standards, including all addenda, in effect at time of purchase order unless otherwise stated herein.

**EW-6.1.1 Technical Characteristics and Requirements**

The fuse disconnect switch to be supplied shall be suitable for high voltage transformer acting as an overload protector and a device for opening and closing load current. All the metal parts of the fuse disconnect switch shall be free from erosion and rust.

**Fuse Cut-Out**

Fuse cutouts shall be satisfactory use in a tropical climate with high relative humidity. The cutouts will be mounted by means of steel brackets on steel poles cross arms.

The cutouts are intended for use with button head-type fuse links and must be able to accommodate fuse links meeting the interchangeability requirements of ANSI standard. The cutouts to be supplied shall include the following:

1. Fuse Support Assembly
2. Fuse Holder Assembly
3. Mounting Bracket
4. Lock Washers

**Fuse Link**

The fuse link to be supplied shall be universal button head with tin fuse element suitable for 15 kV open type distribution cut-out to be used in the overcurrent protection of circuits. It is characterized by perfect time current characteristics, high mechanical strength and reliable arc extinguishing performance, etc. The fuse link shall meet the electrical and mechanical interchangeability requirement in accordance with ANSI standard.

**SECTION VI – TECHNICAL SPECIFICATIONS****Lightning Arrester**

Gapless arresters shall have elements fabricated from non-linear resistance metal oxide materials to perform both the surge discharge and power frequency reseal functions.

Arresters of this type shall be protected in a hermetically sealed wet-process jacket, which shall have a high creep age distance and a high dielectric strength.

The primary terminals shall be suitable for the connection of the type and size of conductors specified in the Technical Data Sheets which can be either copper or aluminum conductors without use of bimetal inserts.

The arrester shall be supplied with a cross-arm mounting bracket that conforms with the requirements of NEMA or with appropriate bracket as a cutout arrester combination on it.

All mounting bolts and conductor connection shall be provided with lock washer. Lock washers shall be fabricated from material that complies with the requirements as per ANSI standard.

All exposed steel or iron part of the arrester shall be hot-dipped galvanized in accordance with ASTM standard.

The Supplier shall submit for approval the brochures and/or catalogues with complete technical specification of the fuse cut out with lightning arrester combination including mounting brackets and accessories.

**EW-6.2 Bus Conductor and Hardware**

This specification covers the technical and associated requirements for stranded aluminum bus conductors and line hardware for use in various diesel power plant switchyards.

All line hardware/materials shall meet the performance requirements application criteria and manufacturing tolerances passed ANSI CB5. 1-1979 - America National Standard for Galvanized Steel Bolts and nuts for overhead line construction.

**EW-6.2.1 Technical Characteristics and Requirements**

Describe herein is the general specification of the Bus conductor, line materials and equipment to be supplied for this project.

**Stranded Conductor**

All wires of the stranded conductor shall be concentrically stranded. The wires in each layer shall be evenly and closely stranded around the underlying wire(s). The tension in individual wires in a layer shall be sufficient to hold each wire firmly in place with only enough strand separation to prevent crowding at the time of stranding and during installation. All steel and



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aluminum wires shall lie naturally in their position in the stranded conductor and, when the core and/or the aluminum wires are cut, the wire ends shall remain in position or be readily replaced by hand and then remain approximately in position.

The aluminum shall be of the higher purity commercially obtainable which shall not be less than 99.5%. The type of conductor to be supplied shall be stated in the Technical Data Sheets and shall be manufactured according to the applicable ASTM or equivalent IEC standards.

The completed conductor shall be smooth, free from nick, burrs, aluminum or steel particles, dirt and excessive die grease. The conductor shall be absolutely free of copper dust and copper particles.

**Clamps**

Aluminum strain clamps and suspension clamps for aluminum conductor, if required in the Technical Data Sheets, shall have its clamp bodies and keeper pieces, made of high strength and heat treated cast aluminum alloy. Cotter bolts, U-bolts, nuts, and lock washers shall be hot dip galvanized steel. Cotter pins shall be made of stainless steel. Slip strength of the strain clamp shall be not less than 85% of the rated ultimate strength of the conductor.

**Cross Arms**

The cross arms to be supplied for this project shall be in accordance to ASCE manual 72 "Design of Steel Transmission Pole Structures". The materials shall meet ASTM A-570 specification (36 KSI min. steel strength) while the galvanizing shall be in accordance with ASTM A-123 specification.

**Insulators**

Insulators to be utilized in the project shall be in accordance to ANSI Class 55-3 for pin, Class 52-1 for suspension, Class 53-2 and Class 53-4 for spool standard as to material, ultimate tensile strength, leakage, distance, etc.

**Line Hardware**

Line hardware shall be made either of aluminum alloy, malleable iron or ductile iron with tensile strength in accordance with ANSI standard.

**Bolts**

All bolts such as carriage, double arming, oval, machine, etc. shall be hot dip galvanized as per ASTM A-153.

**EW-7.0****POWER, CONTROL AND INSTRUMENTATION CABLES**

This specification covers the technical and associated requirements of power, control and instrumentation cables, and medium voltage power cable for use in switchyards.

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All cables shall be designed to withstand the short-circuit condition and voltage drop of 3% (max.).

**EW-7.1 Technical Characteristics and Requirements**

The cables to be supplied shall have insulation levels able to withstand any voltage surges which are normally expected to occur in the power system in which the cable is to be used, due to switching operations, sudden load variations, faults, etc. The medium voltage XLPE power cable and the 600V power, control and instrumentation cable to be supplied shall be compliant to ICEA S-66-524 or IEC 60502-2 and UL 83, PNS 35, ICEA S-73-532 specification and requirements of PEC respectively.

The cables shall be selected to withstand without distress any short-circuit currents in the conductor and sheath related to the existing fault levels.

The cables and its accessories shall be manufactured to fulfill the requirements when operating with full load or at any load factor.

**EW-7.1.1 Insulation**

Insulation shall be of the type specified in the Technical Data Sheets.

**EW-7.1.2 Jacket**

A tough, ozone, low chlorine, heat, flame and moisture-resistant PVC or Nylon jacket capable of providing protection against sunlight, acids, alkalis and oils shall be furnished for all cables.

**EW-7.1.3 Assembly**

All multi-conductor cables shall be bundled together with non-hygroscopic fillers to assure a smooth circular assembly. A lapped core binding tape shall be applied over the assembly.

**EW-7.1.4 Application**

All cables shall be suitable for installation in cable tray, conduit, trench, underground duct in wet and dry locations, and above ground raceway in damp and dry locations.

**EW-8.0 GROUNDING SYSTEM**

This specification covers the technical and associated requirements for the entire grounding system of the electric generating plants and/or switchyards, required to protect persons and equipment, to reduce electromagnetic interference (EMI) and to allow safe service and maintenance of the installations. The grounding system includes all major and minor equipment such as generator, transformer, generator control and protection panel, ground rods, motors, pumps, etc. and connections.

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All materials and parts which are not specifically mentioned herein but are necessary for the safety of operating personnel and safe operation of the plant shall be furnished and determined by the Supplier at no additional cost to NPC.

**EW-8.1 Technical Characteristics and Design Requirements****EW-8.1.1 General**

The ruling criteria in the design of the grounding grid shall be the safety of personnel and the proper operation of the electrical equipment during normal operation and during transient disturbances such as short circuits in the electric power system and during lightning discharges.

The Supplier shall carry out earth resistivity measurement for the plant site. Based on the result of this measurement and the system parameter, the appropriate design and the calculation will be determined whether impermissible touch and step voltages occur at any place inside plant area and at any place 10 m. outside of the plant boundary line which may be endangered. These calculations will decide on the provisions for grounding to be made with the relevant part of the civil works related to foundations. If the calculations proved after the application of all engineering possibility that touch and step voltages are still higher than permitted and consequently the Supplier managed to design the earthing and grounding grid in such a way to obtain the lowest touch and step voltage value, all documents including limitation and justification shall be provided to the NPC for approval.

If in case the actual measured resistance of the Supplier-designed and installed ground grid is higher than specified in the Technical Data Sheets, the Supplier shall install, at no extra cost to the NPC, additional grounding rods, mats, grounding electrodes, etc., until the field-measured resistance is equal to or less than the specified value.

The ground grid shall be composed of a system of copper conductors buried approximately 60 cm. beneath the surface of the earth, excluding crushed rock surfacing. Driven ground rods shall be installed at regular intervals and connected to the grounding conductor at grid nodes. A minimum of four (4) of the specified ground rods must be installed (one at each corner of the ground grid). The Supplier shall determine the spacing of ground grid conductors and the total number and location of ground rods and their lengths (single or two or more coupled sections).

**EW-8.2 Equipment and Materials Requirements****EW-8.2.1 Grounding Cables**

Grounding cables shall be copper conductor of soft drawn or hard drawn concentric stranding bare copper conductor in accordance with the latest revision of ASTM B3 and manufactured in accordance with ASTM Specification B8 (class B). The copper conductor shall have the characteristics specified in the Technical Data Sheets.

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The ground rod shall be copper-covered steel of circular cross section, with a nominal diameter of 19 mm and a nominal length of 3 meters.

Each ground rod shall have a conical swaged point at one end and shall have a continuous smooth copper covering of at least 0.254 mm thickness molten-welded or copper bonded (electro-deposit) to a steel core. The copper clad or pressed type will not be accepted

**EW-8.2.3 Exothermic Welding Materials**

The Supplier shall supply exothermic welding materials for cable-to-cable, cable-to-ground rod and cable-to-steel structure grounding connections. The Supplier should submit detailed information describing the proposed process.

**EW-8.2.4 Grounding Hardware****Terminal Lugs**

Terminal lugs shall be one hole, socket type, rounded edge lug, cast of high strength corrosion resistant copper alloy. Machine screws, nuts, and washers used with the lugs shall be bronze.

**EW-8.2.5 Steel Structure Grounding**

All generating plant metal parts such as structures, equipment, cable trays, fence, etc. shall be connected to the ground grid by suitable ground connections.

If there is any possibility for a conductor to fall down on a steel structure, this structure must be connected to the grid with a connection able to sustain the earth fault current.

**EW-8.2.6 Equipment Earthing****Transformer Earthing**

The transformer shall be earthed at two points diagonally opposite each other. These connections shall be made from two different points of the earthing grid.

**Lightning Arrester**

Lightning arresters shall be connected to the earthing grid with 50 mm<sup>2</sup> tin-annealed copper conductor.

**Power Cables**

The lead sheath or armor (shield) of the MV power cables, if to be provided, shall be earthed by connecting a flexible braid to the shield. This shall be

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done at both ends of each cable. Cable end boxes shall be earthed with copper cable connection on one of the mounting bolts.

**Lighting Poles**

Poles for lighting shall be connected to the earthing grid with 22 mm<sup>2</sup> tin-annealed copper conductor (one connection for each pole).

**Other Metallic Structures**

Other types of metal structures within the diesel plant area, not mentioned thereto, shall be connected to the earthing grid.

Major equipment shall be equipped with at least two (2) terminals or suitable grounding pads of adequate size to accommodate at least two fixing screws for proper connection to the earthing system.

**EW-8.2.7 Powerhouse / Building Earthing**

Generally, each electrical device inside the control building/room must be equipped with an earthing screw of sufficient diameter for connection to the earthing system. The same applies to all metallic parts such as panels, etc. which are effectively connected by earth conductors.

Control panels and desks, switchboards, etc. consisting of several individual sections or compartments shall each be connected to a common tinned copper earth bar unless all panels are solidly welded together, or other approved means are applied ensuring solid earthing connections. In such a case, provisions for earthing must be made at one end at least.

**EW-8.2.8 Fence Earthing**

Steel fences around the switchyard or station shall be connected to the earthing system at appropriate connection point along the fence and at all corners and gate posts.

**EW-8.2.9 Pipe Earthing**

All piping shall be earthed at all service points in an approved manner.

The conceptual design of the grounding system based on the specified conditions shall be referred to the bid drawing.

The supply shall include special tools, kits and expandable materials necessary to weld the grid joints and ground rod connections by exothermic process, including reasonable waste to be expected during installations. Standard grounding connectors shall be fixed to metal frames by means of bolted clamps.

**EW-8.2.10 Cable Tray Earthing**

Cable trays and ladders shall be connected to the earthing system.

**SECTION VI – TECHNICAL SPECIFICATIONS****EW-8.2.11 Ground Rods**

Ground rods shall be driven to a depth such that the top of each rod is at the same elevation as the ground grid and shall be bonded to the ground grid conductors by suitable exothermic connections.

**EW-9.0 CONDUIT AND CABLE TRAY SYSTEM**

This specification covers the technical and associated requirements for the supply, laying and installation of conduits and cable trays as required within the plant complex, including associated fittings, accessories (elbows, tees, steps, crossings etc.), supporting racks and brackets and all hardware.

Included in the scope is the supply and embedment of concrete inserts for supporting cable tray brackets on walls and provision of openings and recesses in walls and floor concrete inserts.

All materials and parts which are not specifically mentioned herein but are necessary for the proper laying and installation of conduits and cable trays shall be furnished at no additional cost to NPC.

**EW-9.1 Technical Requirements and Characteristics**

The conduits and cable tray system shall conform to the material and fabrication requirements of the specification. All miscellaneous materials required for proper installation shall include but are not limited to, the following:

1. Plug and fillers, coupling and bends;
2. Spacers, inserts and ties for conduits;
3. Conduit splicing solvent and connector material for uPVC conduit, if uPVC conduits are used;
4. Fire barriers, duct and conduit sealant; and
5. Cable tray brackets, anchor bolts or expansion bolts, hangers, lock washers, shims, etc.

Conduit and cable tray edges shall be reamed and smoothen to avoid damage to cable outer sheath during cable installation. The conduits and cable trays shall have the following characteristics:

1. High mechanical strength
2. Corrosion resistant
3. Heat resistant

**Conduits**

All embedded and concealed in ceiling conduits, boxes and fitting required for the power and control cables including all necessary hardware and accessories such as screws, bolts, concrete inserts, clamps, locknuts, couplings shall be furnished by the Supplier. The required quantities of various items of conduits and associated materials shall be furnished in accordance with the installation requirements.

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During installation, due precaution shall be taken to protect the conduit and threads from mechanical injury. The ends of the conduit shall be sealed in an approved manner. Conduit runs shall be sealed by the use of caps and discs or plugs. The seals shall be maintained, except during inspection and tests, until the conductor is pulled in. Conduit shall be checked to be free from obstructions by pulling a wooden mandrel of appropriate size through the conduit.

Conduits running in floors and terminating at motors or other equipment mounted on concrete bases shall be brought up to the equipment within the concrete bases, wherever possible.

All joints between lengths of conduits and threaded connection to boxes, fittings and equipment enclosures shall be made watertight.

Conduits installed outdoors running underground shall be buried to a minimum of 0.457 m.

**Metallic Conduits (If specified)**

Rigid metallic conduits shall be hot-dipped galvanized. The inside of the conduit shall have stove enamelled coating to prevent erosion and assure smooth wire pulling.

Metal fittings and cover shall have the same property and finish as that of the metallic conduits.

Rigid metal expansion joints, where required, shall be of standard manufactured product, of watertight construction, equipped with approved means to provide electrical continuity of the conduit runs, zinc-coated, and so designed as to prevent damage to the cables. They shall permit a small amount of transverse movement as well as the longitudinal movement.

**Non-Metallic Conduits**

Where non-metallic conduits are allowed to be used by NPC, it shall be made of unplasticized polyvinyl chloride (uPVC) smooth walled inside and outside, coloured red-orange, schedule 40.

The uPVC conduits shall be non-corrosive and weatherproof, resistant to the attacks of acids and alkalis and must have a self-extinguishing property, hence shall not support combustion. It shall resist corrosion, rust and scale.

**Cable Trays**

The Supplier shall furnish and install cable trays, supports and accessories for the use of power and control cables as shown on the bid drawing. All necessary hardware such as screws, bolts, concrete inserts, clamps, supports, fittings and divider strips for the cable trays shall be included.

The cable trays shall be hot-dipped galvanized steel, ladder rung type proper for laying installation and shall be manufactured based on the bid drawing.

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Before fabrication, the Supplier shall submit all fabrication and installation details for NPC approval.

The cable tray system shall be supported at intervals not exceeding 1.5 meters unless specifically approved for supports at greater interval.

Cable trays, accessories and fittings shall be free of any rough edges or sharp projections, which would cause damage to cables.

Cable trays other than solid bottom trays shall be designed to accept cable clamping devices and cable barriers without drilling or welding.

Tray design shall provide for inter-changeability of like parts and easy assemblage of the system without the use of special tools.

Cable tray covers shall be solid. The preferred cover-fastening device shall require no drilling of the cable tray for installation. Cable tray covers shall be attached to the tray with a heavy duty device to permit easy removal and replacement. The cover and cover clamp shall be equally suitable for vertical and horizontal runs.

Connector plates shall be high pressure rigid plate types, connected by ribbed-neck; case hardened plated steel bolts with flanged serrated locknuts, locknut with serrated washer or locknut with captive washer. Design shall provide for undiminished structural strength of the connection. Hardware for use with expansion plates may be different to allow for movement of the tray.

Cable tray shall be electrically continuous and shall be effectively grounded.

Completed cable tray systems shall be rigid and have all components firmly bolted and in good electrical contact with the ground grid.

Cable tray supports shall be of heavy-duty reinforced type, hot-dip galvanized steel, suitably sized to accommodate the tray system, cables and live loads normally experienced during cable installation. The maximum deflection between two consecutive supports shall not exceed 7.5 mm for ladder type trays.

The steel channel inside the cable trench where power cables will be laid shall be installed at every three (3) meters interval.

**EW-10.0 FACTORY ASSEMBLY AND TESTS****EW-10.1 General**

The Supplier shall carry out at his own expenses all tests necessary to ensure the satisfactory design and manufacture of all equipment is in accordance with relevant ANSI and IEC standard.

All parts shall be properly marked for ease of assembly in the field. Test report on design and routine tests performed in accordance with ANSI or IEC standard shall be submitted to NPC for evaluation and approval.



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The test equipment, test method, measurements and computations shall be in accordance with the latest applicable requirements of ANSI and IEC standard.

**EW-10.2 Shop Test**

Routine, design, quality and conformance test and other necessary tests shall be performed in accordance with ANSI Standard or equivalent IEC Standard. Design tests is required if the equipment is manufacturer's new design or previous design with significant design changes. In this case, certified test report of duplicated production type is acceptable.

The test methods, measurements and computation shall be in accordance with the latest applicable requirements of ANSI and IEC standard and shall be submitted for NPC's approval.

**EW-10.3 Other Requirements**

The Supplier shall submit the following Factory Test Results:

**Generator and Transformer**

1. Duly Certified Factory Type Test Results
2. Duly Certified Factory Routine Test Results

**Power, Control and Instrumentation Cable**

For Power, Control and Instrumentation Cable to be supplied other than those type specified in the PEC, the Supplier shall submit the following:

1. Routine Test Results per IEC or equivalent UL standard
2. Manufacturer's Track Record
3. Brochure with cable ampacity rating including correction factor at 40°C.

**EW-11.0 OTHER SITE REQUIREMENTS****EW-11.1 Job Site Cameras**

This specification covers the supply, delivery and installation of job site cameras for the use in the monitoring and documentation of construction of diesel power plants.

The materials furnished shall be in accordance with, but not limited to, the latest issues of the Applicable Codes and Standards, including all addenda, in effect at time of purchase order unless otherwise stated herein.

**EW-11.2 Technical Characteristics**

The job site cameras to be supplied shall be DC supply operated and battery-operated cameras. It shall be designed to monitor the construction of diesel power plants and access areas for a routine documentation.

**SECTION VI – TECHNICAL SPECIFICATIONS**

Job site cameras must be installed before works shall be done in the sites. Placement/ location of cameras shall be approved by NPC.

The Supplier shall define the focusing ranges and allowable minimum distance in accordance with the layout at site.

In normal operation, the job site camera provides monitoring of the construction sites. For full coverage of the cameras, the job site cameras shall be installed in an elevated area within the site while is out of reach of the construction equipment. It shall include supports and mounting poles (if required) for the ease of the installation.

The job site cameras must have the functionality and adaptability in the construction site. It shall have at least 100% reliability without affecting the implementation.

The Supplier shall ensure that the job site cameras they supply, functions correctly and safely. In principle, the installation shall follow that latest modern engineering practice, ensure optimum functionality of supply and ensure the safety of the construction staff.

Job site cameras shall be subject to the approval of NPC.

All job site cameras shall meet the technical requirements in the specifications. It shall have a dust proof and weather resistant protective enclosure complying with the technical requirements.

**EW-11.3 Technical Requirements**

a. Type	:	Time-Lapse Camera
b. Quantity	:	As specified in the SOR
c. Control Display	:	Thin-Film-Transistor (TFT) Liquid Crystal Display (LCD)
d. Image Sensor Resolution	:	At least 1.3 Megapixel CMOS
e. View Angle	:	At least 110 degrees
f. Still Image Resolution	:	1280 x 720
g. Time Lapse Interval	:	Every 15 minutes/ User-programmable
h. Battery Type	:	Standard AA or AAA Size Alkaline Batteries
i. Battery Life	:	At least 120 days of image recording
j. Additional Batteries (Spare)	:	Required
k. Enclosure	:	IP64 compliant

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l. Storage Memory	:	SDHC
m. Storage Capacity	:	32 GB
n. Additional Storage (Spare)	:	At least Two (2) 32GB SDHC Storage

When the installation of the job site cameras is completed, the operation and safekeeping shall be turnover to NPC.

The Supplier shall provide sufficient number of spare alkaline batteries to operate the construction cameras through the entire contract duration. In case of contract extension, the required additional batteries shall also be provided until contract completion at no additional cost to NPC.

#### **EW-12.0 DATA AND DOCUMENTATION REQUIREMENTS**

Supplier-furnished data and information shall be guaranteed performance data, predicted performance, interface requirements and construction features of all Supplier's furnished equipment. The accuracy of such information and its compatibility with overall performance requirements specified by NPC are the sole responsibility of the Supplier.

##### **EW-12.1 Data and Information to be Submitted with the Proposal**

Supplier shall furnish with his proposal the filled-in Section E-1.0 and E-2.0 of the Technical Data Sheets.

All information submitted would become part of contract data for successful bidder. Any deviation from such data during the implementation stage requires NPC's approval.

##### **EW-12.2 Data and Information to be Submitted During Post Qualification**

Supplier shall furnish during the post qualification the filled-in Section E-3.0 to E-8.0 of the Technical Data Sheets.

Filled-out data by the Supplier shall only serve as reference by NPC for the review and approval of brochures/drawings during implementation stage.

##### **EW-12.3 Data and Information to be Submitted During Implementation**

The following shall be the full technical data requirement of equipment indicated in Section E-1.0 to E-8.0 of the Technical Data Sheets which shall be submitted by the Supplier together with Manufacturer's brochure/drawings during the Implementation stage.

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## 1.0 AC GENERATOR

Item	Description	NPC Requirements	Supplier's Data
<b>AC Generator</b>			
E-1.1	Manufacturer	By Supplier	
E-1.2	Place of Manufacture	By Supplier	
E-1.3	Generator Model	By Supplier	
E-1.4	Type	Rotating Field Synchronous AC Generator, PMG Type with AVR	
E-1.5	Minimum Rated Power Output at 0.8 Power Factor, kW	120 & 90	
E-1.6	Duty/ Operation	Continuous	
E-1.7	Overload Capability	10% of rated power output	
E-1.8	Rated Voltage, V	480	
E-1.9	Frequency, Hz	60	
E-1.10	No. of Phase	3	
E-1.11	Winding Pitch	2/3	
E-1.12	Rated Speed	1800	
E-1.13	Insulation Class	Class H shall be used for both the armature and field windings	
E-1.14	Temperature Rise	Class F at rated load	
E-1.15	Generator Winding Connection	Wye connection with neutral	
E-1.16	Number of Leads	6	
E-1.17	No. of Pole	By Supplier	
E-1.18	No. of Bearing	By Supplier	
E-1.19	Allowable Voltage Variations	At the rated kVA, frequency, voltage and power factor, the generator can operate satisfactorily though the terminal voltage may vary at $\pm 5.0\%$ of rated value	
E-1.20	Winding Temperature Detector	Required	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
E-1.21	Space Heater	Required	
E-1.22	Efficiency		
	a. 100% Load	$\geq 85\%$	
	b. 75% Load	Manufacturer's Data	
E-1.23	Guaranteed Losses at 100% rated kVA at 0.8 PF	Manufacturer's Data	
E-1.24	Guaranteed Losses at 75% rated kVA at 0.8 PF	Manufacturer's Data	
E-1.25	Damper Winding	To be provided	
E-1.26	Telephone Interference	THF is better than 2%	
E-1.27	Radio Interference	Equipped with RFI suppression	
E-1.28	Designed to withstand a momentary excess current of 1.5 times of rated current for not less than 2 min.	Yes	
E-1.29	Over speed	1.2 times the rated speed for 2 min.	
E-1.30	Overload Capacity and Duration	10%, for max of 1 hr. in every 12 hrs.	
E-1.31	Cooling System	Totally Enclosed air cooled	
E-1.32	Protection Class	IP 23	
E-1.33	Sustained Short Circuit Capability	Yes	
<b>Excitation System</b>			
E-1.34	Type	Brushless, Separately Excited, Permanent Magnetic Generator (PMG) or equivalent	
<b>Automatic Voltage Regulator (AVR)</b>			
E-1.35	Manufacturer	By Supplier	
E-1.36	Place of Manufacture	By Supplier	
E-1.37	Model	By Supplier	
E-1.38	Type	Digital	
	a. Capable for Parallel Operation	Yes	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
E-1.39	Input Requirements	Manufacturer's Data	
E-1.40	Continuous Output	Manufacturer's Data	
E-1.41	Regulation, %	$\pm 0.5\%$ in steady state with rapid response time	
E-1.42	Response Time, ms	Manufacturer's Data	
E-1.43	Test Requirement		
	a. Routine Test to be Performed	Yes	
	b. Certified Design and Routine Test Reports to be submitted	Yes	

## 2.0 GENERATOR TRANSFORMER

Item	Description	NPC Requirements	Supplier's Data
E-2.1	Manufacturer	By Supplier	
E-2.2	Place of Manufacture	By Supplier	
E-2.3	Transformer Model	By Supplier	
E-2.4	Minimum Rated Capacity, kVA	150 & 112.5	
E-2.5	No. of Phase	3	
E-2.6	Rated Voltage		
	a. Primary, kV	0.48	
	b. Secondary, kV	13.8	
E-2.7	Transformer Guaranteed Losses at Rated kVA, Voltage, Frequency and Temperature		
	a. No-Load Losses, Watts	By Supplier	
	b. Load Losses, Watts	By Supplier	
	c. Total Losses (a+b), Watts	By Supplier	
E-2.8	Type of Cooling	ONAN	
E-2.9	Type	Two-winding Transformer	
E-2.10	Class	Outdoor	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
E-2.11	Percent Overload, %	10	
E-2.12	Type of Overload Capability	In accordance to IEC 60354 normal cyclic loading	
E-2.13	Temperature		
	a. Ambient Temperature	40°C	
	b. Temperature Rise	65 °C	
E-2.14	Neutral	Solidly ground	
E-2.15	Winding Connections		
	a. H-Winding	Wye with Neutral	
	b. X-Winding	Delta	
E-2.16	Insulation Level		
E-2.17	Nominal Voltage Level (kV)		
	a. H-Winding	13.8	
	b. X-Winding	0.48	
E-2.18	Highest Voltage Level (kV)		
	a. H-Winding	15	
	b. X-Winding	1.2	
E-2.19	Basic Impulse Level (kV)		
	a. H-Winding	95	
	b. X-Winding	30	
E-2.20	Winding Material	100% Copper	
E-2.21	Vector Group	YNd11	
E-2.22	% Impedance at Rated MVA	Manufacturer's Data	
E-2.23	Average Audio Sound Level not more than, dB when measure in at the factory in accordance with (specify applied standard)	Refer to Table specified under TS-EW-5.3.8 (ANSI/IEEE C57.12.90 or IEC 60076-10)	
E-2.24	Short Circuit Capability	In accordance to ANSI C57.12-2000	
E-2.25	Bushing		
	High Voltage and Neutral Terminal		

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
	a. Rated Current	To match VA rating plus overload	
	b. Insulation Class	15	
	c. BIL in kV	110	
	d. Standard Used	IEC 60137	
	e. Creepage length, mm	465	
	f. Color	Brown	
E-2.26	Cooling		
	a. Cooling Medium	Air and Oil	
	b. Temperature		
	b.1 Temperature of cooling air, not to exceed	40°C	
	b.2 Average temperature of the cooling air	30°C	
E-2.27	Temperature Indicator		
	a. Supply of dial type winding temperature indicator mounted on the transformer for top oil and hot spot temperature	Yes	
E-2.28	Sudden Pressure Relay	Required	
E-2.29	Taps	13.8 kV $\pm$ 2x2.5%	
E-2.30	Transformer Protection	As shown on the Single Line Diagram	
E-2.31	Insulating Oil		
	a. Insulating Oil shall be mineral oil in accordance with ASTM D3487	Yes	
	b. Additional Properties		
	b.1 Min. Flash Point, °C (ASTM D92)	145	
	b.2 Pour point, max °C (not higher than	-40	
	b.3 Kinematic, Viscosity at 40°C	Max. 12	



**SECTION VI – TECHNICAL SPECIFICATIONS**

Item	Description	NPC Requirements	Supplier's Data
	b.4 Elect. Breakdown limit (IEC 60156)	Min. 30	
	c. Polychlorinated Biphenyls (PCBs) free	Yes	
	d. Oil Test Results shall be submitted to NPC (PCB analysis and Electrical & Physical Test)	Yes	
E-2.32	Weight of Oil, kg	Manufacturer's Data	
E-2.33	Total Weight, kg	Manufacturer's Data	
E-2.34	Dimension	Manufacturer's Data	
E-2.35	Ground Terminal Connection	Suitable for 100 mm <sup>2</sup> copper conductor	
E-2.36	Test Requirements		
	a. Certified Design and Routine Test Reports to be submitted	Yes	
	b. Routine Tests to be Performed	Yes	

**3.0 GENERATOR CONTROL AND PROTECTION PANEL**

Item	Description	NPC Requirements	Supplier's Data
E-3.1	Manufacturer	By Supplier	
E-3.2	Each GCPP to be supplied shall be equipped with metering, status, alarm and trip indication light, synchronizing devices, protection relays as shown on the bid drawing	Yes	
E-3.3	Class (indoor, outdoor)	Indoor	
E-3.4	Generator Circuit Breaker		
	a. Manufacturer	By Supplier	
	b. Model	By Supplier	
	c. Continuous Current Rating	Refer to Single Line Diagram	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
	d. Construction	Molded Case Circuit Breaker	
	e. Type	Compact with Electronic Trip Unit and remote control functions	
	f. Symmetrical Current	Refer to Single Line Diagram	
E-3.5	Enclosure Details		
	a. Protection Class	IP 44	
	b. Metal Steel Sheet Thickness, mm	2	
	c. Cable Entrance	Refer to Bid Drawing	
	d. Dimension (L X W X H), mm	Refer to Bid Drawing	
	e. Weight, kg	Manufacturer's Data	
	f. All materials are non-hygroscopic to prevent fungus growth	Yes	
	g. The GCPP shall be provided w/ nameplate	Yes	
	h. An outline drawing showing details of the GCPP enclosure including its components as shown on the bid drawing shall be furnished by the Supplier for approval of NPC	Yes	
E-3.6	Programmable Logic Controller	Included	
E-3.7	Metering System		
	The metering device to be provided shall consist of the following:	Yes	
	a. Ammeter	Included	
	b. Voltmeter	Included	
	c. Watt-Hour meter	Included	
	d. Power Factor Meter	Included	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
	e. Frequency	Included	
	f. kW	Included	
	g. kVAR	Included	
	h. Running Hour meter	Included	
	i. Alternator Winding Temperature	Included	
	j. Other engine metering required as specified in Mechanical Specifications	Included	
E-3.8	Monitoring System		
	a. An Annunciator Window with Common Audio Alarm & Trip indication for:		
	a.1. Monitoring of abnormal conditions during operation of the system including generator & transformer protective devices	Included	
	a.2. Detection of alternator winding temperature	Included	
	b. Data Logger and Event Recorder	Included	
	c. User Programmable Fault Reports	Included	
	d. PLC Failure, Circuit Breaker Status (On, OFF, Trip), Engine Start/Stop, etc.	Yes	
	e. Other engine monitoring required in M.2k of the MW-TDS shall be included in the GCPP	Yes	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
E-3.9	Synchronizing System		
	a. Synchronizing device for Auto and manual synchronization	Yes	
	b. GCPP shall be equipped with protection relays to provide signal and alarm to protect the D/G set from damage during fault	Yes	
E-3.10	The Supplier shall provide all the required Generator Protection devices for the all the D/G set ratings as shown on the Single Line diagram	Yes	
E-3.11	Test Requirement		
	a. Routine Test to be Performed	Yes	
	b. Certified Routine Test Reports to be Submitted	Yes	

## 4.0 POWER, CONTROL &amp; INSTRUMENTATION CABLE

Item	Description	NPC Requirements	Supplier's Data
<b>15kV Power Cable</b>			
E-4.1	Manufacturer	By Supplier	
E-4.2	Continuous current carrying capacity of conductor at 90°C Operating Temperature	Manufacturer's Data	
E-4.3	Conductor Cross-Section, mm <sup>2</sup>	Refer to Single Line Diagram	
E-4.4	Type of cable	Single Core	
E-4.5	Conductor Material	Annealed Copper	
E-4.6	Max. Outside Diameter, mm	Manufacturer's Data	
E-4.7	Conductor Shape	Circular Stranded Wire	
E-4.8	Conductor Material	Annealed Copper	

## SECTION VI – TECHNICAL SPECIFICATIONS

Item	Description	NPC Requirements	Supplier's Data
E-4.9	Insulation		
	a. Material	Cross-linked polyethylene (XLPE)	
	b. Thickness, mm	$\geq 4.0$	
E-4.10	Outer covering/Jacket		
	a. Material	PVC Sheath Jacketing	
	b. Thickness, mm	Manufacturer's Data	
	c. Termite Protection Required	Yes	
E-4.11	Shielded (yes, no)	Yes	
	a. Type of Shielding	Copper Tape Screen	
E-4.12	Provided with Filler and Binder Tape	Yes	
<b>600V Power, Instrumentation and Control Cable</b>			
E-4.13	Manufacturer	By Supplier	
E-4.14	Type		
	a. Power	THHN/THWN-2	
	b. Control & Instrumentation	Royal Cord	
E-4.15	Continuous current carrying capacity of conductor at 75°C Operating Temperature		
	a. THHN/THWN-2	Refer to Single Line Diagram	
	b. Royal Cord	By Supplier	
E-4.16	Conductor Material	Annealed Copper	
E-4.17	Conductor Shape	Circular Stranded Conductors	
E-4.18	Type of Insulation	Lead Free, UL-listed PVC	
E-4.19	Outer covering/Jacket	Oil, Chemical and Abrasion Resistant Tough Polyamide (Nylon)	
E-4.20	Meets ASTM, UL 83 & 1063, and PNS 35 Specifications and requirements of PEC	Yes	

## SECTION VI – TECHNICAL SPECIFICATIONS

## 5.0 BUS CONDUCTOR AND HARDWARE

Item	Description	NPC Requirements	Supplier's Data
<b>Stranded Conductor Requirements</b>			
E-5.1	Manufacturer	By Supplier	
E-5.2	Type designation	Aluminum Conductor Steel Reinforced (ACSR)	
E-5.3	Code Name	By Supplier	
E-5.4	Conductor size	Refer to Single Line Diagram	
E-5.5	Voltage Rating, kV	15	
E-5.6	Ampacity, A	270	
E-5.7	Outer Layers		
	a. Material	Aluminum	
	b. Stranding No.	6	
	c. Calculated Cross-sectional Area, mm <sup>2</sup>	Manufacturer's Data	
	d. Coefficient of Elongation (°C)	Manufacturer's Data	
E-5.8	Core		
	a. Material	Galvanized Steel	
	b. Stranding No.	1	
	c. Calculated Cross-sectional Area, mm <sup>2</sup>	Manufacturer's Data	
	d. Coefficient of Elongation (°C)	Manufacturer's Data	
E-5.9	Conductor Coefficient of Linear Expansion (°C)	Manufacturer's Data	
<b>Conductor Hardware</b>			
E-5.10	Tension Clamp		
	a. Type	Bolted, U-Bolt	
	b. Material of Body	Aluminum Alloy	
E-5.11	Connectors		
	a. Type	Wedge pressure clamp for stranded conductor connection	
	b. Angle and T-connectors type	Wedge pressure clamp for stranded conductor connection	

## SECTION VI – TECHNICAL SPECIFICATIONS

**6.0 GROUNDING SYSTEM**

Item	Description	NPC Requirements	Supplier's Data
<b>Grounding Grid Design Criteria</b>			
E-6.1	Fault duration, sec.	3	
E-6.2	Total fault level (line to ground), kA	8	
E-6.3	Ground mat design resistance	5 Ohms (max.)	
E-6.4	Grounding connection	Exothermic	
E-6.5	Permissible temperature rise of grid copper conductor, °C	300	
E-6.6	Grid conductor		
	a. Manufacturer	By Supplier	
	b. Minimum Size, mm <sup>2</sup>	100	
	c. Material	tin-annealed copper stranded conductor (bare)	
E-6.7	Burial depth of grid conductor below finished grade, m	0.6	
<b>Equipment Grounding</b>			
E-6.8	Bonding Conductor (riser)		
	a. Manufacturer	By Supplier	
	b. Size, mm <sup>2</sup>	100, 50 & 22	
	c. Material	Tin-annealed copper stranded conductor with 1.2kV PVC insulation	
E-6.9	Ground Rod		
	a. Manufacturer	By Supplier	
	b. Type	Copper Rod	
	c. Diameter, mm	≥ 19 mm	
	d. Length/section, m	≥ 3 m	

## SECTION VI – TECHNICAL SPECIFICATIONS

**7.0 FUSE DISCONNECT SWITCH WITH LIGHTNING ARRESTER  
COMBINATION**

Item	Description	NPC Requirements	Supplier's Data
E-7.1	Manufacturer	By Supplier	
E-7.2	Class (indoor, outdoor)	Outdoor	
E-7.3	Rated voltage, kV	15	
E-7.4	Nominal system voltage, kV	13.8	
E-7.5	Frequency, Hz	60	
E-7.6	BIL, kV	110	
E-7.7	Ampere Frame	100	
E-7.8	Interrupting Capacity, kA	10	
E-7.9	Fuse Link		
	a. Type	Universal button head design	
	b. Current Rating, A	Refer to Single Line Diagram	
E-7.10	Lightning Arrester		
	a. Type	Metal Oxide Varistor (MOV), Gapless	
	b. Rated frequency, Hz	60	
	c. Nominal system voltage, kV	13.8	
	d. Duty cycle voltage (rating), kVrms	12	
	e. Maximum Continuous Operating Voltage (MCOV), for the arresters having the following duty cycle voltage, kVrms	10.2	
	f. Nominal discharge current, kA	10	
	g. Creepage distance, mm	465	
	h. Supporting brackets, bolts, nuts, etc.	Yes	



## SECTION VI – TECHNICAL SPECIFICATIONS

**8.0 JOB SITE CAMERAS**

Item	Description	NPC Requirements	Supplier's Data
E-8.1	Manufacturer	By Supplier	
E-8.2	Type	Time-Lapse Camera	
E-8.3	Quantity	As specified in the SOR/BOQ	
E-8.4	Control Display	Thin-Film-Transistor (TFT) Liquid Crystal Display (LCD)	
E-8.5	Image Sensor Resolution	At least 1.3 Megapixel CMOS	
E-8.6	View Angle	At least 110 degrees viewing angle	
E-8.7	Still Image Resolution	1280 x 720	
E-8.8	Time Lapse Interval	Every 15 minutes/ User-programmable	
E-8.9	Battery Type	Standard AA or AAA Size Alkaline Batteries	
E-8.10	Battery Life	At least 120 days of image recording	
E-8.11	Additional Battery (Spare)	Required	
E-8.12	Enclosure	IP64 compliant	
E-8.13	Storage Memory	SDHC	
E-8.14	Storage Capacity	32GB	
E-8.15	Additional Storage (Spare)	At least Two (2) 32GB SDHC Storage	

**EW-13.0 MEASUREMENT OF PAYMENT**

Measurement of payment for all electrical works shall be based on the bid price of each item as shown in the Schedule of Requirements – Electrical Works, Section VII of the Tender Documents. The cost of each item shall cover all works required and described in the pertinent provisions of the specifications.

## **SECTION VI TECHNICAL SPECIFICATIONS**

### **PART II – TECHNICAL DATA SHEETS**

## SECTION VI – TECHNICAL SPECIFICATIONS

**PART II – TECHNICAL DATA SHEETS****MW – MECHANICAL WORKS****TABLE OF CONTENTS**

SECTION	DESCRIPTION	PAGE
<b>DOCUMENTS TO BE SUBMITTED DURING BID OPENING</b>		
<b>M-1.0</b>	<b>Diesel Generating Set and Associated Equipment Data Summary</b>	<b>VI-TDS(MW)-4</b>
<b>M-2.0</b>	<b>Fuel Consumption Form for Diesel Generating Set</b>	<b>VI-TDS(MW)-6</b>
<b>Annex A.1</b>	<b>Letter of Authorization and Guarantee Statement either from: 1) Original Equipment Manufacturer (OEM) or 2) Licensee/Agreement from OEM as a Licensee or 3) Authorized Distributor/Dealer (accompanied by a Certificate of Authorized Distributorship/Dealership from the OEM/Licensee of the OEM). If from the Licensee, a Certification from the OEM as a Licensee or the Licensee agreement must also be submitted), for the Diesel Generating Sets.</b>	<b>Attachment As Annex A.1</b>
<b>Annex A.2</b>	<b>“Diesel Generating Set (Engine + AC Generator) Performance Curve” @ Reference Site Conditions issued by the Manufacturer/Assembler/Integrator (duly signed with full name) of the Diesel Generating Set Model/Type being offered</b>	<b>Attachment As Annex A.2</b>
<b>Annex A.3</b>	<b>“Engine Performance Curve” @ Reference Site Conditions issued by the Diesel Engine Manufacturer or Diesel Generating Set Manufacturer/Assembler/Integrator (duly signed with full name) for the Diesel Engine Model/Type being offered</b>	<b>Attachment As Annex A.3</b>
<b>DOCUMENTS TO BE SUBMITTED DURING POST QUALIFICATION BUT NOT LIMITED TO:</b>		
<b>M-3.0</b>	<b>Diesel Engine</b>	<b>VI-TDS(MW)-8</b>
<b>M-4.0</b>	<b>Spare Parts</b>	<b>VI-TDS(MW)-9</b>
<b>M-4.1</b>	<b>Spare Parts per Unit of 120 kW DG Set During the Warranty Period</b>	<b>VI-TDS(MW)-9</b>
<b>M-4.2</b>	<b>Spare Parts per Unit of 90 kW DG Set During the Warranty Period</b>	<b>VI-TDS(MW)-10</b>
<b>M-4.3</b>	<b>Spare Parts per Total Units of 120 kW DG Sets Supplied and to be Delivered at Tagubanhon DPP</b>	<b>VI-TDS(MW)-11</b>
<b>M-4.4</b>	<b>Spare Parts per Total Units of 90 kW DG Sets Supplied and to be Delivered at Tagubanhon DPP</b>	<b>VI-TDS(MW)-12</b>
<b>M-5.0</b>	<b>Standard/Special Tools</b>	<b>VI-TDS(MW)-13</b>
<b>M-5.1</b>	<b>Standard/Special Tools per Total Units of 120 kW and 90 kW DG Sets to be Supplied and Delivered at Tagubanhon DPP</b>	<b>VI-TDS(MW)-13</b>

## SECTION VI – TECHNICAL SPECIFICATIONS

**TABLE OF CONTENTS (Cont'd.....)**

SECTION	DESCRIPTION	PAGE
<b>DOCUMENTS TO BE SUBMITTED DURING PROJECT IMPLEMENTATION BUT NOT LIMITED TO:</b>		
<b>M-6.0</b>	<b>ISO 9001 Certificate of the Manufacturer/Assembler/Integrator or equivalent for each of the Diesel Generating Set</b>	
<b>M-7.0</b>	<b>Standard Certification of the proposed offered model of Diesel Generating Set from any of the following internationally recognized certifying body/organization:</b> a) Canadian Standard Association (CSA) b) Underwriter's Laboratories (UL) c) Japanese Industrial Standards (JIS) d) European Commission (CE) e) Lloyd's Register (LR) f) Germanischer Lloyd (GL) g) Nippon Kaiji Kyokai (NKK) h) American Bureau of Shipping (ABS)	
<b>M-8.0</b>	<b>Power Derate Curves and Details or Certificate/Statement from Diesel Generating Set's Manufacturer/Assembler/ Integrator that the proposed Diesel Engine-Generator Set have no deration at Reference Site Conditions.</b>	
<b>M-9.0</b>	<b>Manufacturer/Assembler/Integrator's General Data, Catalogue and Brochures of model/type of equipment offered and published as standard products for the DG Set which contain the following information:</b>  <ul style="list-style-type: none"> <li>▪ Manufacturer/Assembler</li> <li>▪ Model/Type</li> <li>▪ Prime Rated Power</li> <li>▪ Voltage</li> <li>▪ Frequency</li> <li>▪ Power Factor</li> <li>▪ Rated Speed</li> <li>▪ Arrangement &amp; Number of Cylinders</li> </ul>	
<b>M-10.0</b>	<b>Technical Data for Engine and Auxiliaries</b>	See Attached Forms on page VI-TDS(MW)-16
<b>M-11.0</b>	<b>Supplier/Manufacturer/Assembler Drawings, Brochures, Instruction Manuals and other Documents as specified in Clause GW-6.3 and other relevant Clauses of the Technical Specifications</b>	
<b>M-12.0</b>	<b>Photos of Nameplates (DG Set, Engine and Alternator) – Submit 5 months prior to Test &amp; Commissioning</b>	
<b>M-13.0</b>	<b>Serial Nos. of DG Set, Engine and Alternator – Submit 5 months prior to Test &amp; Commissioning</b>	

**PART II – TECHNICAL DATA SHEETS****MW – MECHANICAL WORKS****DOCUMENTS TO BE SUBMITTED DURING THE BID OPENING**  
**(Sections M-1.0, M-2.0, Annexes A.1, A.2 & A.3)****NOTES**

1. The Bidder shall complete this technical data sheet and submit the filled-up forms with the technical proposal. The Bidder shall use additional sheets as necessary for any other additional information following the format shown herein or by reproducing the same.
2. The data required are technical features and characteristics of the Equipment to be provided by the bidder. Bidder's proposal shall at least be equal or superior to the requirements specified by NPC.
3. Deviation from the requirements indicated in the technical data sheets M-1.0, M-2.0 and non-submission of the required documents listed as Annexes A.1, A.2 and A.3 shall be ground for disqualification.
4. All data and information shall be in English language.

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Name & Signature of Representative

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-1.0 DIESEL GENERATING (DG) SET AND ASSOCIATED  
EQUIPMENT DATA SUMMARY**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
M-1.1	DG Set (Diesel Engine + AC Generator) – PRIME DUTY *	Designed, manufactured & tested in compliance with the latest version of the standards* listed below, mounted on heavy duty steel baseframe with anti-vibration pads contained in a sound attenuated & weatherproof enclosure	
M-1.2	Manufacturer/Assembler/Integrator of DG Set being offered	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-1.3	Brand Name of DG Set being offered	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-1.4	Model of DG Set being offered	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-1.5	DG Set Manufacturer/Assembler/ Integrator Experience, Year	5 (Minimum)	<u>120kW:</u> <u>90kW:</u>
M-1.6	DG Set Guaranteed Prime Rated Power at Reference Site Conditions* & 0.8 Power Factor, kW	120 (min.) & 90 (min.)	<u>120kW:</u> <u>90kW:</u>
M-1.7	D/G set Guaranteed Fuel Rate at Required D/G Set Prime Power Output and at Reference Site Conditions, 100 % Rated Load, li/kW-hr	<u>120kW:</u> 0.30 (maximum) <u>90kW:</u> 0.32 (maximum)	<u>120kW:</u> <u>90kW:</u>
M-1.8	Voltage, V	480 (± 5%)	
M-1.9	Power factor	0.80 (min.)	
M-1.10	Frequency, Hz	60	
M-1.11	No. of Phases, Ø	3	
M-1.12	Rated Speed, RPM	1800	
M-1.13	Governor	Electronic	
M-1.14	Arrangement & Number of Cylinders	In-line & Multi-cylinder	
M-1.15	Factory Acceptance Test	Yes	

NOTES: 1. \* IEC 60034, IEC 60085, IEC60529, ISO 9001 and ISO 3046

2. Guaranteed Fuel Consumption which is more than the specified maximum value will be ground for rejection of the equipment being offered.

3. Experience less than what is required will be ground for rejection of the equipment being offered.

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-1.0 DIESEL GENERATING (DG) SET AND ASSOCIATED  
EQUIPMENT DATA SUMMARY**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
M-1.16	Maximum Sound Pressure Level @ 1-meter distance, dBA	85	<u>120kW:</u> <u>90kW:</u>
M-1.17	Maximum Permissible NOx, mg/Nm <sup>3</sup>	2000 as NO <sub>2</sub>	<u>120kW:</u> <u>90kW:</u>
M-1.18	Maximum Permissible Sox, mg/Nm <sup>3</sup>	700 as SO <sub>2</sub>	<u>120kW:</u> <u>90kW:</u>
M-1.19	Maximum Permissible CO, mg/Nm <sup>3</sup>	500 as CO	<u>120kW:</u> <u>90kW:</u>
M-1.20	Particulates, mg/Nm <sup>3</sup>	200	<u>120kW:</u> <u>90kW:</u>
M-1.1.21	"Diesel Generating Set (Engine + AC Generator) Performance Curve" @ Reference Site Conditions issued by the Manufacturer/Assembler/Integrator (duly signed with full name) of the Diesel Generating Set Model/Type being offered	To be Submitted/Attachment as Annex A.2	
M-1.2	Diesel Engine		
M-1.2.1	Manufacturer	By Supplier	
M-1.2.2	Manufacturer's Experience, years	10	
M-1.2.3	Place of Manufacture	By Supplier	
M-1.2.4	Brand Name of Diesel Engine being offered	By Supplier	
M-1.2.5	Model/Type	By Supplier	
M-1.2.6	Engine Prime Brake Power Output at Reference Site Conditions, kWm or BHP	By Supplier	
M-1.2.7	"Engine Performance Curve" @ Reference Site Conditions issued by the Diesel Engine Manufacturer or Diesel Generating Set Manufacturer/Assembler/Integrator (duly signed with full name) for the Diesel Engine Model/Type being offered	To be Submitted/Attachment as Annex A.3	

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**M-2.0 – FUEL CONSUMPTION FOR DIESEL GENERATING (DG) SET**

<b>A</b>	<b>B**</b>	<b>C</b>	<b>D*</b>	<b>E</b>
DG Set Guaranteed Prime Rated Power at Reference Site Conditions (Minimum KW)	DG Set Guaranteed Fuel Rate at Required Prime Rated Power & at Reference Site Conditions (liters/kilowatt-hour)	Cost of Fuel (PhP/Ltr)	No. of operating hours per year (hrs)	1-Year Cost of Fuel Consumption, (A x B x C x D) (PhP)
120		75.02	3,427	
90		75.02	3,427	

**NOTES:** \* *For evaluation Purposes: The estimated number of operating hours per year is based on 16 hrs/day operation, 25 days PMS, 10% Outages and assumed 70% Utilization Factor.*

\*\* *Write the Guaranteed Fuel Rate in three decimal places, i.e. 0.270 L/kW-hr. If Fuel Rate is indicated in more than three decimal places, only the first three decimal numbers will be considered regardless of any number written in the fourth decimal number.*

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**PART II – TECHNICAL DATA SHEETS****MW – MECHANICAL WORKS****DOCUMENTS TO BE SUBMITTED DURING POST-QUALIFICATION  
BUT NOT LIMITED TO:****(Sections M-3.0 to M-5.1)****NOTES**

1. The Bidder shall complete this technical data sheet and submit the filled-up forms during the post-qualification which shall only serve as reference for the review and approval of brochure/drawings during implementation stage. The Bidder shall use additional sheets as necessary for any other additional information following the format shown herein or by reproducing the same.
2. The data required are technical features and characteristics of the Equipment to be provided by the bidder which shall at least be equal or superior to the requirements specified by NPC.
3. The lists of Spares and Tools (Items M-4.1 to M-5.1) are preliminary and subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard).

The Bidder shall indicate "N/A" to the respective items in the said lists (Items M-4.1 to M-5.1) if found not applicable to the brand/model of the proposed equipment. However, NPC reserves the right to request the Supplier to provide the same or its equivalent if it is determined as "deemed necessary or standard tool/inherent part or optional item" during the evaluation, checking and review/approval of the final lists to be submitted by the Supplier during the Contract Stage at no cost to NPC.

4. Non submission of the above documents shall be a ground for disqualifications.

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-3.0 DIESEL ENGINE**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER's DATA
<b>M-3.1</b>	<b>DIESEL ENGINE</b>		
M-3.1.1	Manufacturer	By Supplier	
M-3.1.2	Manufacturer's Experience, yr.	10	
M-3.1.3	Place of Manufacture	By Supplier	
M-3.1.4	Model/Type	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.5	Engine Prime Rated Brake Power at Reference Site Conditions, kWm or BHP	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.6	Number of Cylinders	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.7	Bore and Stroke, mm	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.8	Piston Displacement, L	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.9	Piston Speed, m/s	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.10	Engine Mean Effective Pressure, kg/cm <sup>2</sup>	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.11	Compression Ratio	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.12	Overall Dimension of Complete Unit, L x W x H, mxmxm	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.13	Maximum Weight of DG Set on Skid, kg	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-3.1.14	Heat Dissipation (Diesel Engine + AC Generator), kJ/hr	By Supplier	<u>120kW:</u> <u>90kW:</u>

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-4.0 SPARE PARTS****M-4.1 SPARE PARTS PER UNIT OF 120 KW DG SET DURING THE WARRANTY PERIOD** (Minimum Requirements as Specified in the Technical Specifications and Manufacturer's Standard and Recommended Spare Parts) \*

ITEM	DESCRIPTION	PART NO.	MINIMUM QTY.**	SUPPLIER'S DATA
M-4.1a	Air Filter Element		6 pcs/size	
M-4.1b	Lube Oil Filter Element		30 pcs/size	
M-4.1c	Fuel Filter Element		15 pcs/size	
M-4.1d	Water Filter Element		6 pcs/size	
M-4.1e	Fan Belt		3 pcs/size	
M-4.1f	Alternator Belt		3 pcs/size	
M-4.1g	Coolant		4 gallons	
M-4.1h	Expected spares to be consumed during the performance test		1 lot	
M-4.1i	Other spare parts recommended by Manufacturer		1 lot	
M-4.1i.1				
M-4.1i.2				
M-4.1i.3				
M-4.1i.4				
M-4.1i.5				
M-4.1i.6				
M-4.1i.7				
M-4.1i.8				
M-4.1i.9				
M-4.1i.10				

**NOTES:**

\* *The above list is preliminary which is subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard). NOTE #3 of page VI-TDS (MW)-7.*

\*\* *Quantities may be increased depending on manufacturer's required replacement intervals.*

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-4.2 SPARE PARTS PER UNIT OF 90 KW DG SET DURING THE WARRANTY PERIOD** (Minimum Requirements as Specified in the Technical Specifications and Manufacturer's Standard and Recommended Spare Parts) \*

ITEM	DESCRIPTION	PART NO.	MINIMUM QTY.**	SUPPLIER'S DATA
M-4.2a	Air Filter Element		6 pcs/size	
M-4.2b	Lube Oil Filter Element		30 pcs/size	
M-4.2c	Fuel Filter Element		15 pcs/size	
M-4.2d	Water Filter Element		6 pcs/size	
M-4.2e	Fan Belt		3 pcs/size	
M-4.2f	Alternator Belt		3 pcs/size	
M-4.2g	Coolant		4 gallons	
M-4.2h	Expected spares to be consumed during the performance test		1 lot	
M-4.2i	Other spare parts recommended by Manufacturer		1 lot	
M-4.2i.1				
M-4.2i.2				
M-4.2i.3				
M-4.2i.4				
M-4.2i.5				
M-4.2i.6				
M-4.2i.7				
M-4.2i.8				
M-4.2i.9				
M-4.2i.10				

**NOTES:**

\* *The above list is preliminary which is subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard). NOTE #3 of page VI-TDS (MW)-7.*

\*\* *Quantities may be increased depending on manufacturer's required replacement intervals.*

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-4.3 SPARE PARTS PER TOTAL UNITS OF 120 KW DG SET  
SUPPLIED AND DELIVERED AT TAGUBANHAN DPP \***

ITEM	DESCRIPTION	PART NO.	MINIMUM QUANTITY**	SUPPLIER'S DATA
M-4.3a	Fuel Injector Assembly		2 pcs	
M-4.3b	Top Overhauling Kit		1 set	
M-4.3c	Actuator		1 set	
M-4.3d	Jacket Water Pump Repair Kit		1 set	
M-4.3e	Lube Oil Pump Repair Kit		1 set	
M-4.3f	Fan Adaptor & Accessories including Bearings		2 sets	
M-4.3g	Rocker Gear Cover Gasket		12 pcs	
M-4.3h	Thermostat		1 set	
M-4.3i	Lube Oil Pump Switch		1 set	
M-4.3j	Hot Water Temp. Switch		1 set	
M-4.3k	Turbocharger Repair Kit		1 set	
M-4.3l	Exhaust Manifold Bellow		1 set	
M-4.3m	Magnetic Pick-up		1 pc	
M-4.3n	Other spare parts recommended by Manufacturer		1 Lot	
M-4.3n.1				
M-4.3n.2				
M-4.3n.3				
M-4.3n.4				
M-4.3n.5				

**NOTES:**

\* *The list is preliminary which is subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard).  
NOTE #3 of page VI-TDS (MW)-7.*

\*\* *Quantities may be increased depending on manufacturer's required replacement intervals.*

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-4.4 SPARE PARTS PER TOTAL UNITS OF 90 KW DG SET  
SUPPLIED AND DELIVERED AT TAGUBANHAN DPP \***

ITEM	DESCRIPTION	PART NO.	MINIMUM QUANTITY**	SUPPLIER'S DATA
M-4.4a	Fuel Injector Assembly		2 pcs	
M-4.4b	Top Overhauling Kit		1 set	
M-4.4c	Actuator		1 set	
M-4.4d	Jacket Water Pump Repair Kit		1 set	
M-4.4e	Lube Oil Pump Repair Kit		1 set	
M-4.4f	Fan Adaptor & Accessories including Bearings		2 sets	
M-4.4g	Rocker Gear Cover Gasket		12 pcs	
M-4.4h	Thermostat		1 set	
M-4.4i	Lube Oil Pump Switch		1 set	
M-4.4j	Hot Water Temp. Switch		1 set	
M-4.4k	Turbocharger Repair Kit		1 set	
M-4.4l	Exhaust Manifold Bellow		1 set	
M-4.4m	Magnetic Pick-up		1 pc	
M-4.4n	Other spare parts recommended by Manufacturer		1 Lot	
M-4.4n.1				
M-4.4n.2				
M-4.4n.3				
M-4.4n.4				
M-4.4n.5				

**NOTES:**

\* *The list is preliminary which is subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard).  
NOTE #3 of page VI-TDS (MW)-7.*

\*\* *Quantities may be increased depending on manufacturer's required replacement intervals.*

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**M-5.0 STANDARD/SPECIAL TOOLS****M-5.1 STANDARD/SPECIAL TOOLS PER TOTAL UNITS OF 120 KW  
AND 90 KW DG SET SUPPLIED AND DELIVERED AT  
TAGUBANHAN DPP (Minimum Requirements as Specified in the  
Technical Specifications and Manufacturer's Standard/Recommended Tools)<sup>+</sup>**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
M-5.1a	Portable computer (Minimum of Intel I7 Processor, 16GB (1x16GB) DDR4 2666 MHZ, 256 GB PCIe NVMe SSD + 1 TB SATA 5400RPM 2.5" INCH, 13"-15.6" screen size & with the latest pre-installed windows operating system compatible with manufacturer's/or Supplier's software) needed in programming the genset control setting (complete with licensed CD-ROM drive dongles of genset control system) and electronic/digital governing system including other digital components that require exclusive programs from the Manufacturer and/or Supplier with free update throughout the operating life of the genset	1 set	
M-5.1b	Other tools recommended by the Manufacturer	1 lot	

**NOTES: +** Minimum requirements but the Supplier shall provide/include in the list all the necessary/standard tools required in the performance of normal maintenance and overhaul. The above list is preliminary which is subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard). Refer also to NOTE #3 of page VI-TDS (MW)-7.

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**PART II – TECHNICAL DATA SHEETS****MW – MECHANICAL WORKS****DOCUMENTS TO BE SUBMITTED DURING THE PROJECT  
IMPLEMENTATION BUT NOT LIMITED TO:****(Sections M-6.0, M-7.0, M-8.0, M-9.0, M-10.0 & M-13.0)****NOTES**

1. The Bidder shall complete this technical data sheet/documents and submit the filled-up forms during the project implementation (during contract stage). The Bidder shall use additional sheets as necessary for any other additional information following to the format shown herein or by reproducing the same.
2. The data required are technical features and characteristics of the Equipment to be provided by the bidder. Bidder's proposal shall at least be equal or superior to the requirements specified by NPC. The data provided shall be used as basis for evaluation of brochures, drawings and other documents to be submitted for review and approval during the project implementation.
3. All data and information shall be in English language.

<b>DOCUMENTS TO BE SUBMITTED DURING PROJECT IMPLEMENTATION BUT NOT LIMITED TO:</b>		
<b>SECTION</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
M-6.0	<b>ISO 9001 Certificate of the Manufacturer/Assembler/Integrator or equivalent for each of the Diesel Generating Set</b>	
M-7.0	<b>Standard Certification of the proposed offered model Diesel Generating Set</b> from any of the following internationally recognized certifying body/organization: <ul style="list-style-type: none"> <li>a) Canadian Standard Association (CSA)</li> <li>b) Underwriter's Laboratories (UL)</li> <li>c) Japanese Industrial Standards (JIS)</li> <li>d) European Commission (CE)</li> <li>e) Lloyd's Register (LR)</li> <li>f) Germanischer Lloyd (GL)</li> <li>g) Nippon Kaiji Kyokai (NKK)</li> <li>h) American Bureau of Shipping (ABS)</li> </ul>	
M-8.0	<b>Power Derate Curves and Details or Certificate/Statement from Diesel Generating Set Manufacturer/Assembler/ Integrator that the proposed Diesel Engine-Generator Set have no deration at Reference Site Conditions.</b>	

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## SECTION VI – TECHNICAL SPECIFICATIONS

<b>DOCUMENTS TO BE SUBMITTED DURING PROJECT IMPLEMENTATION BUT NOT LIMITED TO:</b>		
<b>SECTION</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
M-9.0	<b>Manufacturer/Assembler/Integrator's General Data, Catalogue and Brochures of model/type of equipment offered and published as standard products for the DG Set which contain the following information:</b> <ul style="list-style-type: none"> <li>▪ Manufacturer/Assembler</li> <li>▪ Model/Type</li> <li>▪ Prime Rated Power</li> <li>▪ Voltage</li> <li>▪ Frequency</li> <li>▪ Power Factor</li> <li>▪ Rated Speed</li> <li>▪ Arrangement &amp; Number of Cylinders</li> </ul>	
M-10.0	<b>Technical Data for Engine and Auxiliaries</b>	See Attached Forms on page VI-TDS(MW)-16
M-11.0	<b>Supplier/Manufacturer/Assembler Drawings, Brochures, Instruction Manuals and other Documents as specified in Clause GW-6.3 and other relevant Clauses of the Technical Specifications</b>	
M-12.0	<b>Photos of Nameplates (DG Set, Engine and Alternator) – Submit 5 months prior to Test &amp; Commissioning</b>	
M-13.0	<b>Serial Nos. of DG Set, Engine and Alternator – Submit 5 months prior to Test &amp; Commissioning</b>	

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-10.0 DIESEL ENGINE AND AUXILIARIES**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
<b>M-10.1</b>	<b>DIESEL ENGINE</b>		
M-10.1.1	Number of Strokes	4	
M-10.1.2	Rotating Direction (Viewed from Flywheel Side)	By Supplier	
M-10.1.3	Required Time from Starting Signal to Rated Speed, min.	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.4	Maximum Time from "Cold Condition" to Rated Speed w/ Load and w/o AC power available for motor-driven auxiliaries, min.	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.5	Idling Speed Recommended, RPM	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.6	Duration of Idling (max.), min.	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.7	Minimum Load @ Normal Speed, kW	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.8	Maximum Load @ Normal Speed, kW	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.9	Engine Heat Dissipation, kJ/hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.10	Engine Mechanical Efficiency, $\eta_m$	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.1.11	Numerical Values for Power Adjustment Parameters (Exponents) for high speed per Table 2 of ISO 3046,	By Supplier	<u>120kW:</u> a= m= n= s= <u>90kW:</u> a= m= n= s=
M-10.1.12	Expected Useful Life of Unit @ Prime Rated Power Load, Yrs.	10	
M-10.1.13	<b>Diesel Engine + AC Generator (DG Set)</b>		
a.	Fuel Rate at Required Prime Rated Power and Reference Site Conditions		
	▪ 75 % Rated Load, li/kW-hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
	▪ 50 % Rated Load, li/kW-hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
	▪ 25 % Rated Load, li/kW-hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
b.	Heaviest Part for Maintenance, kg	By Supplier	<u>120kW:</u> <u>90kW:</u>

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-10.0 DIESEL ENGINE (Cont'd.....)**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
<b>M-10.2</b>	<b>LUBRICATING OIL SYSTEM</b>		
M-10.2.1	Total Lube Oil System Capacity, liters	By Supplier	120kW: 90kW:
M-10.2.2	Lube Oil Consumption of the Engine, g/kWhr	By Supplier	120kW: 90kW:
M-10.2.3	Lube Oil Pump Capacity, m <sup>3</sup> /hr	By Supplier	120kW: 90kW:
M-10.2.4	Lube Oil Filter Mesh, microns	By Supplier	120kW: 90kW:
M-10.2.5	Lube Oil Filter Type & Capacity,	Spin-On Full Flow	120kW: 90kW:
M-10.2.6	Lube Oil Priming Pump Capacity, if applicable, m <sup>3</sup> /hr	By Supplier	120kW: 90kW:
<b>M-10.3</b>	<b>STARTING SYSTEM</b>		
M-10.3.1	Battery Capacity, AH	By Supplier	120kW: 90kW:
M-10.3.2	Starting Voltage, V	24 or 12	120kW: 90kW:
M-10.3.3	Starting Motor Rating, HP	By Supplier	120kW: 90kW:
M-10.3.4	Full Load Cranking Current, A	By Supplier	
M-10.3.5	Battery Charging Type,	By Supplier	
M-10.3.6	Battery Charger Charging rate	By Supplier	
M-10.3.7	Time of Cranking, sec	30	
<b>M-10.4</b>	<b>EXHAUST SYSTEM</b>		
M-10.4.1	Exhaust Gas Flow, m <sup>3</sup> /hr	By Supplier	120kW: 90kW:
M-10.4.2	Exhaust Gas Temperature, °C	By Supplier	120kW: 90kW:
M-10.4.3	Maximum Allowable Back Pressure, mmH <sub>2</sub> O	By Supplier	120kW: 90kW:
M-10.4.4	Exhaust Pipe (nom. Diameter x length x weight), mm x mm x kg	By Supplier	120kW: 90kW:
M-10.4.5	Silencer (nom. Diameter x length x weight), mm x mm x kg	By Supplier	120kW: 90kW:
M-10.4.6	Exhaust Pipe Material, ASTM	A 106 or as required	120kW: 90kW:
M-10.4.7	Silencer Material, ASTM	A 106 or as required	120kW: 90kW:

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-10.0 DIESEL ENGINE (Cont'd.....)**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
<b>M-10.5</b>	<b>INTAKE AIR SYSTEM</b>		
M-10.5.1	Air Intake Valve (Free Air), m <sup>3</sup> /hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.5.2	Air Filter Type	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.5.3	Turbocharger Type	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.5.4	Turbocharger RPM	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.5.5	Charge Air Cooler Type	By Supplier	<u>120kW:</u> <u>90kW:</u>
<b>M-10.6</b>	<b>COOLING SYSTEM (Coolant for initial filling shall be provided by Supplier per Engine)</b>		
M-10.6.1	Total Cooling Water Capacity, Liters	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.2	Cooling Water Pump Capacity, m <sup>3</sup> /hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.3	Jacket Water Pump Capacity, m <sup>3</sup> /hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.4	Radiator Fan Air Flow, m <sup>3</sup> /hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.5	Core Material	Aluminum	<u>120kW:</u> <u>90kW:</u>
M-10.6.6	Radiated Heat to Ambient, kW/hr	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.7	Expansion Tank Capacity and Elevation, if applicable, liters and m.	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.8	Radiator Dimensions (l x w x h), m x m x m	By Supplier	<u>120kW:</u> <u>90kW:</u>
M-10.6.9	Recommended cooling water properties such as ph, hardness, TDS, etc., ASTM		<u>120kW:</u> <u>90kW:</u>
	PH Value, ppm	By Supplier	
	Total Hardness	By Supplier	
	TDS, ppm	By Supplier	
	Chloride	By Supplier	
	Sulfate, ppm	By Supplier	
	Silica, mg/l	By Supplier	
	Iron, ppm	By Supplier	
	Conductivity, uS/cm	By Supplier	

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-10.0 DIESEL ENGINE (Cont'd.....)**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER'S DATA
<b>M-10.7</b>	<b>FUEL SYSTEM</b>		
M-10.7.1	Fuel Feed Pump Capacity, m <sup>3</sup> /hr	By Supplier	120kW: 90kW:
M-10.7.2	Discharge Head of Feed Pump, m	By Supplier	120kW: 90kW:
M-10.7.3	Fuel Filter Type and Mesh, microns	Spin-On Full Flow	
M-10.7.4	Injection Nozzle Type	By Supplier	
M-10.7.5	Fuel Day Tank Capacity, m <sup>3</sup>	1	
M-10.7.6	Fuel Day Tank Type (Elevated)	Rectangular or Approved Shape	
M-10.7.7	Fuel Tank Dimensions (W x L x H), m x m x m	Per Drawings	
M-10.7.8	Fuel Tank Plate Material, ASTM	A 36	
M-10.7.9	Fuel Tank Shell Thickness, mm	5	
M-10.7.10	Structural Steel Supports	Included	
<b>M-10.8</b>	<b>ENCLOSURE (Weatherproof)</b>		
M-10.8.1	Manufacturer	By Supplier	
M-10.8.2	Max. Sound Pressure Level @ 1-m distance, dBA	85	
M-10.8.3	Dimensions (L x W x H), m x m x m	By Supplier	
M-10.8.4	Enclosure Walls Thickness, mm	2 minimum	
M-10.8.5	Enclosure Roof Thickness, mm	2 minimum	
M-10.8.6	Enclosure Material, ASTM	A 36	
M-10.8.7	Hinges Material	Stainless Steel	
M-10.8.8	Insulation Materials	Oil-water resistant and fire retardant insulation and sound attenuating material	
M-10.8.9	Total Weight (DG Set, Auxiliaries and Enclosure), kg	By Supplier	

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## SECTION VI – TECHNICAL SPECIFICATIONS

**M-10.0 DIESEL ENGINE (Cont'd.....)**

ITEM	DESCRIPTION	NPC REQUIREMENT	SUPPLIER's DATA
<b>M-10.9</b>	<b>ENGINE METERING AND INDICATION</b>		
M-10.9.1	RPM Meter (RPM) *	Included	
M-10.9.2	Hours Run Counter (hours) *	Included	
M-10.9.3	Oil Pressure (kg/cm <sup>2</sup> )*	Included	
M-10.9.4	Oil Temperature (°C) *	Included	
M-10.9.5	Cooling Water Temp. (°C) *	Included	
M-10.9.6	Cylinders Exhaust Gas Temperature (°C)	Optional	
M-10.9.7	Battery Voltage (V)	Included	
M-10.9.8	Ready to Start	Included	
M-10.9.9	Remote Control Position Indication	Included	
<b>M-10.10</b>	<b>ENGINE PROTECTION AND ALARM</b>		
M-10.10.1	Engine Overspeed	Included	
M-10.10.2	Lube Oil Pressure Low	Included	
M-10.10.3	Lube Oil Temperature High	Included	
M-10.10.4	Cooling Water Temp. High	Included	
M-10.10.5	Cooling Water Temp. Low	Optional	
M-10.10.6	Fuel Day Tank Level High	Included	
M-10.10.7	Fuel Day Tank Level Low	Included	
M-10.10.8	Battery Voltage High	Included	
M-10.10.9	Battery Voltage Low	Included	
M-10.10.10	Failure to Crank	Included	
M-10.10.11	Overcrank	Included	
M-10.10.12	Annunciator Window with Common Audio alarm	Included	
<b>M-10.11</b>	<b>HUMAN MACHINE INTERFACE CONTROL</b>		
M-10.11.1	Manual Start/Stop *	Included	
M-10.11.2	Auto/Remote Start	Included	
M-10.11.3	Test Run Auto	Included	
M-10.11.4	Emergency Stop *	Included	
M-10.11.5	Alpha/Numeric Screen	Included	
M-10.11.6	Discrete Status Indicators	Included	
M-10.11.7	Fault Reset	Included	

**NOTE:** \* These monitoring/control points shall also be provided at DG set Enclosure-mounted panel with viewing window

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**PART II – TECHNICAL DATA SHEETS****EW- ELECTRICAL WORKS****TABLE OF CONTENTS**

<b>SECTION</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
	<b>DOCUMENTS TO BE SUBMITTED DURING BID OPENING</b>	<b>III-TDS(EW)-1</b>
E-1.0	AC Generator	III-TDS(EW)-2
E-2.0	Generator Transformer	III-TDS(EW)-2
	<b>DOCUMENTS TO BE SUBMITTED DURING POST QUALIFICATION but not limited to: (Reference for the Approval of Manufacturer's Brochures/Drawings)</b>	<b>III-TDS(EW)-4</b>
E-3.0	Generator Control and Protection Panel	III-TDS(EW)-5
E-4.0	Power, Control and Instrumentation Cables	III-TDS(EW)-5
E-5.0	Bus Conductor	III-TDS(EW)-6
E-6.0	Grounding System	III-TDS(EW)-6
E-7.0	Fuse Disconnect Switch with Lightning Arrester Combination	III-TDS(EW)-7
E-8.0	Spare Parts	III-TDS(EW)-7

## PART II

### TECHNICAL DATA SHEETS

#### EW – Electrical Works

#### Section E-1.0 – E-2.0

##### Documents to be Submitted during the Bid Opening

1. The following Technical Data Sheets shall be filled-out and to be submitted with the Bid Proposal.
2. Deviation from the requirements indicated in the Technical Data Sheets shall be ground for disqualification.
3. Full technical data of the equipment are indicated in the Technical Specifications (EW-12.3) which will be submitted during the implementation stage for review and approval.

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**SECTION VI – TECHNICAL SPECIFICATIONS****E-1.0 AC GENERATOR**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-1.1	Manufacturer	By Supplier	
E-1.2	Place of Manufacture	By Supplier	
E-1.3	Generator Model	By Supplier	
E-1.4	Type	Rotating Field Synchronous AC Generator, PMG Type with AVR	
E-1.5	Minimum Rated Power Output at 0.8 Power Factor, kW	120 & 90	
E-1.6	Duty/ Operation	Continuous	
E-1.7	Overload Capability	10% of rated power output	
E-1.8	Rated Voltage, V	480	
E-1.9	Frequency, Hz	60	
E-1.10	No. of Phase	3	
E-1.11	Winding Pitch	2/3	
E-1.12	Rated Speed	1800	
E-1.13	Insulation Class	Class H shall be used for both the armature and field windings	
E-1.14	Temperature Rise	Class F at rated load	

**E-2.0 GENERATOR TRANSFORMER**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-2.1	Manufacturer	By Supplier	
E-2.2	Place of Manufacture	By Supplier	
E-2.3	Transformer Model	By Supplier	
E-2.4	Minimum Rated Capacity, kVA	150 & 112.5	
E-2.5	No. of Phase	3	

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## SECTION VI – TECHNICAL SPECIFICATIONS

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ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-2.6	Rated Voltage		
	a. Primary, kV	0.48	
	b. Secondary, kV	13.8	
E-2.7	Transformer Guaranteed Losses at Rated kVA, Voltage, Frequency and Temperature		
	a. No-Load Losses, Watts	By Supplier	
	b. Load Losses, Watts	By Supplier	
	c. Total Losses (a+b), Watts	By Supplier	

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**PART II****TECHNICAL DATA SHEETS****EW – Electrical Works****Section E-3.0 – E-8.0**

**Documents to be Submitted during the Post Qualification  
but not limited to:  
(Reference for the Approval of Manufacturer's Brochures/Drawings)**

1. The following shall be filled-out and to be submitted during the post qualification.
2. Filled-out data by the Supplier shall only serve as reference for the review and approval of brochures/drawings during implementation stage.
3. Full technical data of the equipment are indicated in the Technical Specifications (EW-12.3) which will be submitted during the implementation stage for review and approval.
4. Non-submission of the documents shall be ground for disqualification.

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## SECTION VI – TECHNICAL SPECIFICATIONS

**E-3.0 GENERATOR CONTROL & PROTECTION PANEL**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-3.1	Manufacturer	By Supplier	
E-3.2	Generator Circuit Breaker	Molded Case	
	a. Manufacturer	By Supplier	
	b. Model	By Supplier	
	c. Continuous Current Rating	Refer to Single Line Diagram	

**E-4.0 POWER, CONTROL & INSTRUMENTATION CABLE**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
<b>15kV Power Cable</b>			
E-4.1	Manufacturer	By Supplier	
E-4.2	Continuous current carrying capacity of conductor at 90°C Operating Temperature	Manufacturer's Data	
E-4.3	Conductor Cross-Section, mm <sup>2</sup>	Refer to Single Line Diagram	
E-4.4	Conductor Material	Annealed Copper	
E-4.5	Insulation Material	Cross-linked polyethylene (XLPE)	
<b>600V Power, Instrumentation and Control Cable</b>			
E-4.6	Manufacturer	By Supplier	
E-4.7	Type		
	a. Power	THHN/THWN-2	
	b. Control & Instrumentation	Royal Cord	
E-4.8	Continuous current carrying capacity of conductor at 75°C Operating Temperature		
	a. THHN/THWN-2	Refer to Single Line Diagram	
	b. Royal Cord	By Supplier	
E-4.9	Conductor Material	Annealed Copper	

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**E-5.0 BUS CONDUCTOR**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-5.1	Manufacturer	By Supplier	
E-5.2	Type designation	Aluminum Conductor Steel Reinforced (ACSR)	
E-5.3	Conductor size	Refer to Single Line Diagram	
E-5.4	Ampacity, A	270	

**E-6.0 GROUNDING SYSTEM**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-6.1	Grounding connection	Exothermic	
E-6.2	Permissible temperature rise of grid copper conductor, °C	300	
E-6.3	Grid conductor		
	a. Manufacturer	By Supplier	
	b. Minimum Size, mm <sup>2</sup>	100	
	c. Material	tin-annealed copper stranded conductor (bare)	
E-6.4	Bonding Conductor		
	a. Manufacturer	By Supplier	
	b. Size, mm <sup>2</sup>	100, 50 & 22	
	c. Material	tin-annealed copper stranded conductor with 1.2 kV PVC Insulation	
E-6.5	Copper Ground Rod		
	a. Manufacturer	By Supplier	
	b. Diameter, mm	≥ 19 mm	
	c. Length/section, m	≥ 3 m	

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SECTION VI – TECHNICAL SPECIFICATIONS

**E-7.0 FUSE DISCONNECT SWITCH WITH LIGHTNING ARRESTER COMBINATION**

ITEM	DESCRIPTION	NPC REQUIREMENTS	SUPPLIER'S DATA
E-7.1	Manufacturer	By Supplier	
E-7.2	Rated voltage, kV	15	
E-7.3	Frequency, Hz	60	
E-7.4	BIL, kV	110	
E-7.5	Ampere Frame	100	
E-7.6	Interrupting Capacity, kA	10	
E-7.7	Fuse Link		
	a. Type	Universal button head design	
	b. Current Rating, A	Refer to Single Line Diagram	
E-7.8	Lightning Arrester		
	a. Type	Metal Oxide Varistor (MOV), gapless	

**E-8.0 SPARE PARTS**

ITEM	DESCRIPTION <sup>3</sup>	QTY. <sup>1</sup>	UNIT PRICE	TOTAL PRICE <sup>2</sup>
E-8.1	Generator Circuit Breaker for Generator Control & Protection Panel	One Set for each Genset Rating		
E-8.2				
E-8.3				
E-8.4				
E-8.5				
E-8.6				
E-8.7				
E-8.8				

Name of Firm

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## SECTION VI – TECHNICAL SPECIFICATIONS

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ITEM	DESCRIPTION <sup>3</sup>	QTY. <sup>1</sup>	UNIT PRICE	TOTAL PRICE <sup>2</sup>
E-8.9				
E-8.10				

## Note:

1. Minimum requirements but the Supplier may increase the specified quantity if found not sufficient. Additional spares consumed and/or required for any repairs/replacement during the warranty period shall be provided by the Supplier at no cost to NPC.
2. Indicated Price shall be used for reference in future purchase orders.
3. The above list is preliminary which is subject to changes to conform with the final design and model/brand of the proposed equipment (per manufacturer's standard).

Name of Firm

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## **SECTION VII**

# **BID PRICE SCHEDULE (Schedule of Requirements)**



## SECTION VI - SCHEDULE OF REQUIREMENTS

**SECTION IV - SCHEDULE OF REQUIREMENTS  
(BID PRICE SCHEDULE)****BPS.1 - SUMMARY****SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2 X 90 KW MODULAR DIESEL GENSETS AND  
ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP**

ITEM NO.	PARTICULARS	TOTAL AMOUNT IN FIGURES		TOTAL PESO EQUIVALENT
		Foreign Currency	Phil. Peso	Phil. Peso
A.	Generating Set/s			
B.	Transformer/s			
C.	Other Mechanical Works			
D.	Other Electrical Works			
E.	Civil and Architectural Works			
F.	Spare Parts			
G.	Miscellaneous Works			
<b>TOTAL AMOUNT</b>				

**Notes:** Final delivery site of all equipment/materials shall be at the respective plant sites stated above

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 Name of Firm

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# SECTION IV - SCHEDULE OF REQUIREMENTS (BID PRICE SCHEDULE)

## BPS.2 - Breakdown of Prices

### 1 x 120 KW AND 2 X 90 KW TAGUBANHAN DIESEL POWER PLANT

TA 120 KW AND 2 X 90 KW TAGUBANHAN DIESEL POWER PLANT													
Item No.	Description of Work or Materials	QTY.- UNIT	C O D E	UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM ABROAD				UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM WITHIN THE PHILIPPINES			TOTAL PRICE		
				Unit Price of Goods or Services Foreign Currency ( ) <sup>***</sup>	Import Duties & other Levies Imposed by Phil. Govt. (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Port to Delivery Site (Phil. Peso)	Unit Price of Goods or Services (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Plant to Delivery Site (Phil. Peso)	Forex Currency (E x C)	Local Currency Portion (Phil. Peso) ((F+G+H) x C) or ((I+J+K) x C)	
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	
GENERATING SET(S)													
A.1	120 kW Prime Power Output Modular Diesel Generating set, 1800 RPM, in-line multi-cylinder, 480 V, 3-phase 60 hertz, equipped with turbocharger, air to air charge air cooler, electronic governor, direct fuel injection sound attenuated and weatherproof enclosure and complete with associated auxiliary equipment for lubricating system, engine cooling system, intake air and exhaust gas system, fuel oil supply system, starting system, controls and protection devices, instruction manuals including installation works & alignment and other accessories as described in the technical specifications.	1 Set											
A.2	90 kW Prime Power Output Modular Diesel Generating set, 1800 RPM, in-line Type multi-cylinder, 480 V, 3-phase, 60 hertz, equipped with turbocharger, air to air charge air cooler, electronic governor, direct fuel injection, sound attenuated and weatherproof enclosure and complete with associated auxiliary equipment for lubricating system, engine cooling system, intake air and exhaust gas system, fuel oil supply system that include starting system, controls and protection devices (generator Control & protection panel, auxiliary motor control, monitoring & protection equipment & its accessories), instruction manuals and other accessories as described in the technical specifications.	2 Sets											
SUB-TOTAL A													
(Amount in Words)													
POWER TRANSFORMER(S)													
B.1	150 kVA Generator Transformer, 480V/13.8kV, 3-phase, 60 Hz complete with the required accessories protection relays, grounding materials and other appurtenances as described in the Technical Specifications Technical Data Sheet and as shown on the Bid Drawings including installation works.	1 Set											
B.2	112.5 kVA Generator Transformer, 480V/13.8kV, 3-phase, 60 Hz complete with the required accessories protection relays, grounding materials and other appurtenances as described in the Technical Specifications Technical Data Sheet and as shown on the Bid Drawings including installation works.	2 Sets											
SUB-TOTAL B													
(Amount in Words)													
OTHER MECHANICAL WORKS													
C.1.0	Fuel oil, lubricating oil, lubricants, coolant, chemicals and other consumables required during the initial filling, start-up, pre-test and pre-commissioning including fuel oil to be used during a re-test or performance test as described in Clause GW-9.6 of the technical specifications.	1 Lot											
C.2.0	Fuel Oil Supply/Domestic Water Supply Storage and Transfer System												
C.2.1	Day Tank, 1000 liters capacity complete with manhole, inlet and outlet nozzle, nozzles for vent, overflow, drain and level gauge/switch complete with fittings connections including flexible hoses and other accessories as required in the technical specifications.	3 Sets											
C.2.2	Pipe, fittings, supports, valves and other accessories for interconnection of the supplied equipment including required excavation and backfilling works as described in the technical specifications and shown on the bid drawings:												
a	Fuel supply fitting to the separate/elevated fuel day tanks complete with accessories, and interconnection piping to/from the generating sets incl. strainers, etc.	1 lot											
b	Interconnection of water supply to radiators and pre-fabricated control room from the domestic water source												
b.1	Water Pipe, 25 mm O.D. (20 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories - 12 fm												
b.2	Water Pipe, 20 mm O.D. (15 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories - 8 fm	1 lot											
b.3	Gate Valve, 20 mm Ø, cast bronze, screwed ends, rising stem, Class 150 - 1pc												
b.4	Gate Valve, 15 mm Ø, cast bronze, screwed ends, rising stem, Class 150 - 3pcs												
c	Waste oil discharge to the oil-water separator.												
d	Smoke stack/pipe, insulation and associated structural steel supports (as applicable)												
SUB-TOTAL C													
(Amount in Words)													

Notes: Final delivery site of all equipment/materials shall be at the plant site stated above.

If there is a discrepancy on the numbers/units/quantities between or among the technical provision and Schedule of Requirements (SOR), SOR shall prevail.

Bidders shall enter a code representing the Country of Origin of all imported equipment, materials and accessories.

\*\* Cost of equipment, freight, insurance, etc. up to Phil port of entry. Refer to Section II Instruction To Bidder Clause 12.

\*\*\* Unit Price for Local Transportation, insurance and other local costs incidental to delivery of the goods from the Phil port of entry to final delivery site.

Code Country of Origin


Name of Firm

Name and Signature of Authorized Representative

Designation

## SECTION VI - SCHEDULE OF REQUIREMENTS

## SECTION IV - SCHEDULE OF REQUIREMENTS

## (BID PRICE SCHEDULE)

## BPS.2 - Breakdown of Prices

## 1 x 120 KW AND 2 X 90 KW TAGUBANHAN DIESEL POWER PLANT

1 x 120 KW AND 2 x 90 KW TAGUBANHAN DIESEL POWER PLANT												
Item No.	Description of Work or Materials	QTY.- UNIT	C O D E	UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM ABROAD				UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM WITHIN THE PHILIPPINES			TOTAL PRICE	
				Unit Price of Goods or Services Foreign Currency ( ) <sup>***</sup>	Import Duties & other Levies Imposed by Phil. Govt. (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Port to Delivery Site (Phil. Peso)	Unit Price of Goods or Services (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Plant to Delivery Site (Phil. Peso)	Forex Currency (E x C)	Local Currency Portion (Phil. Peso) ((F+G+H) x C) or ((I+J+K) x C)
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
D.	OTHER ELECTRICAL WORKS											
D.1	Generator Control and Protection Panel complete with the required metering, monitoring, control and protection devices, synchronizing, circuit breaker, grounding materials and other appurtenances as described in the Technical Specifications, Technical Data Sheet and as shown on the Bid Drawings including installation works in the existing control room.	3 Sets										
				PRICE OF THIS ITEM SHALL BE INCLUDED IN ITEMS A.1 & A.2 ABOVE								
D.2	15KV Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link brackets and accessories as described in the Technical specifications and Technical Data Sheets as shown on the Bid Drawings including installation works.	1 Lot										
D.3	Power, Control & Instrumentation Cables complete with the required accessories for cabling works to interface the supplied equipment to the existing system as described in the Technical Specifications, Technical Data Sheet and as shown on the Bid Drawings including installation works.	1 Lot										
D.4	Electrical Conduit and Cable Tray System complete with the required fittings and other accessories for cabling works as described in the Technical Specifications and Technical Data Sheets as shown on the Bid Drawings including installation works.	1 Lot										
D.5	Take-Off Structure complete with the required steel poles, cross arms, braces, bus conductor, line materials/hardware, termination kit and other accessories as described in Technical Specifications, Technical Data Sheet and as shown on the Bid Drawings including installation works.	1 Lot										
D.6	Grounding System complete with the required grounding conductor, equipment bonding riser, exothermic welding materials, ground rods and other accessories as described in the Technical Specifications and Technical Data Sheets as shown on the Bid Drawings including installation works.	1 Lot										
	SUB-TOTAL D			(Amount in Words)								
E.	CIVIL WORKS AND ARCHITECTURAL WORKS											
E.1	Civil Works											
E.1.1	Site Development: Demolition of existing grouted riprap and construction of concrete steps and cover of canal	1 Lot										
E.1.2	Construction materials including excavation, bedding, drain ditch, bituminous joint filler, 150mm zocalo wall, gravel surfacing, anchor/machine bolts for gensets, and associated equipment for the provision of the following:	1 Lot										
	a) New concrete foundation for the 1 x 120kW and 2 x 90kW gensets;	1 lot										
	b) New concrete foundation for 1 x 150 kVA and 2 x 112.5kVA Generator Transformers;	1 Lot										
	c) 150mm thick zocalo wall	25.2 l.m.										
	d) Gravel surfacing for engine area	4.5 cu.m.										
	e) New concrete foundation and structural steel (A36) supports and accessories for the 3 x 1000L Storage Daytank including shop painting and concrete chipping.	1 lot										
E.1.3	Drainage Appurtenance											
	a) Drain Pit	3 ps										
	SUB-TOTAL E			(Amount in Words)								

Notes: Final delivery site of all equipment/materials shall be at the plant site stated above.

If there is a discrepancy on the number/units/sets/quantities between or among the technical provision and Schedule of Requirements (SOR), SOR shall prevail.

\* Bidders shall enter a code representing the Country of Origin of all imported equipment, materials and accessories

\*\* Cost of equipment, freight, insurance, etc. up to Phil. port of entry. Refer to Section II Instruction To Bidder Clause 12

\*\*\* Unit Price for Local Transportation, insurance and other local costs incidental to delivery of the goods from the Phil. port of entry to final delivery site

Code	Country of Origin

Name of Firm

Name and Signature of Authorized Representative

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## SECTION VI - SCHEDULE OF REQUIREMENTS

## SECTION IV - SCHEDULE OF REQUIREMENTS

## (BID PRICE SCHEDULE)

## BPS.2 - Breakdown of Prices

## 1 x 120 KW AND 2 X 90 KW TAGUBANHAN DIESEL POWER PLANT

Item No.	Description of Work or Materials	QTY./ UNIT	A C O D E	UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM ABROAD				UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM WITHIN THE PHILIPPINES			TOTAL PRICE	
				Unit Price of Goods or Services Foreign Currency ( ) <sup>***</sup>	Import Duties & other Levies Imposed by Phil. Govt. (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Port to Delivery Site (Phil. Peso)	Unit Price of Goods or Services (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Plant to Delivery Site (Phil. Peso)	Foreign Currency (E x C)	Local Currency Portion (Phil. Peso) ((F+G+H) x C) or ((I+J+K) x C)
				(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
F.	SPARE PARTS AND SPECIAL/STANDARD TOOL											
F.1	MECHANICAL											
F.1.1	Spare Parts per Unit of 120 kW Diesel Genset During the Warranty Period (M-4.1: Part II - Technical Data Sheets, Mechanical Works of the Technical Specification)											
a	Air Filter Element (6 pcs/size)	1 lot										
b	Lube Oil Filter Element (30 pcs/size)	1 lot										
c	Fuel Filter Element (15 pcs/size)	1 lot										
d	Water Filter Element (6 pcs/size)	1 lot										
e	Fan Belt (3 pcs/size)	1 lot										
f	Alternator Belt (3 pcs/size)	1 lot										
g	Coolant (4 Gallon)	1 lot										
h	Expected spares to be consumed during the performance test	1 lot										
i	Other spare parts recommended by Manufacturer	1 lot										
F.1.2	Spare Parts per Unit of 90 kW Diesel Genset During the Warranty Period (M-4.2: Part II - Technical Data Sheets, Mechanical Works of the Technical Specification)											
a	Air Filter Element (6 pcs/size)	2 lots										
b	Lube Oil Filter Element (30 pcs/size)	2 lots										
c	Fuel Filter Element (15 pcs/size)	2 lots										
d	Water Filter Element (6 pcs/size)	2 lots										
e	Fan Belt (3 pcs/size)	2 lots										
f	Alternator Belt (3 pcs/size)	2 lots										
g	Coolant (4 Gallon)	2 lots										
h	Expected spares to be consumed during the performance test	2 lots										
i	Other spare parts recommended by Manufacturer	2 lots										
F.1.3	Spare Parts per Total Units of 120 kW Generating Sets Supplied and Delivered (M-4.3: Part II - Technical Data Sheets, Mechanical Works of the Technical Specification)											
a	Fuel Injector Assembly	2 Pcs										
b	Top Overhauling Kit	1 Set										
c	Achuator	1 Set										
d	Jackel Water Pump Repair Kit	1 Set										
e	Lube Oil Pump Repair Kit	1 Set										
f	Fan Adaptor & Accessories including Bearings	2 Sets										
g	Rocker Gear Cover Gasket	12 Pcs										
h	Thermostat	1 Set										

Notes: Final delivery site of all equipment/materials shall be at the plant site stated above.

If there is a discrepancy on the numbers/units/sets/quantities between or among the technical provision and Schedule of Requirements (SOR), SOR shall prevail.

\* Bidders shall enter a code representing the Country of Origin of all imported equipment, materials and accessories.

\*\* Cost of equipment, freight, insurance, etc. up to Phil port of entry. Refer to Section II Instruction To Bidder Clause 12.

\*\*\* Unit Price for Local Transportation, insurance and other local costs incidental to delivery of the goods from the Phil port of entry to final delivery site.

Code	Country of Origin

Name of Firm

Name and Signature of Authorized Representative

Designation

## SECTION VI - SCHEDULE OF REQUIREMENTS

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## SECTION IV - SCHEDULE OF REQUIREMENTS

## (BID PRICE SCHEDULE)

## BPS.2 - Breakdown of Prices

## 1 x 120 KW AND 2 X 90 KW TAGUBANHAN DIESEL POWER PLANT

Item No.	Description of Work or Materials	QTY.- UNIT	UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM ABROAD	UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM WITHIN THE PHILIPPINES			TOTAL PRICE					
				Unit Price of Goods or Services Foreign Currency ( $\text{Y}^{\text{a}}$ )	Import Duties & other Levies Imposed by Phil. Govt. (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Port to Delivery Site $^{***}$ (Phil. Peso)	Unit Price of Goods or Services (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Plant to Delivery Site $^{***}$ (Phil. Peso)	Forex Currency (E x C)	Local Currency Portion (Phil. Peso) ((F+G+H) x C) or ((I+J+K) x C)
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
F.1.3	Spares Parts per Total Units of 120 kW Generating Sets Supplied and Delivered (M-4.3: Part II - Technical Data Sheets, Mechanical Works of the Technical Specification) Confid...											
	l Lub Oil Pump Switch	1 Set										
	j Hot Water Temp. Switch	1 Set										
	k Turbocharger Repair Kit	1 Set										
	l Exhaust Manifold Bellow	1 Set										
	m Magnetic Pick-up	1 Pc.										
	n Other spare parts recommended by Manufacturer	1 Lot										
F.1.4	Spares Parts per Total Units of 90 kW Generating Sets Supplied and Delivered (M-4.4: Part II - Technical Data Sheets, Mechanical Works of the Technical Specification)											
	a Fuel Injector Assembly	2 Pcs										
	b Top Overhauling Kit	1 Set										
	c Actuator	1 Set										
	d Jacket Water Pump Repair Kit	1 Set										
	e Lub Oil Pump Repair Kit	1 Set										
	f Fan Adaptor & Accessories including Bearings	2 Sets										
	g Rocker Gear Cover Gasket	12 Pcs										
	h Thermostat	1 Set										
	i Lub Oil Pump Switch	1 Set										
	j Hot Water Temp. Switch	1 Set										
	k Turbocharger Repair Kit	1 Set										
	l Exhaust Manifold Bellow	1 Set										
	m Magnetic Pick-up	1 Pc.										
	n Other spare parts recommended by Manufacturer	1 Lot										
F.1.5	Manufacturer's Special/Standard Tools											
F.1.5.1	Standard/Special Tools per Total Units: Gensets to be Supplied and Delivered (M-5.1: Part II - Technical Data Sheets, Mechanical Works of the Technical Specification)											
	Portable computer (Minimum of Intel i7 Processor, 16GB (1x16GB) DDR4 2666 MHZ, 256 GB PCIe NVMe SSD + 1 TB SATA 5400RPM 2.5" INCH, 13"-15.6" screen size & with the latest pre-installed windows operating system compatible with manufacturer's/Supplier's software) needed in programming the genset control setting (complete with licensed CD-ROM drive dongles of genset control system) and electronic/digital governing system (including other digital components that require exclusive programs from the Manufacturer and/or Supplier with free update throughout the operating life of the genset)	1 Set										
	b Other standard tools recommended by the Manufacturer	1 Lot										
F.1.5.2	SPARE PARTS (E-8.0 of Part II - Technical Data Sheet, Electrical Works of the Technical Specifications)											
	a Generator Circuit Breaker for Generator Control and Protection Panel of 120 kW D/G Set	1 Set										
	b Generator Circuit Breaker for Generator Control and Protection Panel of 90 kW D/G Set	1 Set										
	SUB-TOTAL F											

Notes: Final delivery site of all equipment/materials shall be at the plant site stated above.

If there is a discrepancy on the number/units/sets/quantities between or among the technical provision and Schedule of Requirements (SOR), SOR shall prevail.

\* Bidders shall enter a code representing the Country of Origin of all imported equipment, materials and accessories.

\*\* Cost of equipment, freight, insurance, etc. up to Phil. port of entry. Refer to Section II Instruction To Bidder Clause 12.

\*\*\* Unit Price for Local Transportation, insurance and other local costs incidental to delivery of the goods from the Phil port of entry to final delivery site.

Code Country of Origin


Name of Firm

Name and Signature of Authorized Representative

Designation

**SECTION IV - SCHEDULE OF REQUIREMENTS  
(BID PRICE SCHEDULE)**

**BPS.2 - Breakdown of Prices**

**1 x 120 KW AND 2 X 90 KW TAGUBANHAN DIESEL POWER PLANT**

Item No.	Description of Work or Materials	QTY.- UNIT	C D D E	UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM ABROAD				UNIT PRICE FOR GOODS AND RELATED SERVICES TO BE SUPPLIED FROM WITHIN THE PHILIPPINES			TOTAL PRICE	
				Unit Price of Goods or Services Foreign Currency (US\$)	Import Duties & other Levies Imposed by Phil. Govt. (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Port to Delivery Site (Phil. Peso)	Unit Price of Goods or Services (Phil. Peso)	Value Added Tax and other Taxes Imposed by Phil. Govt. (Phil. Peso)	Local Transport from Plant to Delivery Site (Phil. Peso)	Foreign Currency (E x C)	Local Currency Portion (Phil. Peso) ((F+G+H) x C) or ((I+J+K) x C)
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
G.	<b>MISCELLANEOUS WORKS</b>											
G.1	Job Site Cameras, complete with all the necessary accessories and peripherals, spare / tools, installation and testing for the proper operation and maintenance in accordance with the Specifications and Technical Data Sheets for the provision of the following: a. Construction Cameras (2 Sets), complete with the required accessories and peripherals; b. SDHC Memory Cards, complete with the required storage capacity and spares; and, c. Alkaline Batteries, complete with the required quantities and spares.	1 Lot										
G.2	Miscellaneous Equipment and Materials (Technical Specifications)											
G.13	Tagging and/or Labels for Equipment, Valves, Piping, Instruments and its fixing accessories as described in the bid documents or shown on the drawings.	1 Lot										
G.14	Painting for Fuel Oil Piping & Equipment, Water Piping, Waste Oil Piping, its associated valves, fittings, supports and other accessories including touch-up for factory painted equipment and accessories as described in the technical specifications or shown on the drawings.	1 Lot										
G.15	Conduct training on site of at least four (4) NPC personnel to be conducted by experts who are knowledgeable & trained by the general manufacturer or his authorized distributor and equipment auxiliaries.	1 Lot										
G.16	Conduct Testing & Commissioning incl. test instruments & other services as described in the technical specifications.	1 Lot										
	<b>SUB-TOTAL G</b>											
	<b>GRAND TOTAL</b>											

Notes: Final delivery site of all equipment/materials shall be at the plant site stated above.  
If there is a discrepancy on the numbers/units/sets/quantities between or among the technical provision and Schedule of Requirements (SOR), SOR shall prevail.  
• Bidders shall enter a code representing the Country of Origin of all imported equipment, materials and accessories.  
\*\* Cost of equipment, freight, insurance, etc. up to Phil. port of entry. Refer to Section II-Instruction To Bidder Clause 12.  
\*\*\* Unit Price for Local Transportation, Insurance and other local costs incidental to delivery of the goods from the Phil port of entry to final delivery site.

Code	Country of Origin

Name of Firm

Name and Signature of Authorized Representative

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## **SECTION VIII**

# **BIDDING FORMS**

## SECTION VIII – BIDDING FORMS

### TABLE OF CONTENTS

NPCSF-GOODS-01	- Checklist of Technical and Financial Envelope Requirements for Bidders
NPCSF-GOODS-02	- List of all Ongoing Government & Private Contracts Including Contracts Awarded but not yet Started
NPCSF-GOODS-03	- Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid
NPCSF-GOODS-04	- Computation of Net Financial Contracting Capacity (NFCC)
NPCSF-GOODS-05	- Joint Venture Agreement
NPCSF-GOODS-06a	- Form of Bid Security : Bank Guarantee
NPCSF-GOODS-06b	- Form of Bid Security : Surety Bond
NPCSF-GOODS-06c	- Bid Securing Declaration Form
NPCSF-GOODS-07	- Omnibus Sworn Statement (Revised)
NPCSF-GOODS-08	- Bid Letter
Sample Form	- Bank Guarantee Form for Advance Payment
Sample Form	- Certification from DTI as Domestic Bidder



## SECTION VIII – BIDDING FORMS

Standard Form No: NPCSF-GOODS-01

**Checklist of Technical & Financial Envelope Requirements for Bidders****A. THE 1<sup>ST</sup> ENVELOPE (TECHNICAL COMPONENT) SHALL CONTAIN THE FOLLOWING:****1. ELIGIBILITY DOCUMENTS****a. (CLASS A)****➤ Any of the following:**

- PhilGEPS Certificate of Registration and Membership under Platinum Category in accordance with Section 8.5.2 of the IRR;

**OR:**

- The following updated and valid Class "A" eligibility documents enumerated under "Annex A" of the Platinum Membership:
  - Registration Certificate from the Securities and Exchange Commission (SEC) for corporations, Department of Trade and Industry (DTI) for sole proprietorship, or Cooperative Development Authority (CDA) for cooperatives;
  - Mayor's/Business permit issued by the city or municipality where the principal place of business of the prospective bidder is located, or the equivalent document for Exclusive Economic Zones or Areas.  
In cases of recently expired Mayor's/Business permits, it shall be accepted together with the official receipt as proof that the bidder has applied for renewal within the period prescribed by the concerned local government unit, provided that the renewed permit shall be submitted as a post qualification requirement in accordance with Section 34.2 of the Revised IRR of RA 9184.
  - The prospective bidder's audited financial statements, showing, among others, the prospective bidder's total and current assets and liabilities, stamped "received" by the 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.
  - Tax clearance per Executive Order 398, Series of 2005, as finally reviewed and approved by the BIR or as stated under GPPB NPM-039-2014, for Non-Resident Foreign Corporation (NRFC) and Non-Resident Alien Not Engaged in Trade or Business (NRANETB), a Delinquency Verification Certificate may be submitted as a form of Tax Clearance;

**OR:**

- A combination thereof
- Statement of all its ongoing government and private contracts if any, whether similar or not similar in nature and complexity to the contract to be bid (NPCSF-GOODS-02)
- The Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid, and whose value, adjusted to current prices using the Philippine Statistics Authority (PSA) consumer price index, must be at least 50% of the ABC (NPCSF-GOODS-03) complete with the following supporting documents:

1. Contract/Purchase Order
2. Certificate of Acceptance; or Certificate of Completion; or Official Receipt (O.R); or Sales Invoice

*(The Single Largest Completed Contract (SLCC) as declared by the bidder shall be verified and validated to ascertain such completed contract. Hence, bidders must ensure access to sites of such projects/equipment to NPC representatives for verification and validation purposes during post-qualification process.*

*It shall be a ground for disqualification, if verification and validation cannot be conducted for reasons attributable to the Bidder.)*

## SECTION VIII – BIDDING FORMS

Standard Form No: NPCSF-GOODS-01

- Duly signed computation of its Net Financial Contracting Capacity (NFCC) at least equal to the ABC (NPCSF-GOODS-04) or a Committed Line of Credit (CLC) at least equal to ten percent (10%) of the ABC, issued by a Universal or Commercial Bank; If the Bidder opted to submit a Committed Line of Credit (CLC), the bidder must submit a granted credit line valid/effective at the date of bidding.
- b. (CLASS B)**
- For Joint Venture (if applicable), any of the following:
  - Valid Joint Venture Agreement (NPCSF-GOODS-05)
  - OR**
  - Notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA, if awarded the contract
- Certification from the relevant government office of their country stating that Filipinos are allowed to participate in their government procurement activities for the same item/product *(For foreign bidders claiming eligibility by reason of their country's extension of reciprocal rights to Filipinos)*

**2. Technical Documents**

- Bid Security, any one of the following:
  - Bid Securing Declaration (NPCSF-GOODS-06c)
  - OR**
  - Cash or Cashier's/Manager's check issued by a Universal or Commercial Bank – 2% of ABC;
  - OR**
  - Bank draft/guarantee or irrevocable letter of credit issued by a Universal or Commercial Bank: (NPCSF-GOODS-06a) - 2% of ABC;
  - OR**
  - Surety Bond callable upon demand issued by a reputable surety or insurance company (NPCSF-GOODS-06b) - 5% of ABC, with
    - Certification from the Insurance Commission as authorized company to issue surety
- Duly signed, completely filled-out and notarized Omnibus Sworn statement (Revised) (NPCSF-GOODS-07), complete with the following attachments:
  - For Sole Proprietorship:
    - Special Power of Attorney
  - For Partnership/Corporation/Cooperative/Joint Venture:
    - Document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, whichever is applicable)
- Drawings & Documents to be submitted with the Bid, Sections M-1.0, M-2.0, Annexes A.1 to A.3 for Mechanical Works and Sections E-1.0 and E-2.0 for Electrical Works, Section VI – Part II Technical Data Sheets;
- Complete eligibility documents of the proposed subcontractor, if any

## SECTION VIII – BIDDING FORMS

Standard Form No: NPCSF-GOODS-01

**B. THE 2<sup>ND</sup> ENVELOPE (FINANCIAL COMPONENT) SHALL CONTAIN THE FOLLOWING:**

- Duly signed Bid Letter indicating the total bid amount in accordance with the prescribed form (NPCSF-GOODS-08)
- Duly signed and completely filled-out Schedule of Requirement (Section VII) indicating the unit and total prices per item and the total amount in the prescribed Price Schedule form.
- For Domestic Bidder claiming for domestic preference:
  - Letter address to the BAC claiming for preference
  - Certification from DTI as Domestic Bidder in accordance with the prescribed forms provided

**CONDITIONS:**

1. Each Bidder shall submit one copy of the first and second components of its Bid. NPC may request additional hard copies and/or electronic copies of the Bid. However, failure of the Bidders to comply with the said request shall not be a ground for disqualification.
2. In the case of foreign bidders, the eligibility requirements under Class "A" Documents (except for Tax Clearance) may be substituted by the appropriate equivalent documents, if any, issued by the country of the foreign bidder concerned. The eligibility requirements or statements, the bids, and all other documents to be submitted to the BAC must be in English. If the eligibility requirements or statements, the bids, and all other documents submitted to the BAC are in foreign language other than English, it must be accompanied by a translation of the documents in English. The documents shall be translated by the relevant foreign government agency, the foreign government agency authorized to translate documents, or a registered translator in the foreign bidder's country; and shall be authenticated by the appropriate Philippine foreign service establishment/post or the equivalent office having jurisdiction over the foreign bidder's affairs in the Philippines.  
 These documents shall be accompanied by a Sworn Statement in a form prescribed by the GPPB stating that the documents submitted are complete and authentic copies of the original, and all statements and information provided therein are true and correct. Upon receipt of the said documents, the PhilGEPS shall process the same in accordance with the guidelines on the Government of the Philippines – Official Merchants Registry (GoP-OMR).
3. A Bidder not submitting bid for reason that his cost estimate is higher than the ABC, is required to submit his letter of non-participation/regret supported by corresponding detailed estimates. Failure to submit the two (2) documents shall be understood as acts that tend to defeat the purpose of public bidding without valid reason as stated under Section 69.1.(i) of the revised IRR of R.A. 9184.

Standard Form Number: NPCSF-GOODS-02

**List of All Ongoing Government and Private Contracts Including Contract Awarded But Not Yet Started**

Business Name : \_\_\_\_\_  
 Business Address : \_\_\_\_\_

Name of Contract/ Project Cost	a. Owner's Name b. Address c. Telephone Nos.	Nature of Work	Bidder's Role		a. Date Awarded b. Date Started c. Date of Completion or Contract Duration/ Date of Delivery	Value of Outstanding Works / Undelivered Portion
			Description	%		
<b>Government</b>						
<b>Private</b>						
<b>Total Cost</b>						

The bidder shall declare in this form all his on-going government and private contracts including contracts where the bidder (either as individual or as a Joint Venture) is a partner in a Joint Venture agreement other than his current joint venture where he is a partner. Non declaration will be a ground for disqualification of bid.

Note : This statement shall be supported with the following documents for all the contract(s) stated above which shall be submitted during Post-qualification:

1. Contract/Purchase Order and/or Notice of Award
2. Certification coming from the project owner/client that the performance is satisfactory as of the bidding date.

Submitted by : \_\_\_\_\_  
 (Printed Name & Signature)  
 Designation : \_\_\_\_\_  
 Date : \_\_\_\_\_

Standard Form Number: NPCSF-GOODS-03

**The Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid**

Business Name : \_\_\_\_\_  
 Business Address : \_\_\_\_\_

Name of Contract	a. Owner's Name b. Address c. Telephone Nos.	Nature of Work	Contractor's Role		a. Amount at Award b. Amount at Completion c. Duration	a. Date Awarded b. Contract Effectivity c. Date Completed
			Description	%		

- Notes: 1. The bidder must state only one (1) Single Largest Completed Contract (SLCC) similar to the contract to be bid.  
 2. Supporting documents such as Contract/Purchase Order and any of the following: Certificate of Acceptance; or Certificate of Completion; or Official Receipt (O.R); or Sales Invoice for the contract stated above shall be submitted during Bid Opening.

Submitted by : \_\_\_\_\_  
 (Printed Name & Signature)  
 Designation : \_\_\_\_\_  
 Date : \_\_\_\_\_

## SECTION VIII – BIDDING FORMS

Standard Form Number: NPCSF-GOODS-04

**NET FINANCIAL CONTRACTING CAPACITY (NFCC)**

- A. Summary of the Supplier's/Distributor's/Manufacturer's assets and liabilities on the basis of the income tax return and audited financial statement for the immediately preceding calendar year are:

		Year 20__
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 Net Financial Contracting Capacity (NFCC) based on the above data is computed as follows:

NFCC = [(Current assets minus current liabilities) x 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 for this Project.

NFCC = P \_\_\_\_\_

Herewith attached is certified true copy of the audited financial statement, stamped "RECEIVED" by the BIR or BIR authorized collecting agent for the immediately preceding calendar year.

Submitted by:

\_\_\_\_\_  
Name of Supplier / Distributor / Manufacturer

\_\_\_\_\_  
Signature of Authorized Representative

Date : \_\_\_\_\_

## SECTION VIII – BIDDING FORMS

Standard Form Number: NPCSF-GOODS-05

**JOINT VENTURE AGREEMENT****KNOW ALL MEN BY THESE PRESENTS:**

That this JOINT VENTURE AGREEMENT is entered into by and between:  
\_\_\_\_\_, of legal age, *(civil status)* \_\_\_\_\_, authorized representative of  
\_\_\_\_\_ and a resident of \_\_\_\_\_.

- and -

\_\_\_\_\_, of legal age, *(civil status)* \_\_\_\_\_, authorized representative of  
\_\_\_\_\_ a resident of \_\_\_\_\_.

That both parties agree to join together their capital, manpower, equipment, and other resources and efforts to enable the Joint Venture to participate in the Bidding and Undertaking of the hereunder stated Contract of the **National Power Corporation**.

**NAME OF PROJECT****CONTRACT AMOUNT**

\_\_\_\_\_  
That the capital contribution of each member firm:

NAME OF FIRM	CAPITAL CONTRIBUTION
1. _____	P _____
2. _____	P _____

That both parties agree to be jointly and severally liable for their participation in the Bidding and Undertaking of the said contract.

That both parties agree that \_\_\_\_\_ and/or \_\_\_\_\_ shall be the Official Representative/s of the Joint Venture, and are granted full power and authority to do, execute and perform any and all acts necessary and/or to represent the Joint Venture in the Bidding and Undertaking of the said contract, as fully and effectively and the Joint Venture may do and if personally present with full power of substitution and revocation.

That this Joint Venture Agreement shall remain in effect only for the above stated Contract until terminated by both parties.

\_\_\_\_\_  
*Name & Signature of Authorized Representative*

\_\_\_\_\_  
*Official Designation*

\_\_\_\_\_  
*Name of Firm*

\_\_\_\_\_  
*Name & Signature of Authorized Representative*

\_\_\_\_\_  
*Official Designation*

\_\_\_\_\_  
*Name of Firm*

*Witnesses*

1. \_\_\_\_\_

2. \_\_\_\_\_

**[Jurat]**

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

## SECTION VIII – BIDDING FORMS

Standard Form Number: NPCSF-GOODS-06a

**FORM OF BID SECURITY (BANK GUARANTEE)**

WHEREAS, (Name of Bidder) (hereinafter called "the Bidder") has submitted his bid dated (Date) for the [name of project] (hereinafter called "the Bid").

KNOW ALL MEN by these presents that We (Name of Bank) of (Name of Country) having our registered office at \_\_\_\_\_ (hereinafter called "the Bank" are bound unto National Power Corporation (hereinafter called "the Entity") in the sum of [amount in words & figures as prescribed in the bidding documents] for which payment well and truly to be made to the said Entity the Bank binds himself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

THE CONDITIONS of this obligation are that:

- 1) if the Bidder withdraws his Bid during the period of bid validity specified in the Bidding Documents; or
- 2) if the Bidder does not accept the correction of arithmetical errors of his bid price in accordance with the Instructions to Bidder; or
- 3) if the Bidder, having determined as the LCB, fails or refuses to submit the required tax clearance, latest income and business tax returns and PhilGEPs registration certificate within the prescribed period; or
- 4) if the Bidder having been notified of the acceptance of his bid and award of contract to him by the Entity during the period of bid validity:
  - a) fails or refuses to execute the Contract; or
  - b) fails or refuses to submit the required valid JVA, if applicable; or
  - c) fails or refuses to furnish the Performance Security in accordance with the Instructions to Bidders;

we undertake to pay to the Entity up to the above amount upon receipt of his first written demand, without the Entity having to substantiate its demand, provided that in his demand the Entity will note that the amount claimed by it is due to the occurrence of any one or combination of the four (4) conditions stated above.

The Guarantee will remain in force up to 120 days after the opening of bids or as it may be extended by the Entity, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE \_\_\_\_\_

SIGNATURE OF THE BANK \_\_\_\_\_

WITNESS \_\_\_\_\_

SEAL \_\_\_\_\_

\_\_\_\_\_  
(Signature, Name and Address)



## SECTION VIII – BIDDING FORMS

Standard Form Number: NPCSF-GOODS-06b

**FORM OF BID SECURITY (SURETY BOND)**

BOND NO.: \_\_\_\_\_ DATE BOND EXECUTED: \_\_\_\_\_

By this bond, We (Name of Bidder) (hereinafter called "the Principal") and (Name of Surety) of (Name of Country of Surety), authorized to transact business in the Philippines (hereinafter called "the Surety") are held and firmly bound unto National Power Corporation (hereinafter called "the Employer") as Oblige, in the sum of (amount in words & figures as prescribed in the bidding documents), callable on demand, for the payment of which sum, well and truly to be made, we, the said Principal and Surety bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.

SEALED with our seals and dated this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

WHEREAS, the Principal has submitted a written Bid to the Employer dated the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_, for the \_\_\_\_\_ (hereinafter called "the Bid").

NOW, THEREFORE, the conditions of this obligation are:

- 1) if the Bidder withdraws his Bid during the period of bid validity specified in the Bidding Documents; or
- 2) if the Bidder does not accept the correction of arithmetical errors of his bid price in accordance with the Instructions to Bidder; or
- 3) if the Bidder, having determined as the LCB, fails or refuses to submit the required tax clearance, latest income and business tax returns and PhilGEPS registration certificate within the prescribed period; or
- 4) if the Bidder having been notified of the acceptance of his bid and award of contract to him by the Entity during the period of bid validity:
  - d) fails or refuses to execute the Contract; or
  - e) fails or refuses to submit the required valid JVA, if applicable; or
  - f) fails or refuses to furnish the Performance Security in accordance with the Instructions to Bidders;

then this obligation shall remain in full force and effect, otherwise it shall be null and void.

PROVIDED HOWEVER, that the Surety shall not be:

- a) liable for a greater sum than the specified penalty of this bond, nor
- b) liable for a greater sum than the difference between the amount of the said Principal's Bid and the amount of the Bid that is accepted by the Employer.

Standard Form Number: NPCSF-GOODS-06b

SECTION VIII – BIDDING FORMS

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*Page 2 of 2*

This Surety executing this instrument hereby agrees that its obligation shall be valid for 120 calendar days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Surety is hereby waived.

PRINCIPAL \_\_\_\_\_ SURETY \_\_\_\_\_

SIGNATURE(S) \_\_\_\_\_ SIGNATURE(S) \_\_\_\_\_

NAME(S) AND TITLE(S) \_\_\_\_\_ NAME(S) \_\_\_\_\_

SEAL \_\_\_\_\_ SEAL \_\_\_\_\_

## SECTION VIII – BIDDING FORMS

Standard Form No: NPCSF-GOODS-06c

REPUBLIC OF THE PHILIPPINES )  
CITY OF \_\_\_\_\_ ) S.S.**BID-SECURING DECLARATION**  
**SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1 X 120 kW**  
**AND 2 X 90 kW MODULAR DIESEL GENSETS AND ASSOCIATED ELECTRICAL**  
**EQUIPMENT FOR TAGUBANHAN DPP, VisP21Z1282Se**To: **National Power Corporation**  
BIR Road cor. Quezon Ave.  
Diliman, Quezon CityI/We<sup>1</sup>, 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 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 R.A. 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;
  - (c) I am/we are declared as the bidder with the Lowest Calculated and Responsive Bid, and I/we have furnished the performance security and signed the Contract.

IN WITNESS WHEREOF, I/we have hereunto set my hand this \_\_\_\_ day of \_\_\_\_  
20\_\_\_\_ at \_\_\_\_\_, Philippines.\_\_\_\_\_  
[Name and Signature of Bidder's Representative/  
Authorized Signatory] / [Signatory's legal capacity]  
Affiant**[Jurat]**

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

<sup>1</sup> Select one and delete the other. Adopt same instruction for similar terms throughout the document.

## SECTION VIII – BIDDING FORMS

Standard Form No: NPCSF-GOODS-07

**Omnibus Sworn Statement (Revised)****REPUBLIC OF THE PHILIPPINES )**  
**CITY/MUNICIPALITY OF \_\_\_\_\_ ) S.S.****AFFIDAVIT**

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

1. *[Select one, delete the other:]*

*[If a sole proprietorship:]* I am the sole proprietor or authorized representative of [Name of Bidder] with office address at [address of Bidder];

*[If a partnership, corporation, cooperative, or joint venture:]* I am the duly authorized and designated representative of [Name of Bidder] with office address at [address of Bidder];

2. *[Select one, delete the other:]*

*[If a sole proprietorship:]* As the owner and sole proprietor, or authorized representative of [Name of Bidder], 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 [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached duly notarized Special Power of Attorney;

*[If a partnership, corporation, cooperative, or joint venture:]* 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 [Name of the Project] of the [Name of the Procuring Entity], 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. *[Select one, delete the rest:]*

*[If a sole proprietorship:]* The owner or sole proprietor is not related to the Head of the Procuring Entity, 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;

## SECTION VIII – BIDDING FORMS

*[If a partnership or cooperative:]* None of the officers and members of *[Name of Bidder]* is related to the Head of the Procuring Entity, 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;

*[If a corporation or joint venture:]* None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, 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.

*[Insert NAME OF BIDDER OR ITS AUTHORIZED  
REPRESENTATIVE]*

*[Insert signatory's legal capacity]*  
Affiant

**[Jurat]**

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

## SECTION VIII – BIDDING FORMS

Standard Form No: NPCSF-GOODS-08

## BID LETTER

Date: \_\_\_\_\_

To: **THE PRESIDENT**  
National Power Corporation  
BIR Road cor. Quezon Ave.  
Diliman, Quezon City

Gentlemen:

Having examined the Bidding Documents including Bid Bulletin Numbers *[insert numbers]*, the receipt of which is hereby duly acknowledged, we, the undersigned, offer to perform **SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1 X 120 kW AND 2 X 90 kW MODULAR DIESEL GENSETS AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP ( VisP21Z1282Se)** in conformity with the said Bidding Documents for the sum of *[total Bid amount in words and figures]* or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Bid.

We undertake, if our Bid is accepted, to supply and deliver the goods and perform other services, if required within the contract duration and in accordance with the scope of the contract specified in the Schedule of Requirements and Technical Specifications.

If our Bid is accepted, we undertake to provide a performance security in the form, amounts, and within the times specified in the Bidding Documents.

We agree to abide by this Bid for the Bid Validity Period specified in Bid Documents and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof and your Notice of Award, shall be binding upon us.

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

We certify/confirm that we comply with the eligibility requirements pursuant to the Bidding Documents.

We likewise certify/confirm that the undersigned, *[for sole proprietorships, insert: as the owner and sole proprietor or authorized representative of [Name of Bidder]* has the full power and authority to participate, submit the bid, and to sign and execute the ensuing contract, on the latter's behalf for the *[Name of Project]* of the National Power Corporation *[for partnerships, corporations, cooperatives, or joint ventures, insert: is granted full power and authority by the [Name of Bidder]* to participate, submit the bid, and to sign and execute the ensuing contract on the latter's behalf for *[Name of Project]* of the National Power Corporation.

We acknowledge that failure to sign each and every page of this Bid Letter, including the attached Schedule of Requirements (Bid Price Schedule), shall be a ground for the rejection of our bid.

\_\_\_\_\_  
*[name and signature of authorized signatory]*\_\_\_\_\_  
*[in the capacity of]*

Duly authorized to sign Bid for and on behalf of \_\_\_\_\_  
*[name of bidder]*

## SECTION VIII – BIDDING FORMS

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**Bank Guarantee Form for Advance Payment**

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To: **THE PRESIDENT**  
National Power Corporation  
BIR Road cor. Quezon Ave.  
Diliman, Quezon City

*[name of Contract]*

Gentlemen and/or Ladies:

In accordance with the Advance Payment Provision, of the General Conditions of Contract, [name and address of Supplier] (hereinafter called the "Supplier") shall deposit with the PROCURING ENTITY a bank guarantee to guarantee its proper and faithful performance under the said Clause of the Contract in an amount of [amount of guarantee in figures and words].

We, the [name of the universal/commercial bank], as instructed by the Supplier, agree unconditionally and irrevocably to guarantee as primary obligator and not as surety merely, the payment to the PROCURING ENTITY on its first demand without whatsoever right of objection on our part and without its first claim to the Supplier, in the amount not exceeding [amount of guarantee in figures and words].

We further agree that no change or addition to or other modification of the terms of the Contract to be performed thereunder or of any of the Contract documents which may be made between the PROCURING ENTITY and the Supplier, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition, or modification.

This guarantee shall remain valid and in full effect from the date the advance payment is received by the Supplier under the Contract and until the Goods are accepted by the PROCURING ENTITY.

Yours truly,

Signature and seal of the Guarantors

\_\_\_\_\_  
*[name of bank or financial institution]*

\_\_\_\_\_  
*[address]*

\_\_\_\_\_  
*[date]*

**CERTIFICATION AS A DOMESTIC BIDDER**

This is to certify that based on the records of this office, (Name of Bidder) is  
duly registered with the DTI on \_\_\_\_\_.

This further certifies that the articles forming part of the product of (Name of Bidder),  
which are/is (Specify) \_\_\_\_\_, are substantially composed of  
articles, materials, or supplies grown, produced or manufactured in the Philippines. (Please  
encircle the applicable description/s).

This certification is issued upon the request of (Name of Person/Entity) in  
connection with his intention to participate in the bidding for the (Name of Project)  
of the National Power Corporation (NPC).

Given this \_\_\_ day of \_\_\_\_\_ 20\_\_ at \_\_\_\_\_, Philippines

\_\_\_\_\_  
Name

\_\_\_\_\_  
Position

\_\_\_\_\_  
Department of Trade & Industry



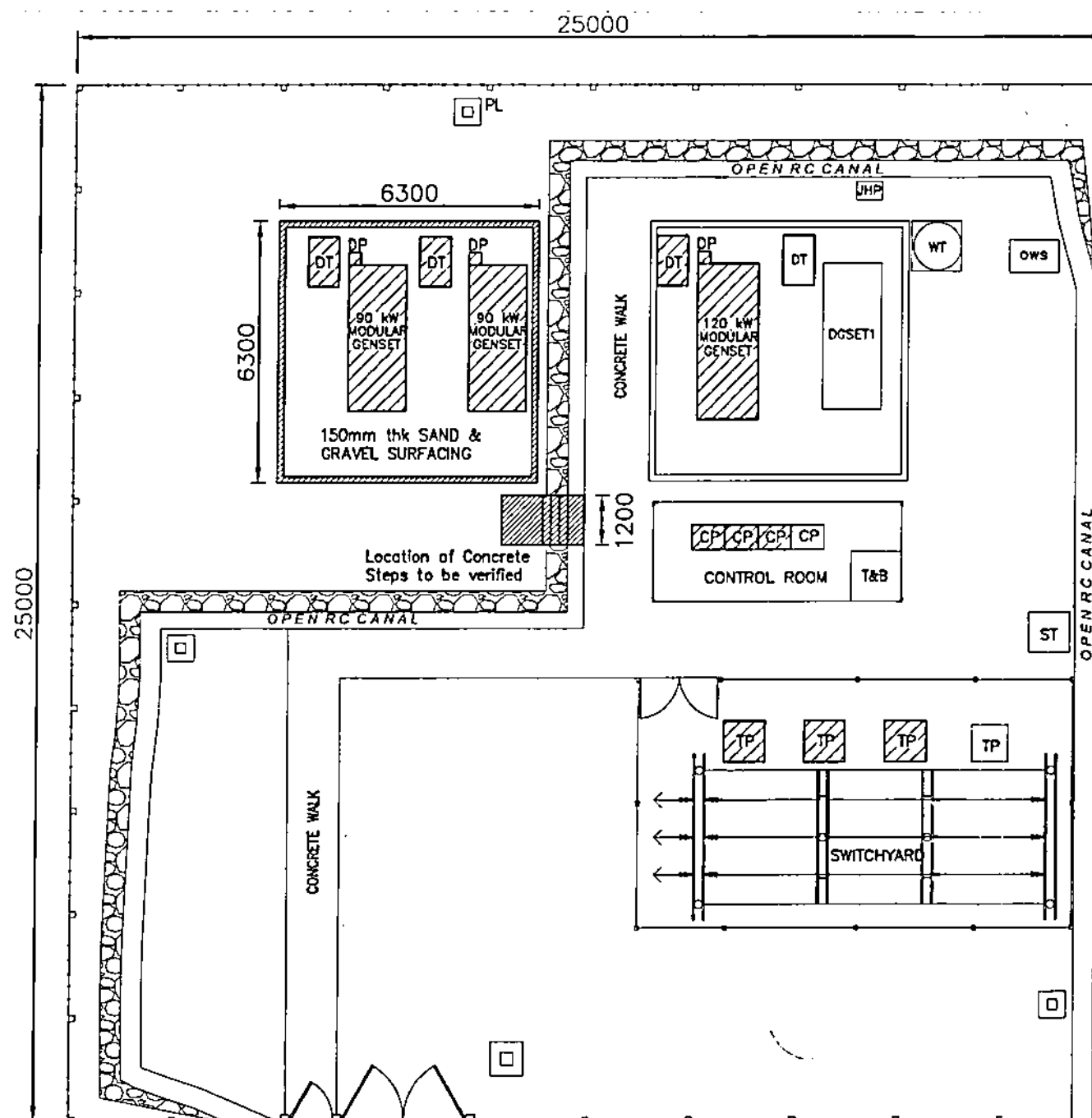
## **SECTION IX**

# **BID DRAWINGS**

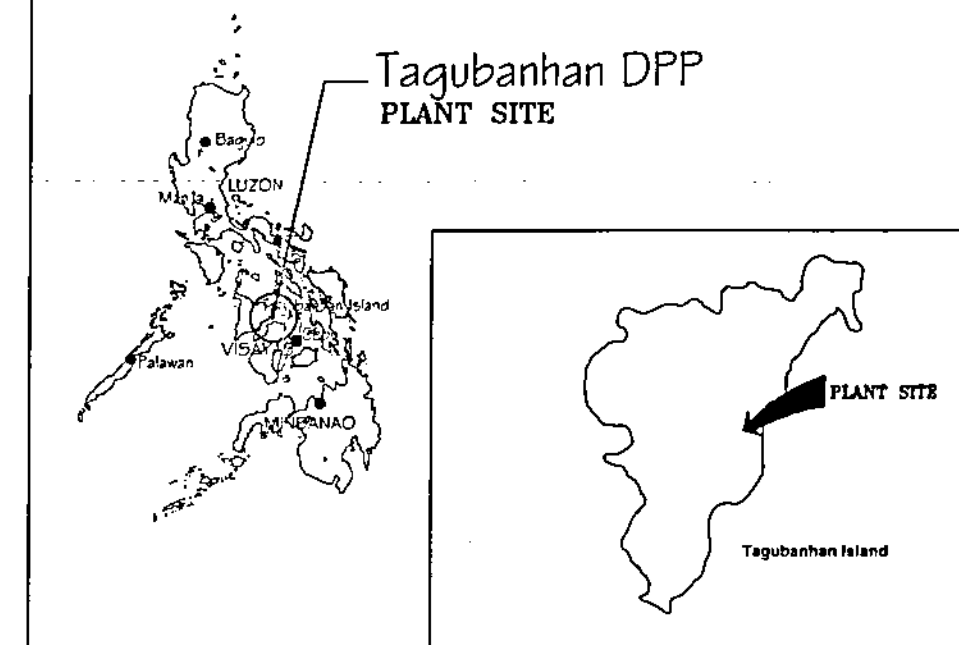
**SECTION IX – BID/REFERENCE DRAWINGS****CW – CIVIL WORKS**

<b><u>DRAWING NO.</u></b>	<b><u>TITLE</u></b>
TagDPP-BDC-17.701	SITE DEVELOPMENT PLAN (1 x 120 kW & 2 x 90 kW Diesel Genset for Tagubanhon DPP)
TagDPP-BDC-17.702	TYPICAL GENSET & TRANSFORMER PAD (Plan, Section & Details)
TagDPP-BDC-17.703	DAY TANK STEEL SUPPORT, DRAIN PIT, ZOCALO WALL & CONCRETE STEPS DETAILS (Plan, Elevations, Section & Details)
TagDPP-BDC-17.704	TYPICAL DIRECT BURIED STEEL POLE (Plan & Detail)





**SITE DEVELOPMENT PLAN**  
SCALE 1:150



**LOCATION MAP**  
NOT TO SCALE

**NOTE:**

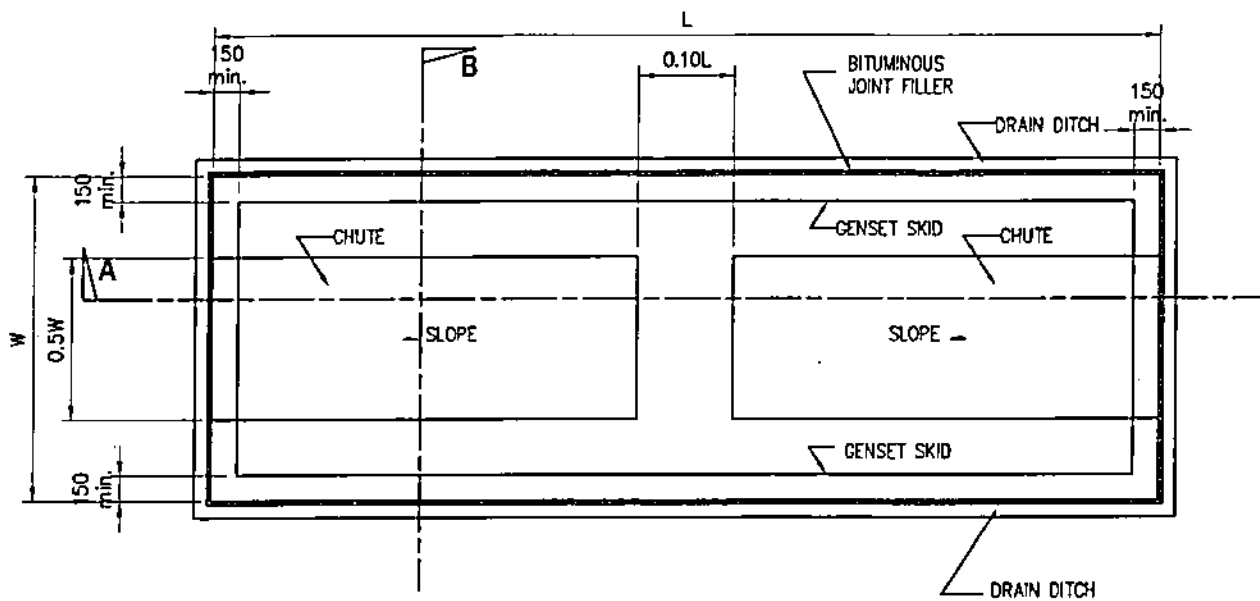
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.
2. THIS DRAWING SHALL BE WORKED WITH RELEVANT CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS.
3. LOCATION OF CONCRETE STEPS TO BE VERIFIED AT THE SITE.

**LEGEND:**

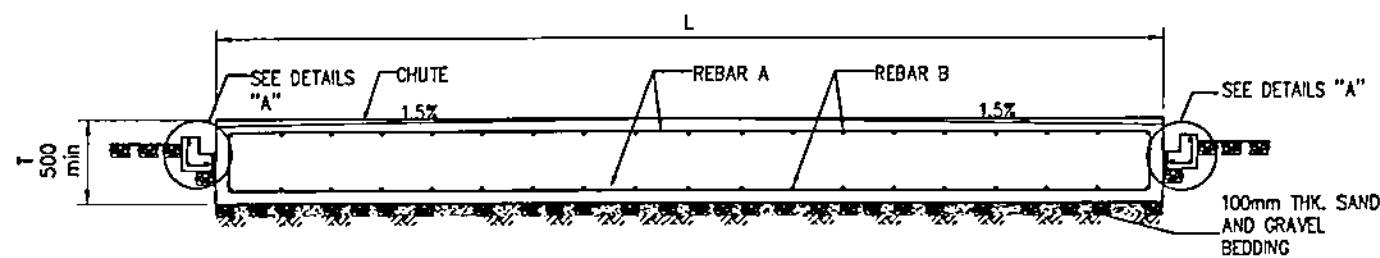
PL	-	PERIMETER LIGHTING
DT	-	DAY TANK
DP	-	DRAIN PIT
TP	-	TRANSFORMER PAD
OWS	-	OIL WATER SEPARATOR
WT	-	WATER TANK
ST	-	SEPTIC TANK
T&B	-	TOILET AND BATH
CP	-	CONTROL PANEL
JHP	-	JETMATIC HAND PUMP
	-	PROPOSED LOCATION OF EQUIPMENT/FACILITY TO BE SUPPLIED/CONSTRUCTED
	-	GROUTED RIPRAP

OWNER:		<b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DELIMAN QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2x90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP			
LOCATION: SITIO PALMA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>SITE DEVELOPMENT PLAN (TAGUBANHAN DPP)</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	ITAPEL		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.			
MECH.			
SUBMITTED: <b>H. L. MENDOZA</b> Principal Engineer A, CEO		RECOMMENDED: <b>A. C. ESPIRITU</b> Manager, DDO	
APPROVED: <b>N. G. SOMOGUERRA</b> Manager, DDO			
DWG. NO. <b>TagDPP-BDC-17.701</b>		SPECS. NO. <b>VisP21Z1282Se</b>	
SCALE: <b>1:150</b>		<b>BID DRAWING</b>	
REV. 0			

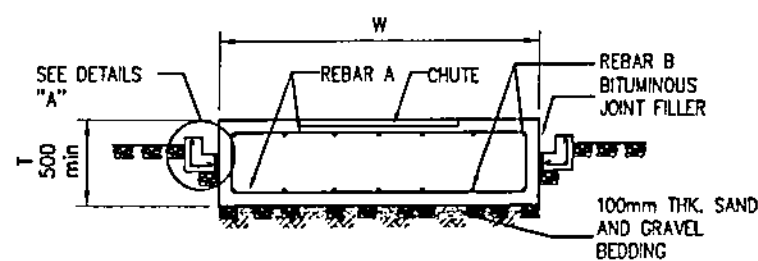
REV.	DATE	NATURE OF REVISION	BY	CHKD	RECD	APPD.



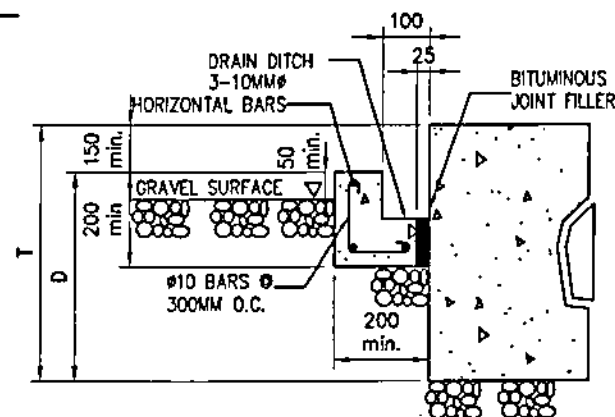
PLAN



SECTION A

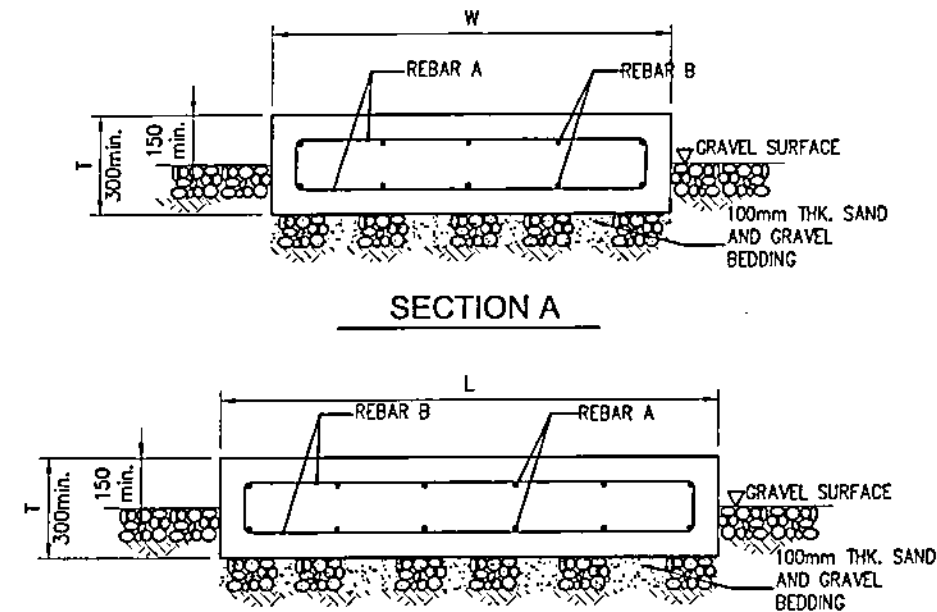


SECTION B



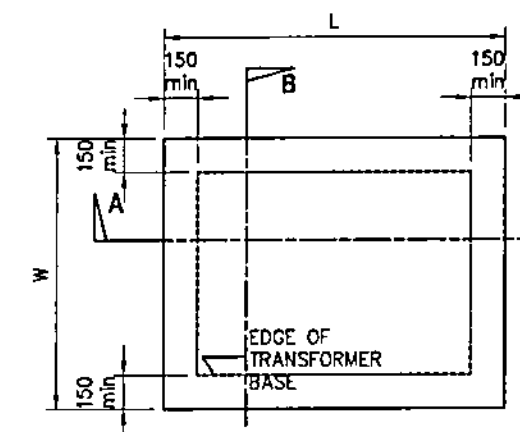
DETAILS "A"

CONCRETE GENSET PAD  
SCALE NTS



SECTION A

SECTION B



PLAN

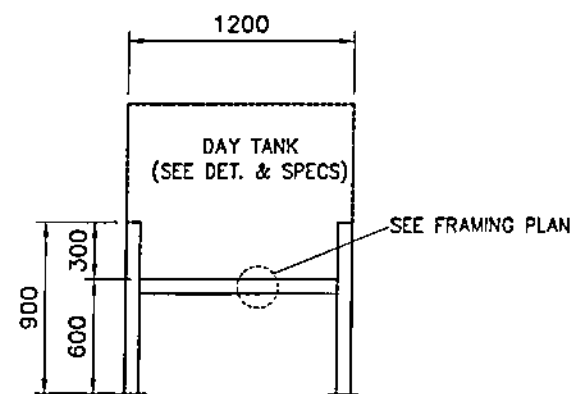
TRANSFORMER PAD  
SCALE NTS

#### NOTES:

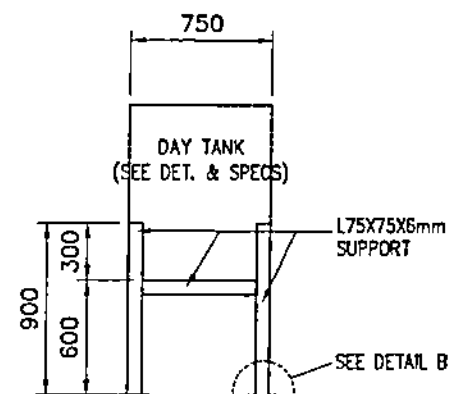
1. THE DESIGN OF THE GENSET AND TRANSFORMER PAD FOUNDATION AND MOUNTING DETAILS SHALL BE PREPARED BY THE SUPPLIER/CONTRACTOR SUBJECT TO NPC'S REVIEW AND APPROVAL. FINAL DIMENSION SHALL BE AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER IN CONSIDERATION OF THE MINIMUM REQUIREMENTS.
2. WORK THIS WITH ELECTRICAL AND MECHANICAL DRAWINGS.

OWNER:		NATIONAL POWER CORPORATION AGHAM ROAD, DELIMAN QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP			
LOCATION: SITIO PALMA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>TYPICAL GENSET &amp; TRANSFORMER PAD</b> (PLAN, SECTION & DETAIL)			
DESIGNED	BY	CHKD	DATE
DRAWN	ITAPL		
REVIEWED	PRINCIPAL ENGR./ARCHT.		
CIVIL/ARCHT			
ELEC.			
MECH.			
SUBMITTED:		H. L. MENDOZA Principal Engineer, CEO	
RECOMMENDED:		A. C. B. SORITO Principal Engineer, CEO	
APPROVED:		N. O. SORIANO Manager, DDO	
DWG. NO. TagDPP-BDC-17.702		SPECS. NO. VisP21Z1282Se	
SCALE: AS SHOWN		BID DRAWING	
REV. 0			

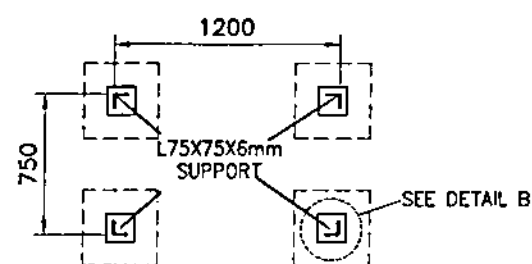
REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.



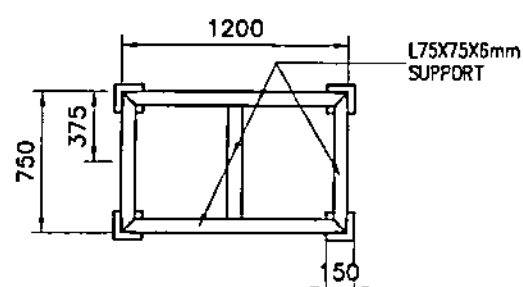
SIDE ELEVATION



FRONT ELEVATION

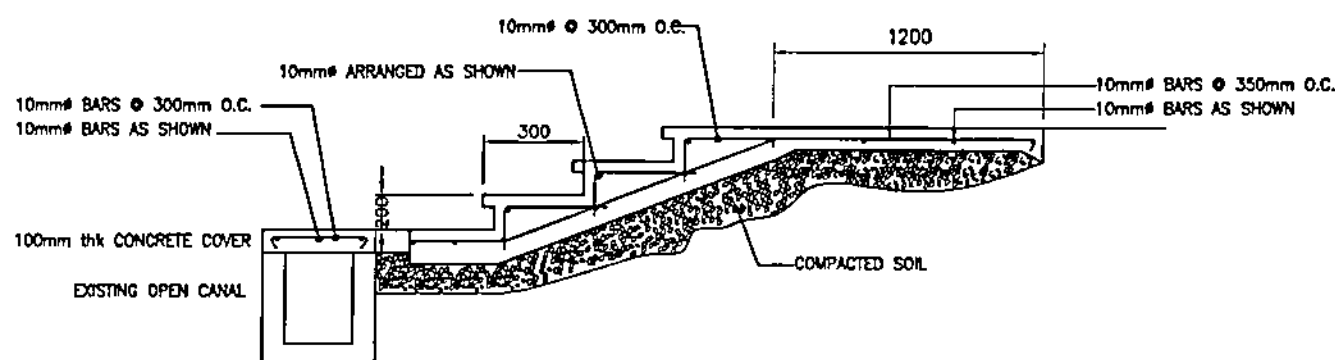


PLAN

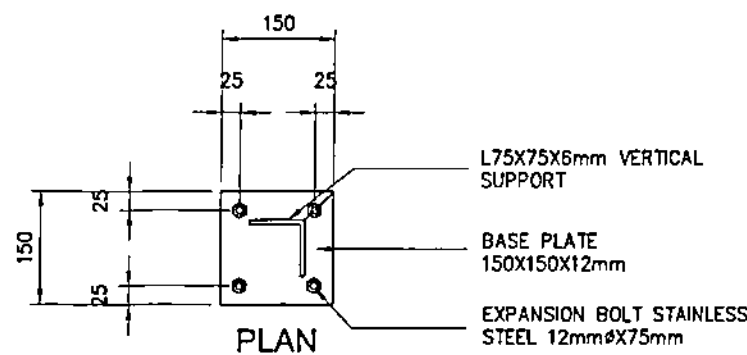


FRAMING PLAN

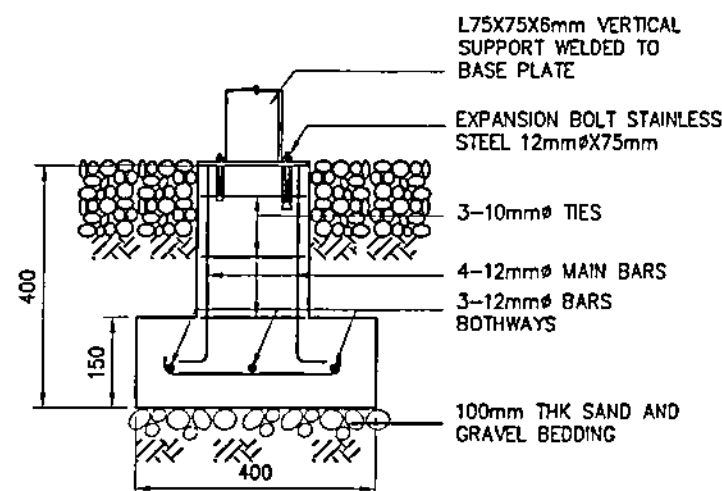
DAYTANK SUPPORT  
SCALE 1:40



DETAIL OF CONCRETE STEPS AND CANAL COVER  
SCALE NTS

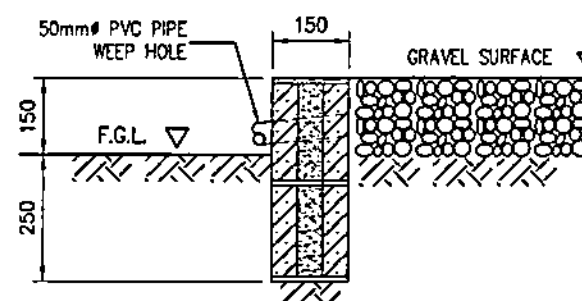


PLAN



SECTION

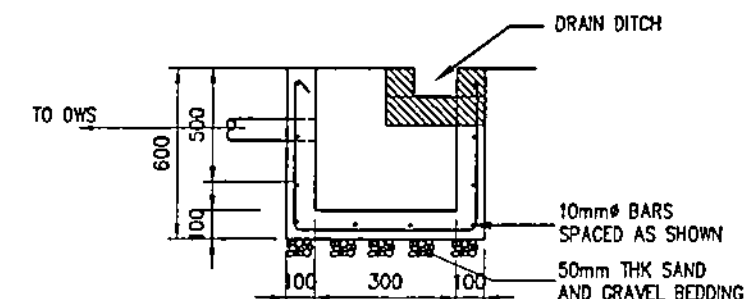
DETAIL "B"  
SCALE 1:10



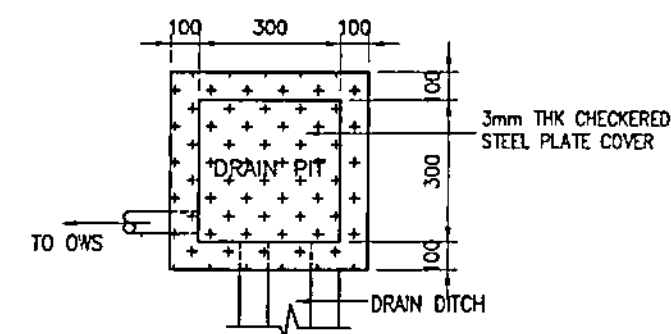
CHB ZOCALO WALL  
SCALE NTS

## NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE INDICATED.
2. USE STRUCTURAL GRADE STEEL SHAPES, BARS AND PLATES CONFORMING TO ASTM A36.
3. ALL WELDING WORKS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE AMERICAN WELDING SOCIETY.
4. ALL STRUCTURAL STEEL SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE AISC SPECIFICATIONS AND CODE OF STANDARD PRACTICE.




SECTION



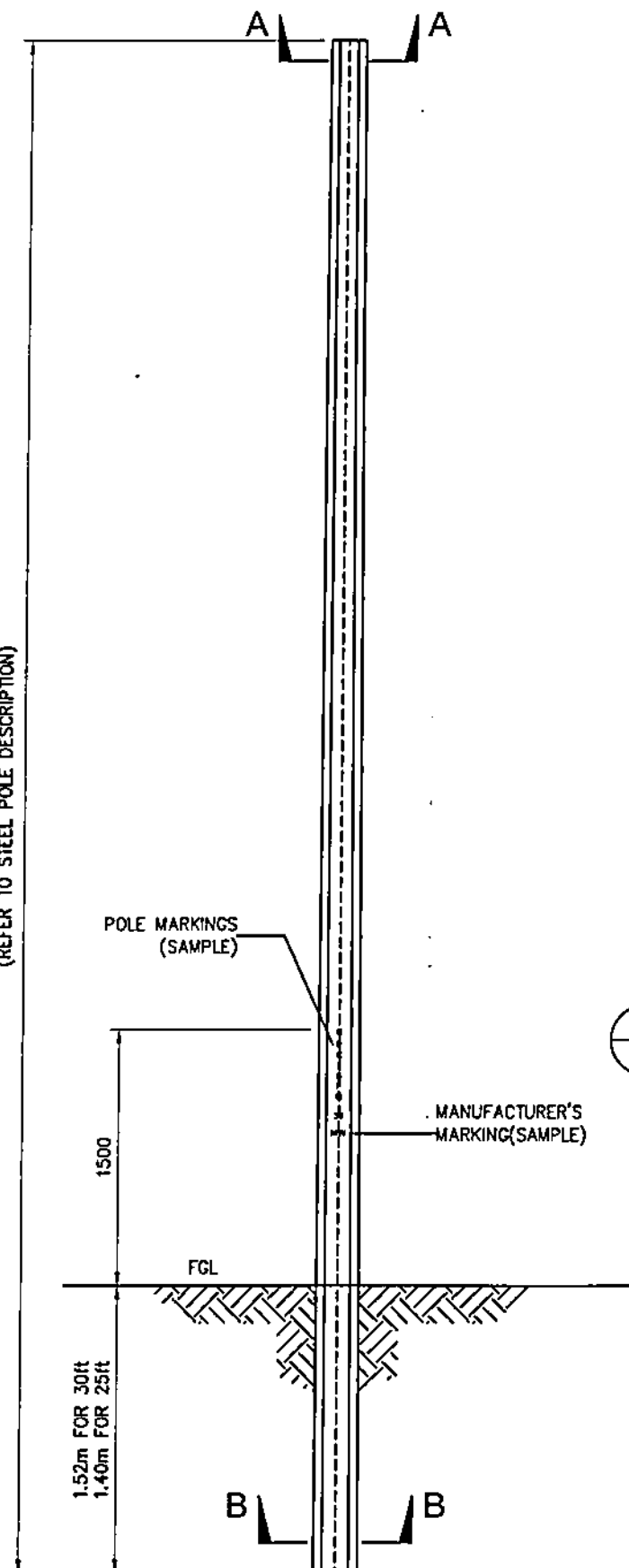
PLAN

DRAIN PIT (DP)  
SCALE NTS

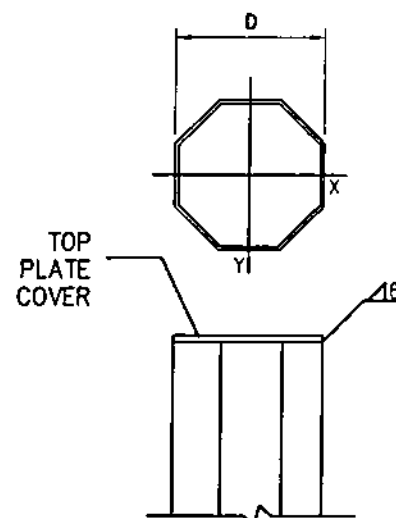
OWNER:		 <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DELIMAN QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2x30 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP			
LOCATION: SITIO PALINA GRANDE, BRGY. SANGONGOM, CONCEPCION, ILOILO			
TITLE: DAY TANK STEEL SUPPORT, DRAIN PIT ZOCALO WALL & CONCRETE STEPS DETAILS (PLAN, ELEVATIONS, SECTION & DETAILS)			
DESIGNED	BY	CHKD	DATE
DRAWN	FTAPEL		
REVIEWED	PRINCIPAL ENGR./ARCHT.		
CIVIL/ARCHT			
ELEC.			
MECH.			
SUBMITTED:		H. L. MENDOZA Principal Engineer A, CEAD	
RECOMMENDED:		A. C. ESPIRITU Manager, CEAD	
APPROVED:		N. G. SORIANO Manager, ODO	
DWG. NO. TagDPP-BDC-17.703		SPECS. NO. VisP21Z1282Se	
SCALE: AS SHOWN		BID DRAWING	
REV. 0			

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.

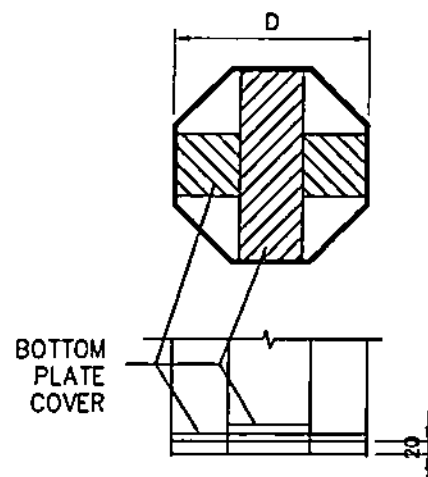
(REFER TO STEEL POLE DESCRIPTION)



ELEVATION OF STEEL POLE  
SCALE 1:40



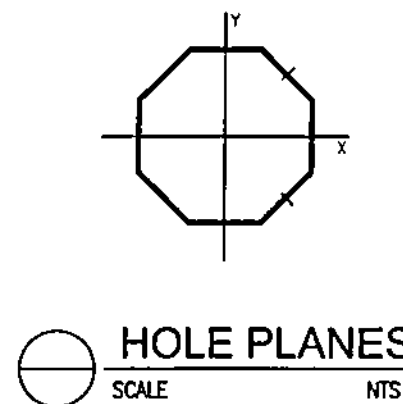
TOP PLATE (SECTION A-A)  
SCALE NTS



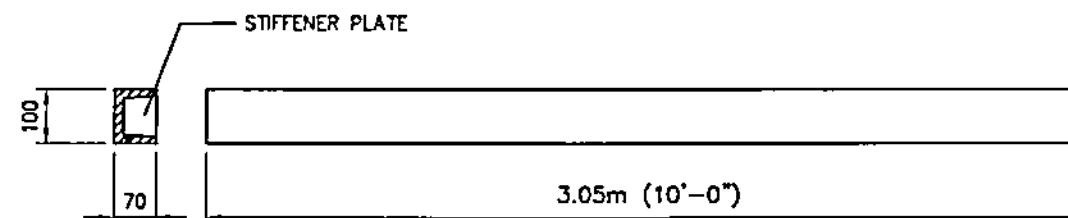
BOTTOM PLATE (SECTION B-B)  
SCALE NTS

#### SHAFT INFORMATION

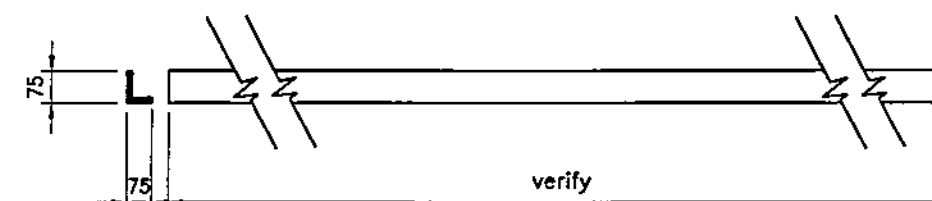
DESCRIPTION	LENGTH	
	30 ft.	25 ft.
TIP DIAMETER	200mm	150mm
BUTT DIAMETER	260mm	240mm
THICKNESS	4mm	4mm



HOLE PLANES  
SCALE NTS



CROSS ARM DET.  
SCALE NTS



CROSS BRACE DET.  
SCALE NTS

#### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. DRILL HOLES ON CENTERLINE OF POLE FACES.
3. HOLE LOCATION AND DIAMETER SHALL BE REFERRED TO ELECTRICAL DRAWINGS FOR DIFFERENT TYPES OF POLE.
4. POLES SHALL BE OCTAGONAL ( 8 SIDES ) AND THE DIAMETERS ARE MEASURED ON THE OUTSIDE AND ACROSS THE FLAT SURFACES.
5. THE MATERIAL FOR POLE SHALL BE 345MPa (50ksi) MINIMUM YIELD STRENGTH OF ROLLED STEEL PLATE.
6. ALL POLES ARE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123M WITH MINIMUM COATING THICKNESS OF 85 MICRONS.
7. TIP AND BUTT OF POLES SHALL BE COVERED WITH PLATE SIMILAR TO SHAFT BODY THICKNESS.
8. CROSSARMS SHALL BE 6MM THICK BENDED CHANNEL SECTION PROVIDED WITH 6MM THICK STIFFENER PLATE WELDED AT 300MM ON CENTERS.
9. CROSS BRACES SHALL BE 6MM THICK ANGULAR SECTION. LENGTHS AND HOLE LOCATIONS SHALL BE REFERRED TO ELECTRICAL DRAWINGS.

OWNER:	NATIONAL POWER CORPORATION AGHAM ROAD, DELIMAN QUEZON CITY
PROJECT:	SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X30 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP
LOCATION:	SINO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, KLRD
TITLE:	<b>TYPICAL DIRECT BURIED STEEL POLE</b> (PLAN & DETAIL)
DESIGNED:	BY:  H. L. MENDOZA Principal Engineer / CEAD
DRAWN:	BY:  A. C. ESPARITU Principal Engr. / ARCHT.
REVIEWED:	BY:  N. G. SCHUSTER Manager, DDO
CIVIL/ARCHT:	
ELEC:	
MECH:	
DWG. NO.	TagDPP-BDC-17.704
SPECS. NO.	VisP21Z1282Se
SCALE:	AS SHOWN
BID DRAWING	REV. 0

# **BID DRAWINGS**








## **MECHANICAL DRAWINGS**

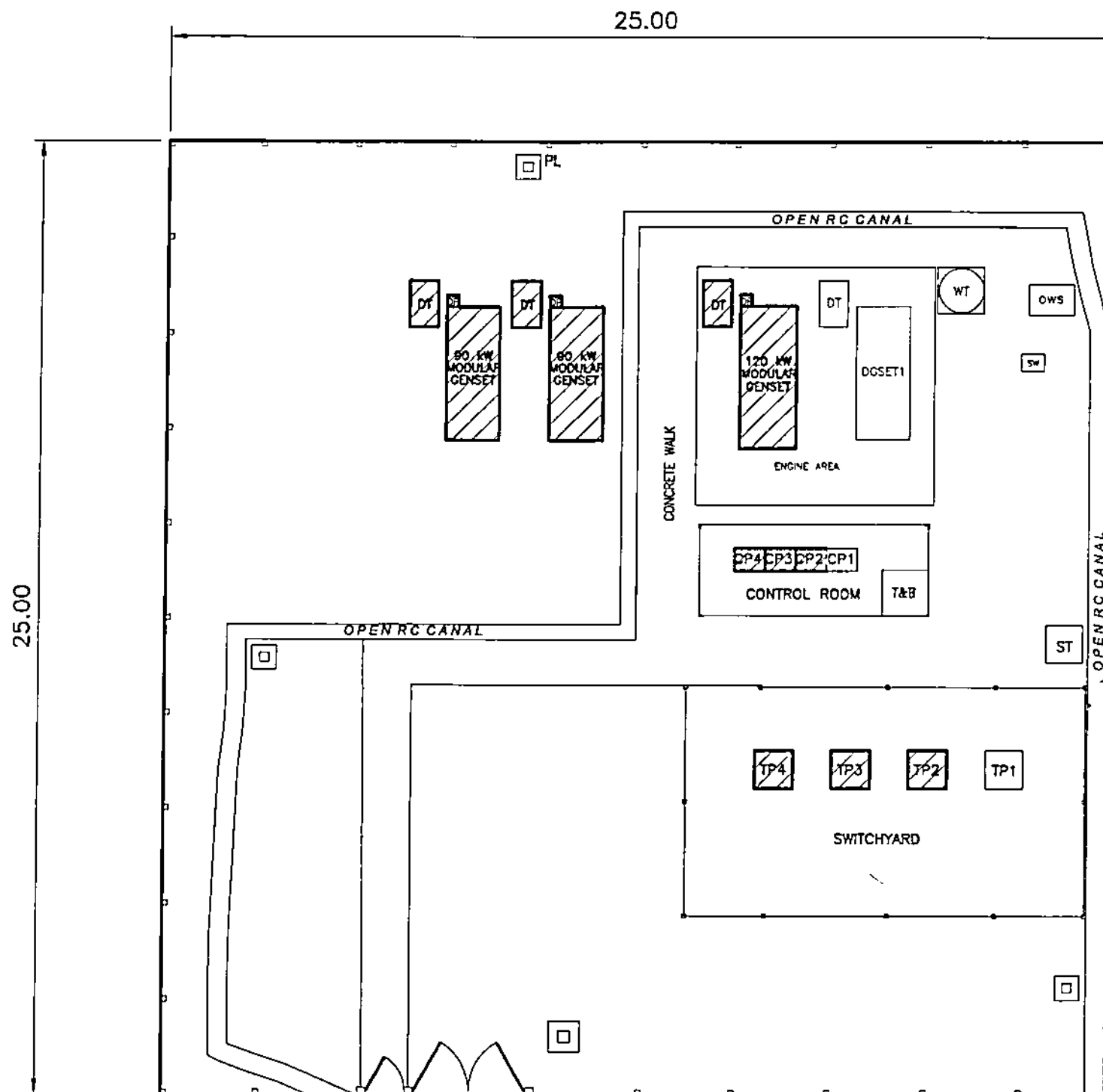
**SECTION IX - BID DRAWINGS****MW - MECHANICAL DRAWINGS**

<b>DRAWING NO.</b>	<b>TITLE</b>
TagDPP-BDM-17.001	SITE PLANT LAYOUT
TagDPP-BDM-17.002	EQUIPMENT AND PIPING LAYOUT
TagDPP-BDM-17.003	FUEL OIL FILLING SYSTEM – P&I DIAGRAM
TagDPP-BDM-17.004	GENSET WATER SYSTEM AND WASTE-OIL WATER LINE
TagDPP-BDM-17.005	1,000L FUEL OIL DAY TANK
TagDPP-BDM-17.006	GENERATOR SET WEATHERPROOF ENCLOSURE




# LEGEND :

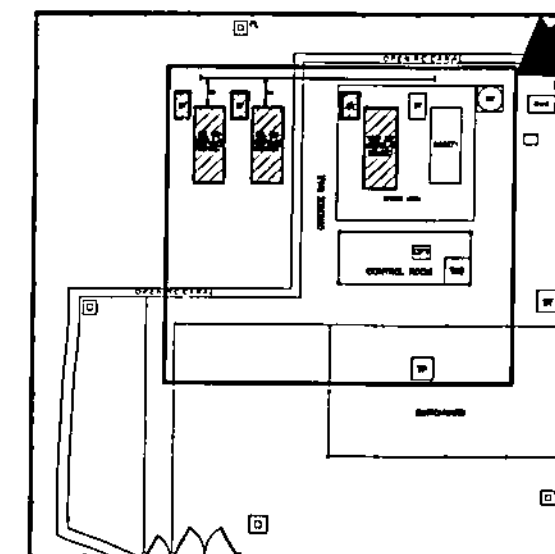
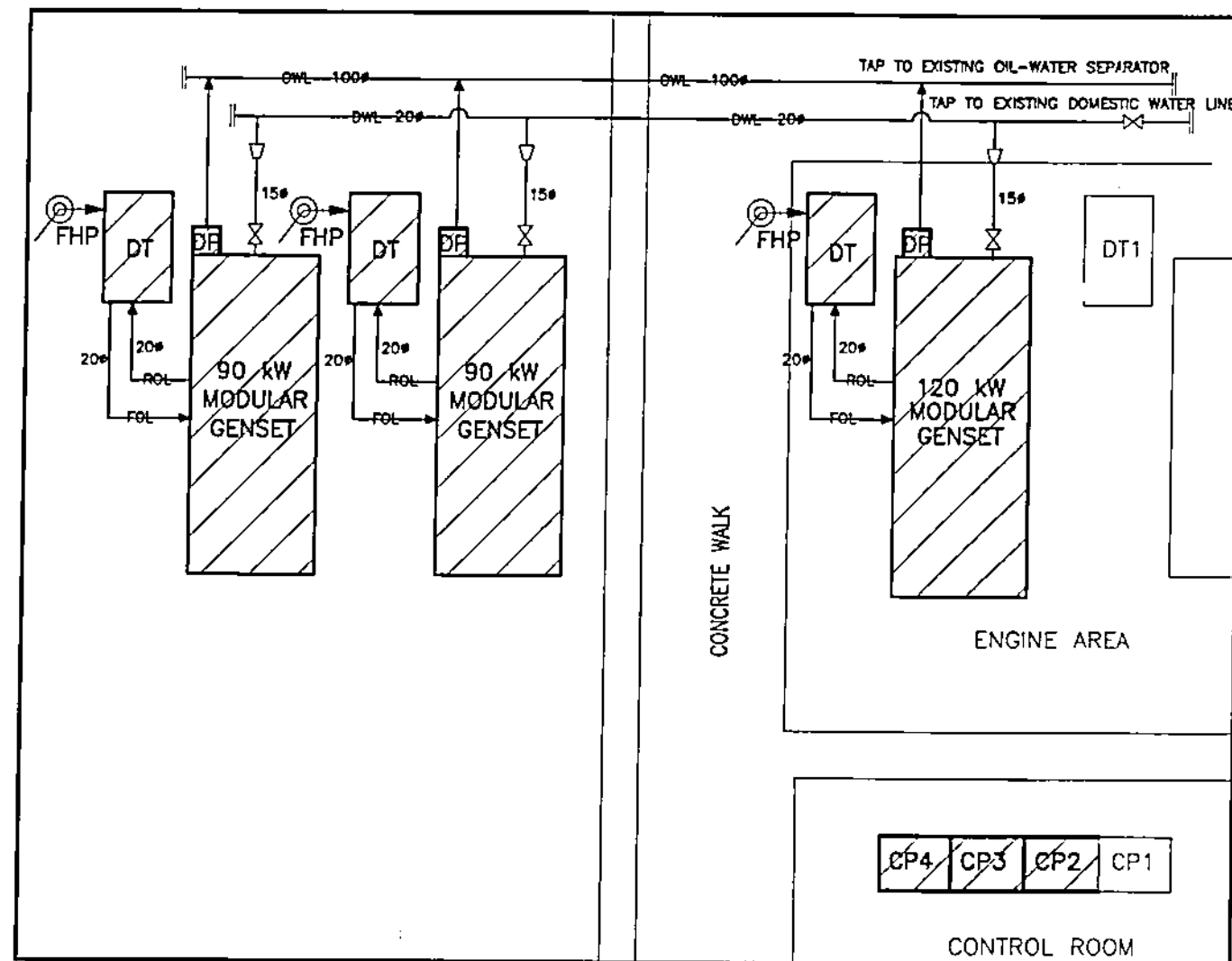
-  PROPOSED LOCATION OF EQUIPMENT
-  FUEL OIL LINE
-  DOMESTIC WATER LINE
-  HOSE BIBB
-  GATE VALVE (NORMALLY OPEN)
-  REDUCER
-  CHECK VALVE
- ST - SEPTIC TANK
- WT - WATER TANK
- CP - CONTROL PANEL
- DT - DAY TANK
- TP - TRANSFORMER PAD
- GH - GUARD HOUSE
- PL - PERIMETER LIGHT
- TP - TRANSFORMER PAD
- CP - CONTROL PANEL



## NOTES:

1. THIS DRAWING IS FOR BIDDING PURPOSES ONLY.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. THE ARRANGEMENT AND LAYOUT OF EQUIPMENT AND FACILITIES SHALL GENERALLY CONFORM WITH THOSE SHOWN ON THIS DRAWING. HOWEVER, EQUIPMENT MAY BE ARRANGED TO SUIT THE CONTRACTOR'S STANDARD DESIGN OR CONFIGURATION OF THE SUPPLIED EQUIPMENT PROVIDED THAT IT CAN BE ACCOMMODATED WITHIN THE DIMENSIONS SHOWN, SUBJECT TO REVIEW/APPROVAL OF NPC. ANY ADJUSTMENT/INCREASE ON THE DIMENSIONS OF THE FACILITIES SHOWN TO ACCOMMODATE THE EQUIPMENT TO BE SUPPLIED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NO COST TO NPC.
4. THE DESIGN OF AUXILIARY SYSTEMS AS DESCRIBED IN THE SPECIFICATION AND SHOWN ON THE IN THE BID DRAWINGS IS INTENDED TO INDICATE THE BASIC TYPE OF PROPOSED SYSTEMS. THE CONTRACTOR SHALL DESIGN IN DETAIL AND CARRY OUT ALL THE ENGINEERING NECESSARY TO PRODUCE A COMPLETE, SAFE, RELIABLE AND WORKABLE ARRANGEMENT FOR ALL SYSTEMS BEING PROVIDED AND AS REQUIRED BY THE EQUIPMENT TO BE SUPPLIED UNDER THIS SPECIFICATION.
5. FINAL ARRANGEMENT OF EQUIPMENT/CABLE TRENCH/PIPING/TAKE-OFF STRUCTURES SHALL BE FULLY COORDINATED TO SUIT ACTUAL CONDITIONS.
6. THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS AND FOUNDATION DETAILS FOR ALL EQUIPMENT TO BE SUPPLIED UNDER THIS SCOPE FOR APPROVAL OF NPC INCLUDING SMOKE STACK AND SUPPORT STRUCTURES, FUEL DAY TANK AND SUPPORT STRUCTURES AND OTHER WORKS AS DESCRIBED IN THE SPECIFICATIONS AND SHOWN ON THE DRAWINGS.
7. WORK THIS DRAWING WITH RELEVANT CIVIL AND ELECTRICAL DRAWINGS.

OWNER:		 <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X300 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANTHAN DPP			
LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE:		SITE/PLANT LAYOUT	
DESIGNED	BY	CHKD	DATE
DRAWN	BY	CHKD	DATE
REVIEWED	PRINCIPAL ENGR. TAPCHIT.		RECOMMENDED
CIVIL/ARCHT			MANAGER, MDO
ELEC.			APPROVED
MECH.			MANAGER, DDO
DWG. NO. TagDPP-BDM-17.001		SPECS. NO. VisP21Z1282Se	
SCALE: 1:150		BID DRAWING	
REV.	DATE	NATURE OF REVISION	CHKD. RECD. APPD.



AREA 2

# NOTES:

1. THIS DRAWING IS FOR BIDDING PURPOSES ONLY.
2. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
3. THIS DRAWING SHOWS THE ARRANGEMENT OF EQUIPMENT TO BE SUPPLIED/CONSTRUCTED BY THE SUPPLIER WHICH INCLUDES 1 X 120 KW & 2 X 90 KW MODULAR GENSETS, DAY TANKS, FUEL OIL AND WATER SUPPLY LINES, WASTE OR DRAIN LINE, TRANSFORMERS, ELECTRICAL POSTS AND BALANCE OF PLANT AND ASSOCIATED CIVIL APPURTENANCES/STRUCTURES.

THE SUPPLIER SHALL BE RESPONSIBLE FOR VERIFYING AT SITE THE MEASUREMENTS/INFORMATION OR DATA SHOWN ON THIS DRAWING INCLUDING AFFECTED CIVIL STRUCTURES/FACILITIES. THE EQUIPMENT SHALL BE ADJUSTED TO SUIT ACTUAL SITE CONDITIONS. FINAL ARRANGEMENT OF EQUIPMENT MAY BE RE-ARRANGED BY THE SUPPLIER SUBJECT TO REVIEW/APPROVAL OF NPC DURING PROJECT IMPLEMENTATION. THE SUPPLIER SHALL SUBMIT DESIGN CALCULATIONS AND FOUNDATION DETAILS FOR ALL EQUIPMENT AND CIVIL STRUCTURES TO BE SUPPLIED/CONSTRUCTED UNDER THIS SCOPE FOR APPROVAL OF NPC

4. MINIMUM DEPTH OF EMBEDDED PIPE SHALL BE NOT LESS THAN 300 MM IN OPEN GROUNDS AND 400 MM UNDER ROADWAYS. FOR PIPE THAT CROSSES ROADWAY, PIPE SLEEVES OF STEEL MATERIALS OR RSC SHALL BE PROVIDED.
5. EMBEDDED FUEL OIL PIPE SHALL BE PAINTED/APPLIES WITH TAPE WRAPPING IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION.
6. WORK THIS DRAWING WITH APPLICABLE CIVIL AND ELECTRICAL DRAWINGS.
7. ALL OTHER WORKS, MATERIALS AND SERVICES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE TECHNICAL SPECIFICATION.

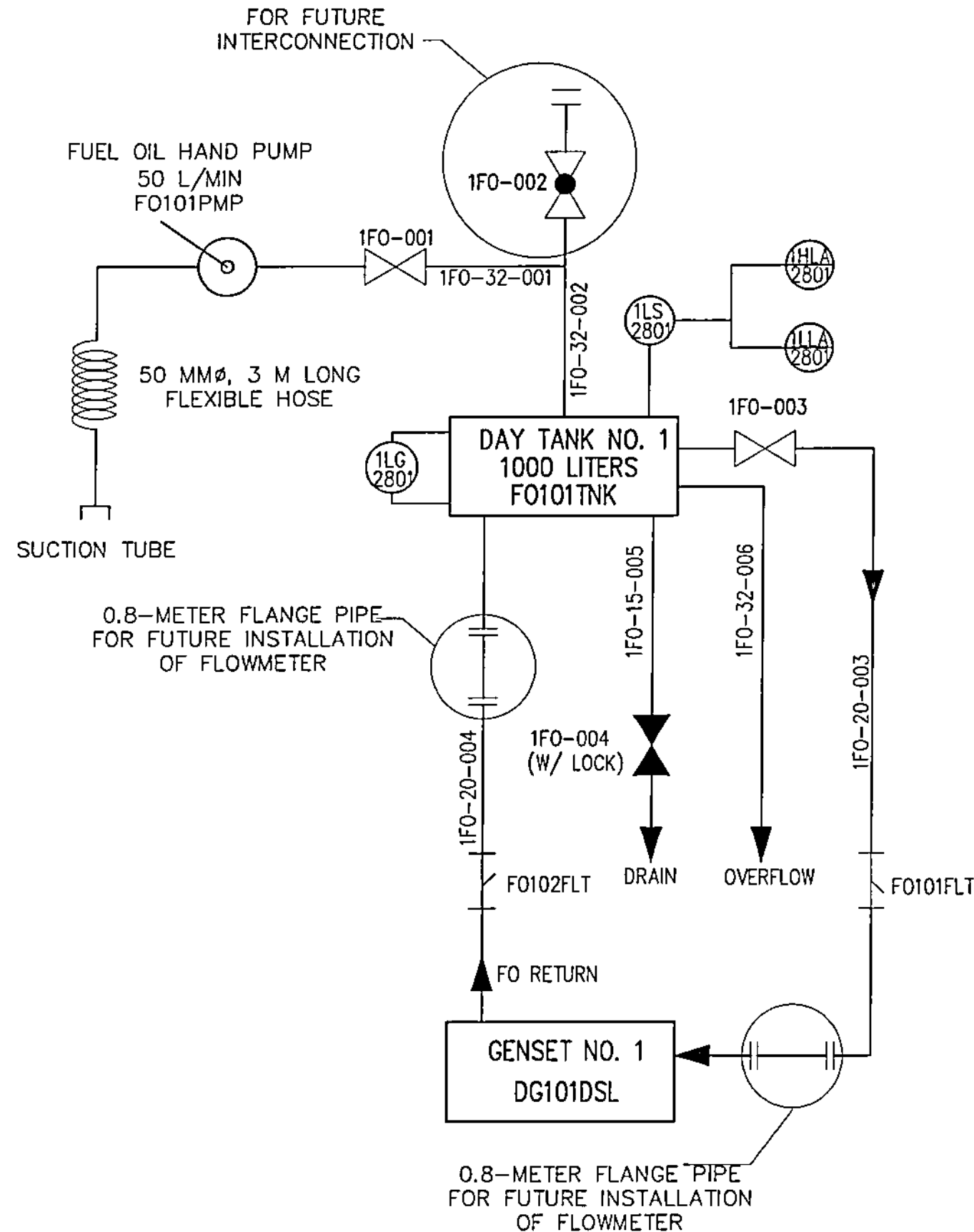
## LEGEND :




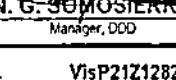
- PROPOSED LOCATION OF EQUIPMENT
- FUEL OIL LINE
- DOMESTIC WATER LINE
- GATE VALVE (NORMALLY OPEN)
- REDUCER
- CP - CONTROL PANEL
- DT - DAY TANK
- OWL - OIL-WATER LINE
- ROL - RETURN OIL LINE
- OWS - OIL WATER SEPARATOR
- DP - DRAIN PIT
- FHP - FUEL HANDPUMP

OWNER:		<b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2x90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBAHAN DPP			
LOCATION: SITIO PALMA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE:		<b>EQUIPMENT AND PIPING LAYOUT</b>	
DESIGNED	BY	CHKD	DATE
DRAWN	DATE		
REVIEWED	PRINCIPAL ENGR. / ARCHT.	RECOMMENDED	
CIVIL/ARCHT		APPROVED	
ELEC.			
MECH.			
DWG. NO. <b>TagDPP-BDM-17.002</b>		SPECS. NO. <b>VisP21Z1282Se</b>	
SCALE: 1:75		<b>BID DRAWING</b>	
REV.	DATE	NATURE OF REVISION	CHKD. RECD. APPD.

## NOTES:

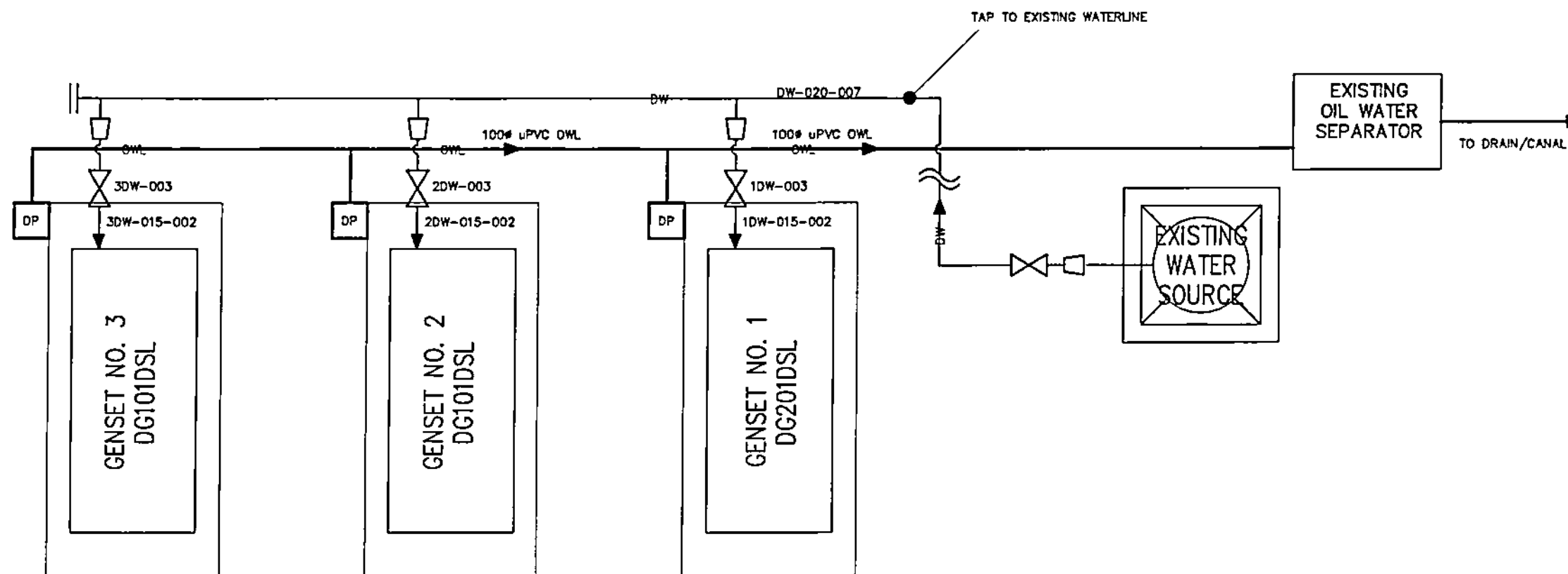
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. ELEVATION OF DAY TANK SHALL NOT BE LESS THAN THOSE INDICATED ON RELEVANT CIVIL DRAWINGS, BUT MAY BE ADJUSTED/INCREASED TO CONFORM WITH THE ENGINE REQUIREMENTS PER MANUFACTURER'S RECOMMENDATION;
3. FUEL OIL PIPES SHALL CONFORM TO ASTM A 53 GRADE B, SEAMLESS AND SCHEDULE 40. SIZE OF FUEL PIPES TO/FROM THE ENGINE MAY BE REVISED TO CONFORM WITH THE REQUIREMENTS SUBJECT TO NPC APPROVAL;
4. VALVES 65 MMØ AND LARGER SHALL BE CAST IRON, FLANGED ENDS, OSY OR RISING STEM, CLASS 150. VALVES 50 MMØ AND BELOW SHALL BE CAST BRONZE, FLANGED OR SCREWED ENDS, RISING STEM, CLASS 150;
5. FUEL OIL PIPES WHICH ARE BURIED UNDERGROUND, IF NECESSARY SHALL BE APPLIED WITH 1MM MINIMUM THICKNESS OF TAPE WRAPPING APPLIED SPIRALLY WITH OVERLAP OF 50% OR APPROVED EQUIVALENT. FOR PIPES THAT CROSSES ROADWAYS, PIPE SLEEVE OF GALVANIZED STEEL MATERIAL OR RSC SHALL BE PROVIDED;
6. LEVEL SWITCH FOR HIGH AND LOW LEVEL ALARM SHALL BE PROVIDED AND TO BE MONITORED AT THE GENERATOR CONTROL & PROTECTION PANEL LOCATED AT THE CONTROL ROOM;
7. HAND PUMP SHALL HAVE CAPACITY OF NOT LESS THAN 50 LITERS PER MINUTE @ 10M DISCHARGE HEAD, DOUBLE ACTING ROTARY TYPE, HEAVY DUTY CAST IRON CONSTRUCTION WITH BRASS INTERNALS WITH EASY CLEAN WIRE SCREEN, EASY DISPENSING THROUGH SYNTHETIC RUBBER HOSE, WITH TELESCOPIC SUCTION TUBE, ADJUSTED TO FIT 50MM DIAMETER TO 210 LITERS DRUM. THE SUPPLY SHALL INCLUDE RUBBER HOSE NOT LESS THAN 50MM DIAMETER AND 3 METERS LONG, REINFORCED WITH SPIRAL-PLUED SYNTHETIC FABRIC WITH WIRE HELIX COMPLETE CONNECTION ACCESSORIES AT BOTH ENDS;
8. FINAL DETAILS AND ADJUSTMENTS SHALL BE DONE IN THE FIELD BY THE SUPPLIER DURING INSTALLATION;
9. THE SUPPLIER SHALL SUPPLY FLEXIBLE HOSE NOT LESS THAN 50 MM Ø AN 3 METERS LONG FITTED WITH STEEL PIPE NOT LESS THAN 50 MM Ø FOR HANDLING FUEL OIL FROM A 210 L DRUM AND FLANGE CONNECTION AT F.O. TRANSFER PUMP SUCTION. THE FLEXIBLE HOSE SHALL BE MADE OF SYNTHETIC RUBBER TUBE, REINFORCED WITH SPIRAL-PLUED SYNTHETIC FABRIC WITH WIRE HELIX; AND
10. THE DIAGRAM SHOWN IS TYPICAL FOR EACH UNIT. THE TAG NO. SHOWN ARE FOR UNIT NO. 1. TAG NUMBERS OR SPIN FOR OTHER DIESEL GENSET UNITS SHALL BE THE SAME AS UNIT 1 EXCEPT FOR UNIT NUMBER. EX. DG101DSL, DG201DSL, 1FO-001, 2F0001.



OWNER: 		NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP			
LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>FUEL OIL FILLING SYSTEM P&amp;I DIAGRAM</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	jesTC		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.			
MECH.			
SUBMITTED: 		RECOMMENDED: 	
APPROVED: 		Manager, DOD	
DWG. NO. TagDPP-BDM-17.003		SPECS. NO. VisP2121282Se	
SCALE: NTS		BID DRAWING	
REV. 0		REV. 0	



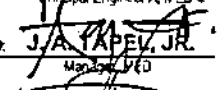

REV.	DATE	NATURE OF REVISION	BY	CHKD	RECD	APPO.

LEGEND	
—	MAIN DOMESTIC PIPELINE
⊗	GATE VALVE (NORMALLY OPEN)
⊗	GATE VALVE (NORMALLY CLOSE)
⊗	BALL VALVE
⌞	CHECK VALVE
▷	REDUCER
⊥	HOSE BIBB
— —	BLIND FLANGE

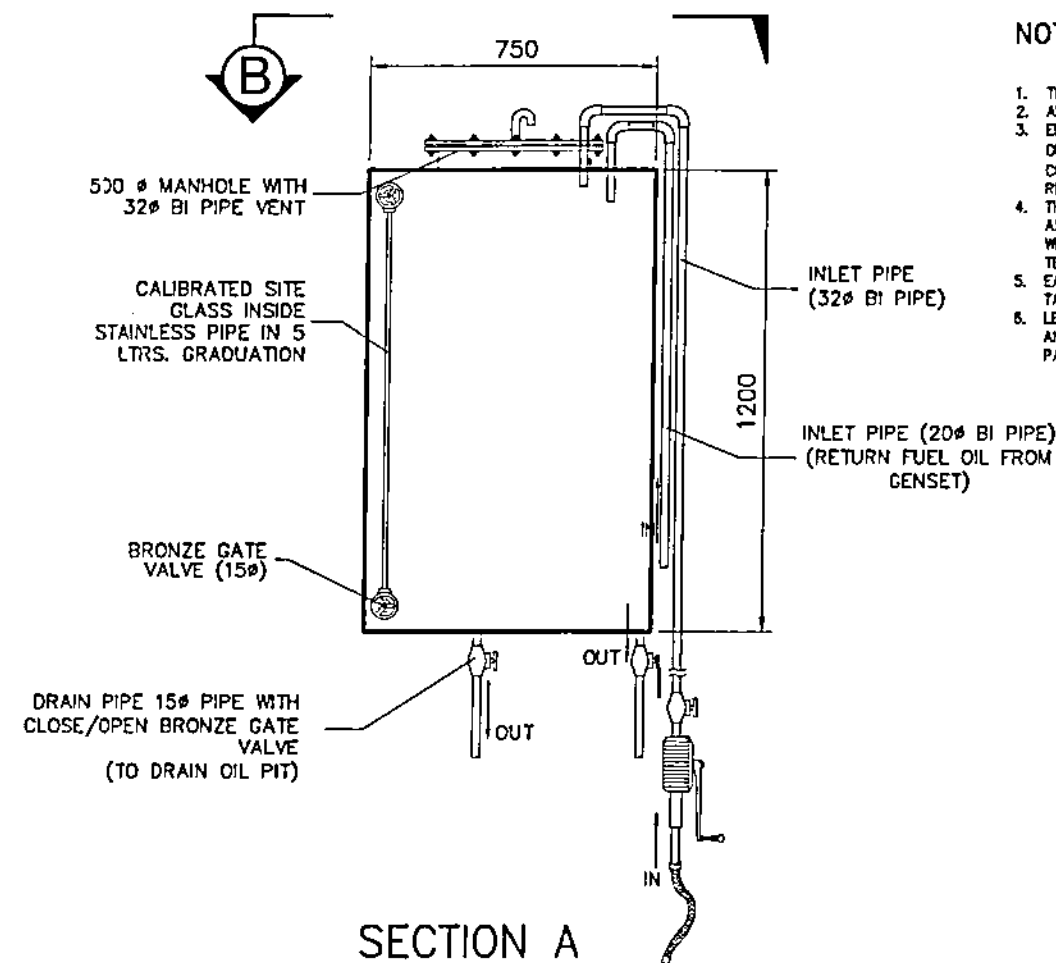
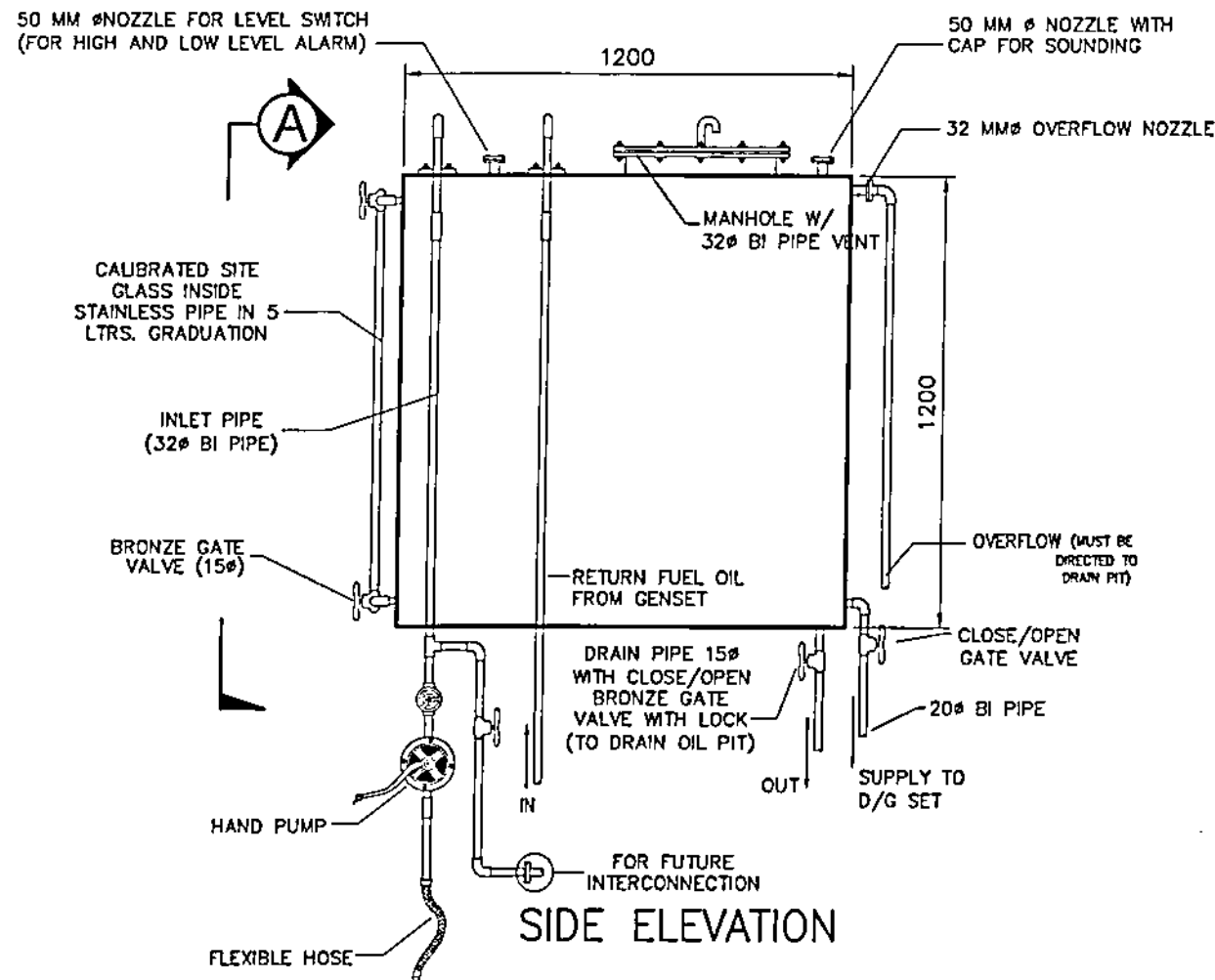


## NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- ELEVATION OF DAY TANK SHALL NOT BE LESS THAN THOSE INDICATED ON RELEVANT CIVIL DRAWINGS, BUT MAY BE ADJUSTED/INCREASED TO CONFORM WITH THE ENGINE REQUIREMENTS PER MANUFACTURER'S RECOMMENDATION;
- FUEL OIL PIPES SHALL CONFORM TO ASTM A 53 GRADE B, SEAMLESS AND SCHEDULE 40. SIZE OF FUEL PIPES TO/FROM THE ENGINE MAY BE REVISED TO CONFORM WITH THE REQUIREMENTS SUBJECT TO NPC APPROVAL;
- VALVES 65 MMØ AND LARGER SHALL BE CAST IRON, FLANGED ENDS, OSY OR RISING STEM, CLASS 150. VALVES 50 MMØ AND BELOW SHALL BE CAST BRONZE, FLANGED OR SCREWED ENDS, RISING STEM, CLASS 150;
- FUEL OIL PIPES WHICH ARE BURIED UNDERGROUND, IF NECESSARY SHALL BE APPLIED WITH 1MM MINIMUM THICKNESS OF TAPE WRAPPING APPLIED SPIRALLY WITH OVERLAP OF 50% OR APPROVED EQUIVALENT. FOR PIPES THAT CROSSES ROADWAYS, PIPE SLEEVE OF GALVANIZED STEEL MATERIAL OR RSC SHALL BE PROVIDED;
- LEVEL SWITCH FOR HIGH AND LOW LEVEL ALARM SHALL BE PROVIDED AND TO BE MONITORED AT THE GENERATOR CONTROL & PROTECTION PANEL LOCATED AT THE CONTROL ROOM;
- INDIVIDUAL FLOW METERS SHALL HAVE LCD DISPLAY CAPABLE OF MONITORING THE TOTAL/ACCUMULATED FLOW, RESETTABLE TOTAL FLOW AND INSTANTANEOUS FLOW RATE WITH MINIMUM 60 MESH SIZE STRAINER, 0.5% ACCURACY AND 0.03% REPEATABILITY, MADE OF ALUMINUM OR APPROVED EQUIVALENT WITH FLANGED ENDS, WITH INTERNAL BATTERY THAT CAN LAST UP TO AT LEAST 5 YEARS. THE FLOWMETER SHALL BE EQUIPPED WITH PULSE GENERATOR OR 4-20MA CURRENT OUTPUT AND READY FOR INTERCONNECTIONS IN FUTURE TELEMETRY PROJECT;
- HAND PUMP SHALL HAVE CAPACITY OF NOT LESS THAN 50 LITERS PER MINUTE @ 10M DISCHARGE HEAD, DOUBLE ACTING ROTARY TYPE, HEAVY DUTY CAST IRON CONSTRUCTION WITH BRASS INTERNALS WITH EASY CLEAN WIRE SCREEN, EASY DISPENSING THROUGH SYNTHETIC RUBBER HOSE, WITH TELESCOPIC SUCTION TUBE, ADJUSTED TO FIT 50MM DIAMETER TO 210 LITERS DRUM. THE SUPPLY SHALL INCLUDE RUBBER HOSE NOT LESS THAN 50MM DIAMETER AND 3 METERS LONG, REINFORCED WITH SPIRAL-PLUED SYNTHETIC FABRIC WITH WIRE HELIX COMPLETE CONNECTION ACCESSORIES AT BOTH ENDS;
- FINAL DETAILS AND ADJUSTMENTS SHALL BE DONE IN THE FIELD BY THE SUPPLIER DURING INSTALLATION;
- THE SUPPLIER SHALL SUPPLY FLEXIBLE HOSE NOT LESS THAN 50 MM Ø AN 3 METERS LONG FITTED WITH STEEL PIPE NOT LESS THAN 50 MM Ø FOR HANDLING FUEL OIL FROM A 210 L DRUM AND FLANGE CONNECTION AT F.O. TRANSFER PUMP SUCTION. THE FLEXIBLE HOSE SHALL BE MADE OF SYNTHETIC RUBBER TUBE, REINFORCED WITH SPIRAL-PLUED SYNTHETIC FABRIC WITH WIRE HELIX; AND
- THE DIAGRAM SHOWN IS TYPICAL FOR EACH UNIT. THE TAG NO. SHOWN ARE FOR UNIT NO. 1. TAG NUMBERS OR SPIN FOR OTHER DIESEL GENSET UNITS SHALL BE THE SAME AS UNIT 1 EXCEPT FOR UNIT NUMBER. EX. DG101DSL, DG201DSL, 1FO-001, 2FO001.

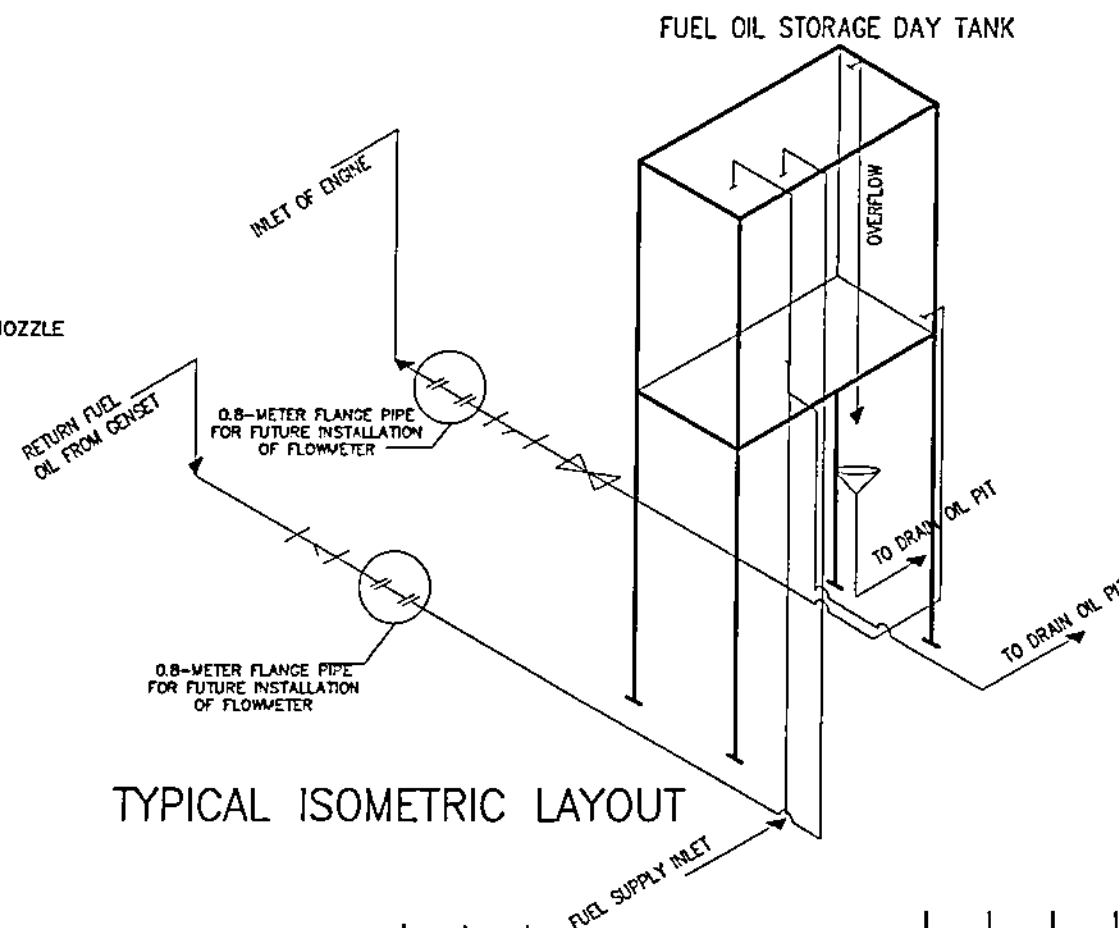
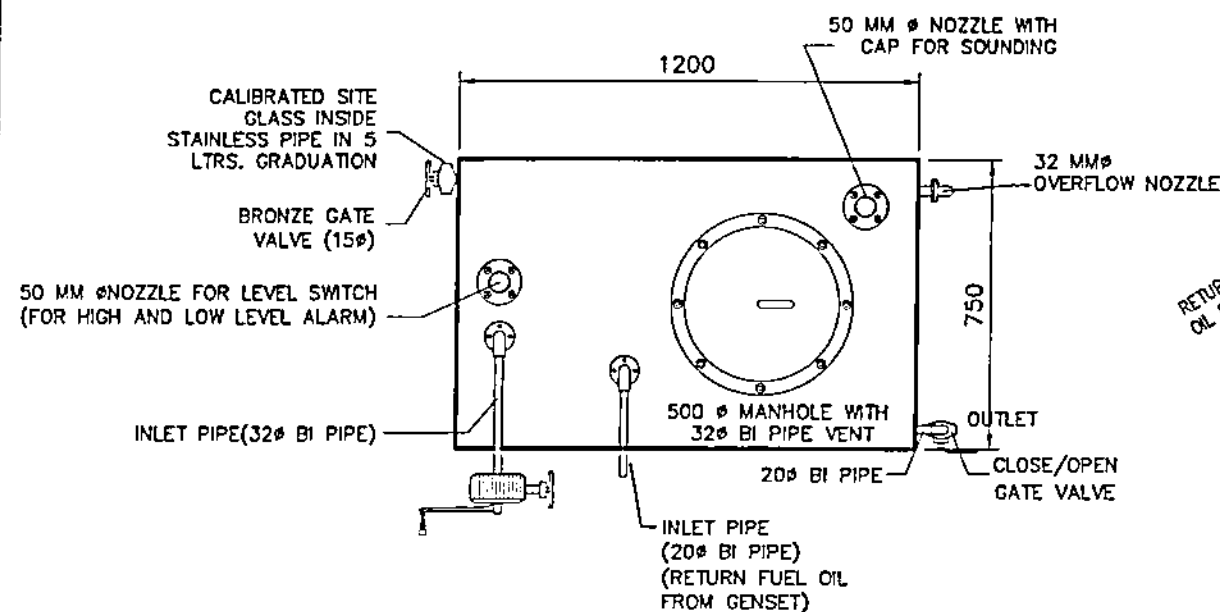
OWNER: 		NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANKHAN DPP			
LOCATION: SITIO PALMA GRANDE, BRGY. BANGONGONG, CONCEPCION, ILOILO			
TITLE: <b>GENSET WATER SYSTEM AND WASTE OIL-WATER LINE</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JEH/TC		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.			
MECH.			
SUBMITTED:  R.M. CADSAWAN Principal Engineer A, MED		RECOMMENDED:  J.A. YAP, JR. Manager, EED	
APPROVED:  N.G. GOMOSIERA Manager, DDG			
DWG. NO. TagDPP-BDM-17.004		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		BID DRAWING	
REV. 0			

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.



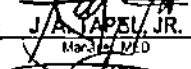
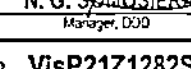


# NOTES:

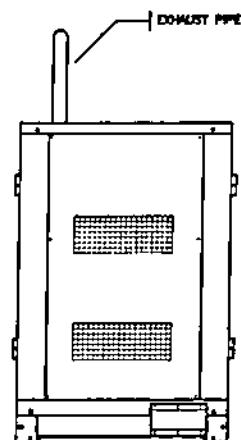
1. THIS DRAWING IS FOR BIDDING PURPOSES ONLY.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. ELEVATION OF DAY TANK SHALL NOT BE LESS THAN THOSE INDICATED ON RELEVANT CIVIL DRAWINGS, BUT MAY BE ADJUSTED/INCREASED TO CONFORM WITH THE ENGINE REQUIREMENTS PER MANUFACTURER'S RECOMMENDATION.
4. THE TANK SHALL BE SHOP-FABRICATED, RECTANGULAR MADE OF ASTM A 36 OR APPROVED EQUAL WITH MINIMUM THICKNESS OF 5 MM, WITH INTERIOR AND EXTERIOR COATING TO CONFORM WITH THE TECHNICAL SPECIFICATIONS CLAUSE MW-5.2.
5. EACH DIESEL GENERATING SET SHALL BE PROVIDED WITH FUEL DAY TANK; AND
6. LEVEL SWITCH FOR HIGH AND LOW LEVEL ALARM SHALL BE PROVIDED AND TO BE MONITORED AT THE GENERATOR CONTROL & PROTECTION PANEL LOCATED AT THE CONTROL ROOM.



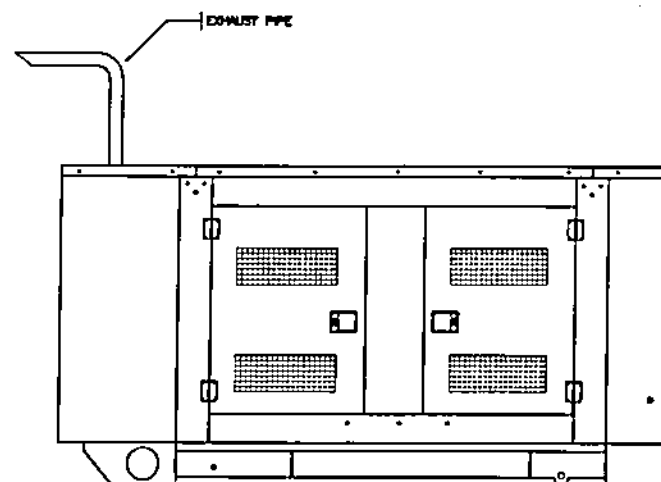
## FUEL OIL STORAGE DAY TANK

OWNER: 		NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x125 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP			
LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>1,000L FUEL OIL DAY TANK</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JMT		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.			
MECH.			
SUBMITTED: 		R.M. CEBADAWAN Principal Engineer A, MED	
RECOMMENDED: 		J.A. TAPAY, JR. Manager, MED	
APPROVED: 		N.G. SOLIS Manager, DDO	
DWG. NO. TagDPP-BDM-17.005		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		BID DRAWING	
REV. 0			

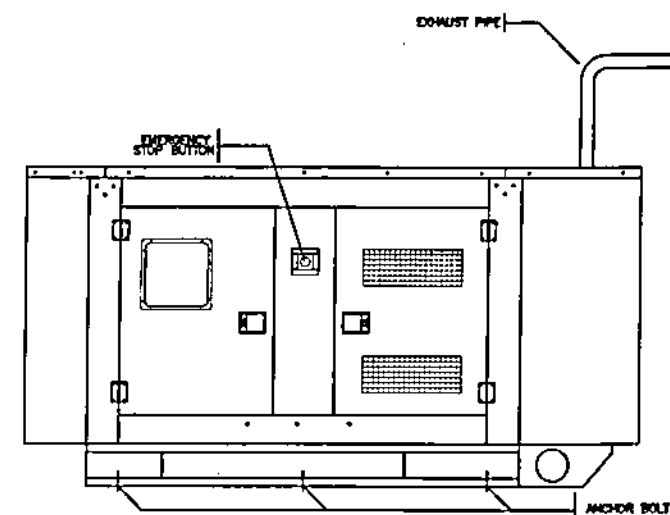
REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.



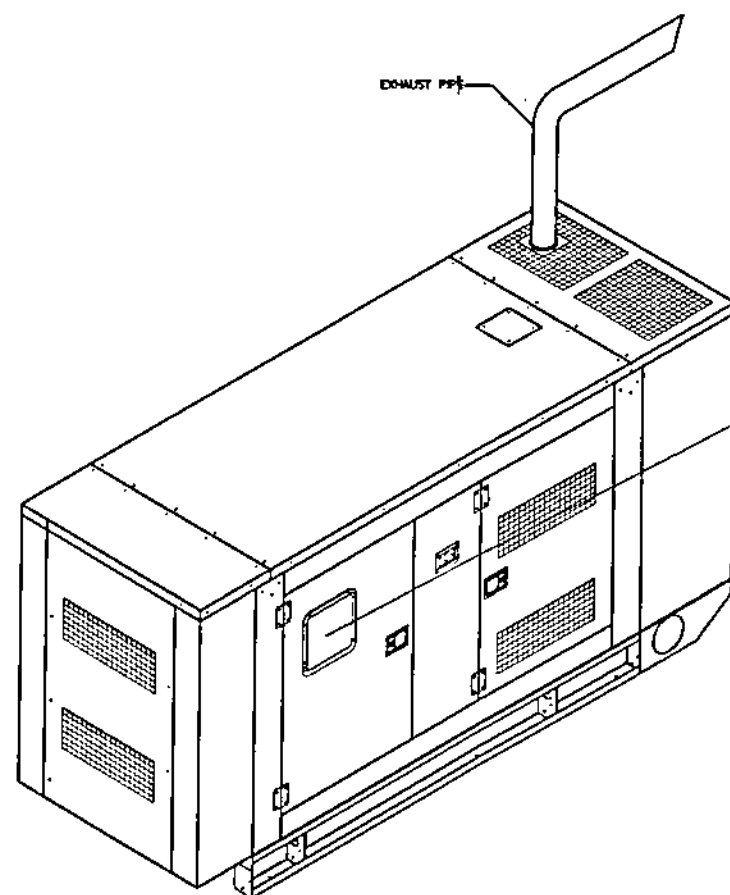
FRONT VIEW



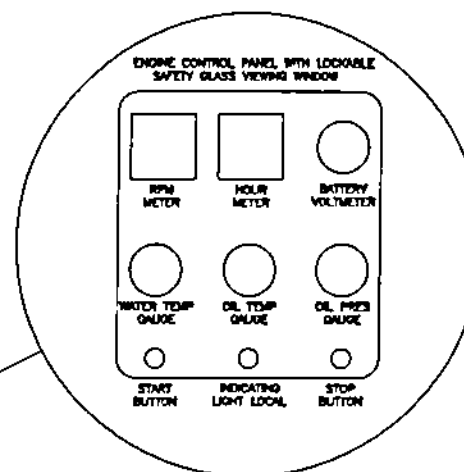
RIGHT SIDE VIEW



LEFT SIDE VIEW




ISOMETRIC VIEW



# NOTES:

- THE ENCLOSURE SHALL HAVE THE FOLLOWING FEATURES:
  - 1.1 LESS THAN 85 dBA SOUND PRESSURE LEVEL AT 1 METER FROM ANY POINT OF THE ENCLOSURE
  - 1.2 2mm MINIMUM THICKNESS OF WALL/ROOF ENCLOSURE
  - 1.3 STAINLESS BOLTS AND HINGES
  - 1.4 CAN WITHSTAND 250 KPH WIND VELOCITY AND/OR AS SPECIFIED IN THE LATEST EDITION OF NATIONAL STRUCTURAL CODE OF THE PHILIPPINES.
- THE SUPPLIER SHALL SUBMIT DRAWING DETAILS OF THE ENCLOSURE FOR NPC REVIEW AND APPROVAL
- THE MONITORING/CONTROL POINTS AT MONITORING PANEL SHOWN HEREIN ARE MINIMUM REQUIREMENTS. ADDITIONAL MONITORING POINTS AND ITS ARRANGEMENT MAY BE PROVIDED AND ARRANGED PER MANUFACTURER'S STANDARD SUBJECT TO NPC APPROVAL
- RAIN TEST EQUIVALENT TO 100MM PER HOUR SHALL BE CONDUCTED TO ENSURE THAT RAIN WATER IS PREVENTED FROM ENTERING THE ENCLOSURE.

OWNER:  <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x125 KW AND 2X99 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP	
LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO	
TITLE: <b>GENERATOR SET WEATHERPROOF ENCLOSURE</b>	
DESIGNED	SUBMITTED: <b>R. M. CADSAWAN</b> PRINCIPAL ENGINEER & MEO
DRAWN	RECOMMENDED: <b>J. A. TAPEL, JR.</b> MANAGER, MEO
REVIEWED	APPROVED: <b>N. G. SOMOCIERBA</b> MANAGER, DDO
CIVIL/ARCHT	
ELEC	
MECH	
DWG. NO. <b>TagDPP-BDM-17.006</b>	SPECS. NO. <b>VisP21Z1282Se</b>
SCALE: NTS	BID DRAWING
REV. 0	

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.

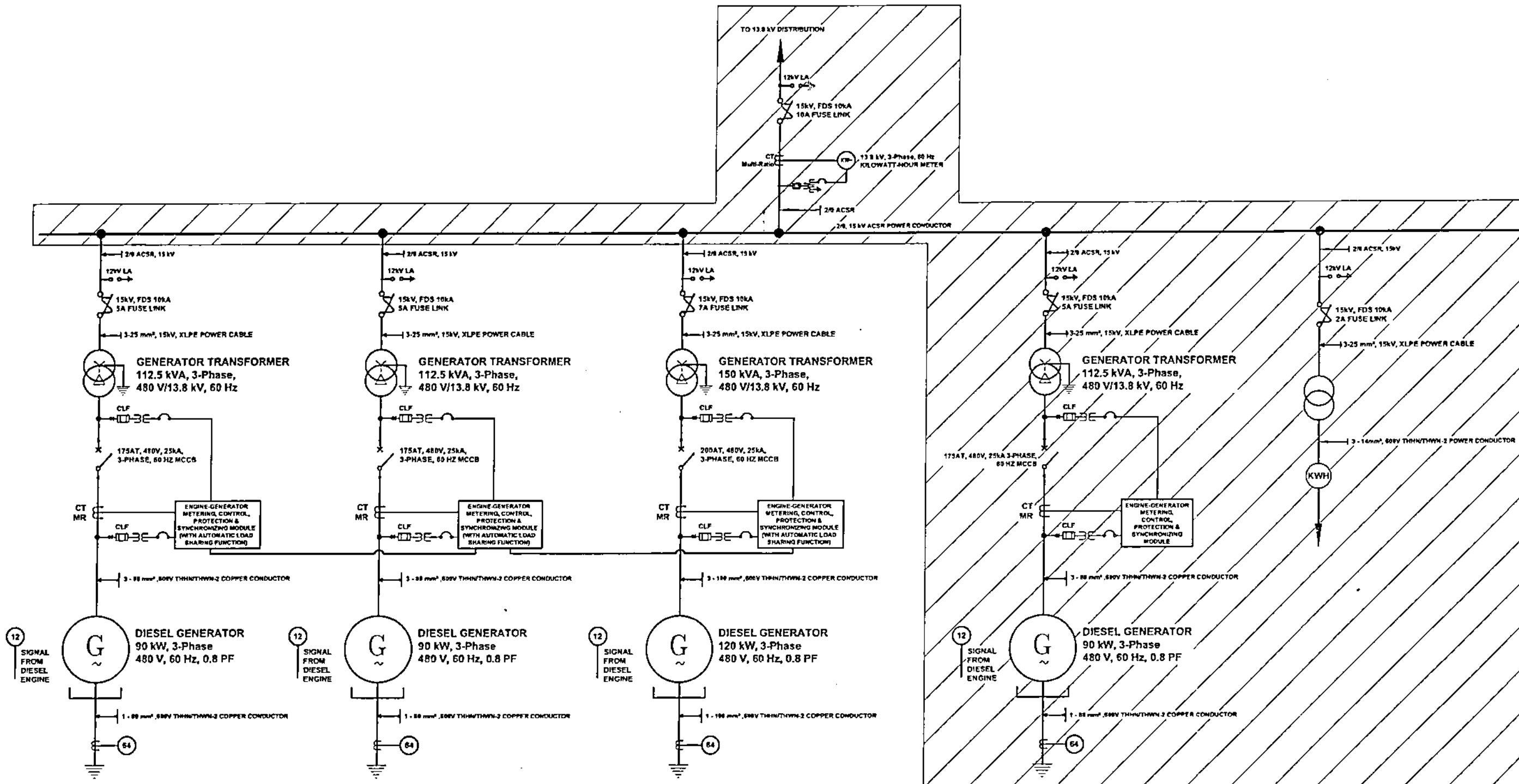
# **BID DRAWINGS**

## **ELECTRICAL DRAWINGS**

**SECTION IX - BID DRAWINGS****EW – ELECTRICAL DRAWINGS**

<b>DRAWING NO.</b>	<b>TITLE</b>
TagDPP-BDE-17.001	SINGLE LINE DIAGRAM
TagDPP-BDE-17.002	EQUIPMENT LAYOUT
TagDPP-BDE-17.003	TAKE-OFF STRUCTURE DETAILS
TagDPP-BDE-17.004	ROUTE OF CABLE TRAY AND CONDUIT PLAN
TagDPP-BDE-17.005	SYSTEM CONFIGURATION
TagDPP-BDE-17.006	OUTLINE DRAWING OF GENERATOR CONTROL AND PROTECTION PANEL (GCPP)
TagDPP-BDE-17.007	DETAILS OF CABLE TRAY
TagDPP-BDE-17.008	DETAILS OF EQUIPMENT GROUND CONNECTION
TagDPP-BDE-17.009	DETAILS OF TRANSFORMER TERMINATION
TagDPP-BDE-17.010	GENERAL NOTES





# NOTES:

1. THE SUPPLIER SHALL PROVIDE PROTECTION MODULE EQUIPPED WITH THE ENGINE-GENERATOR PROTECTION AS SHOWN.
2. TRIP AND FAULT ALARM/SIGNAL FROM THE GENERATOR TRANSFORMER SHALL BE INCLUDED IN THE ENGINE-GENERATOR ANNUNCIATOR WINDOW.
3. BURDENS AND RATINGS INCLUDING CIRCUIT PROTECTIONS OF INSTRUMENT TRANSFORMER SHALL BE DETERMINED BY THE SUPPLIER.
4. ALL THE EQUIPMENT TO BE SUPPLIED SHALL BE TESTED AND PROVEN PASSED IN ACCORDANCE TO THE REQUIREMENTS OF SECTION VI. - TECHNICAL SPECIFICATIONS.
5. ALL EQUIPMENT IN THE SHADED AREA ARE EXISTING, ALL OTHERS ARE INCLUDED ON THE CONTRACT.

# LEGEND:

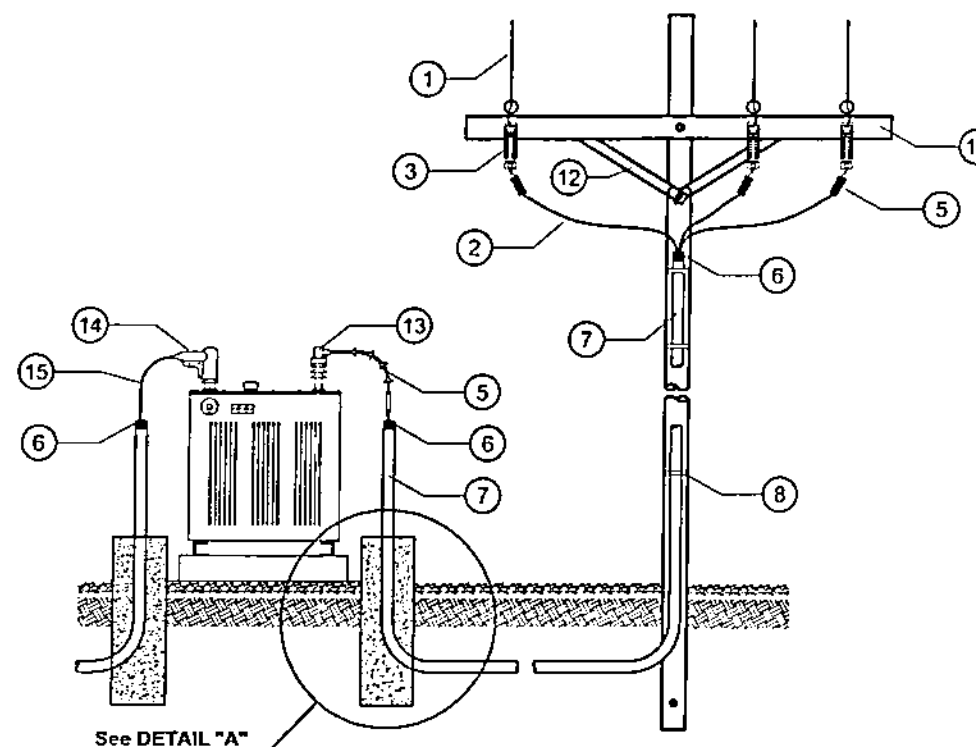
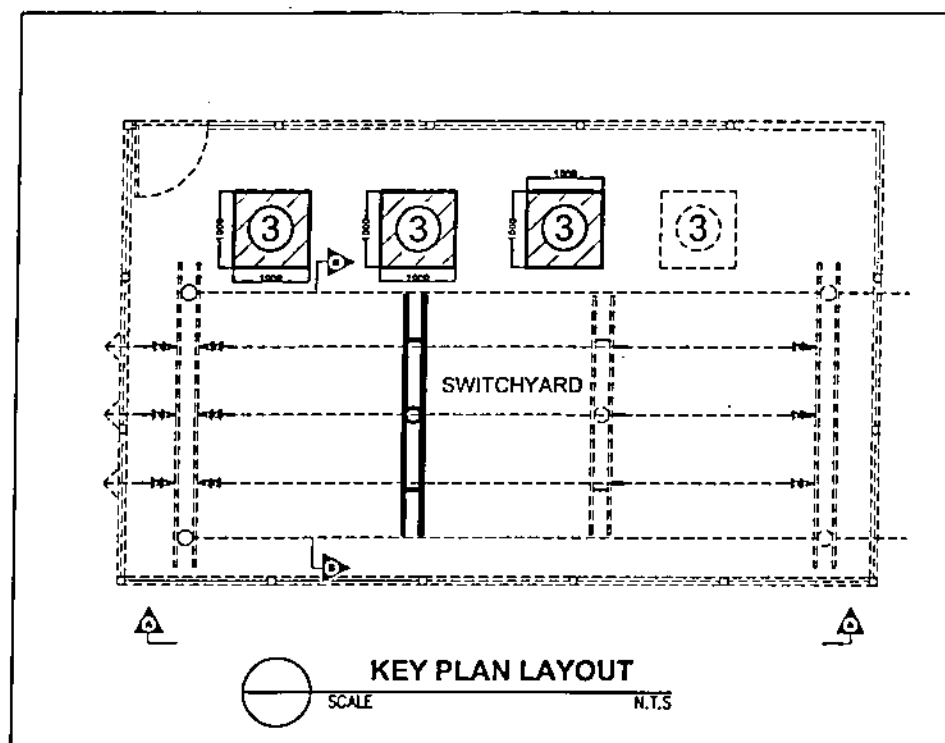
- |  |                             |  |                       |
|--|-----------------------------|--|-----------------------|
|  | GENERATOR TRANSFORMER       |  | LIGHTNING ARRESTER    |
|  | GENERATOR CIRCUIT BREAKER   |  | CURRENT LIMITING FUSE |
|  | DIESEL GENERATOR            |  | VOLTAGE TRANSFORMER   |
|  | STATION SERVICE TRANSFORMER |  | CURRENT TRANSFORMER   |
|  | FUSE DISCONNECT SWITCH      |  | KILOWATT-HOUR METER   |
|  | EARTHGROUND                 |  |                       |

# PROTECTION & MONITORING DEVICES:

- |         |   |
|---------|---|
| 12      | OVERSPEED RELAY                         |
| 25      | SYNCHRONIZING DEVICE                    |
| 27/59   | UNDER/OVER VOLTAGE RELAY                |
| 30      | ANNUNCIATOR RELAY                       |
| 32      | DIRECTIONAL POWER RELAY                 |
| 47      | PHASE-SEQUENCE VOLTAGE RELAY            |
| 49      | THERMAL RELAY                           |
| 50/51   | INSTANTANEOUS/AC TIME OVERCURRENT RELAY |
| 50N/51N | RESIDUAL OVER CURRENT RELAY             |
| 64      | GROUND PROTECTIVE RELAY                 |
| 81      | FREQUENCY RELAY                         |
| 94      | TRIPPING RELAY                          |

OWNER:  NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2x90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP	
LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO	
TITLE: SINGLE LINE DIAGRAM (1 x 120kW & 2 X 90kW D/G SET - TAGUBANHAN DPP)	
DESIGNED: BY: CHD DATE:	SUBMITTED:
DRAWN: JAC	PRINCIPAL ENGINEER: B.M. AGUILA
REVIEWED: PRINCIPAL ENGR. / ARCHT.	RECOMMENDED:
CIVIL/ARCHT.	MANAGER: EECED
ELEC. MRP	APPROVED:
MECH.	MANAGER: CDD
DWG. NO. TagDPP-BDE-17.001 SPECS. NO. VisP21Z1282Se	
SCALE: NTS BID DRAWING	
REV. 0	





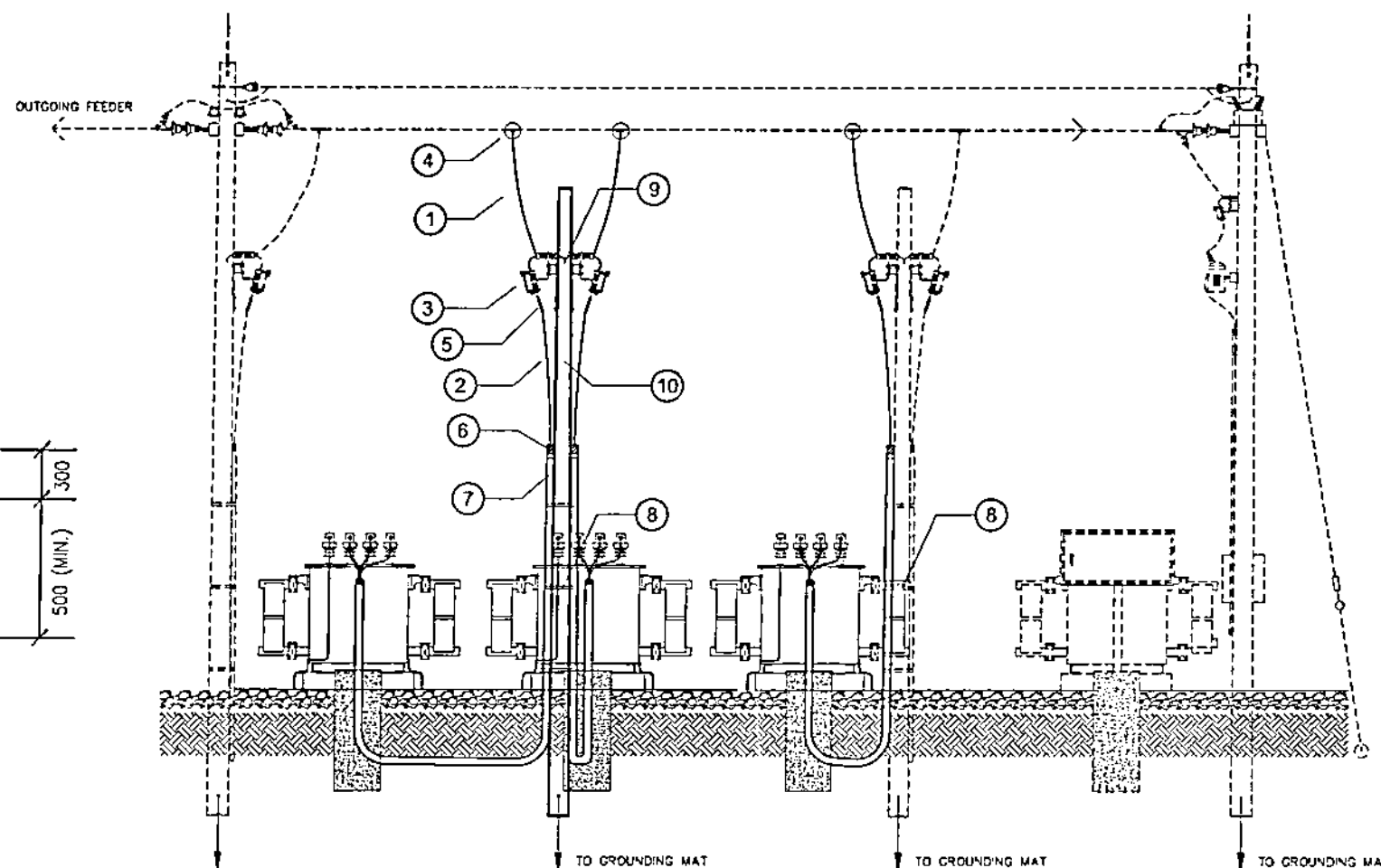
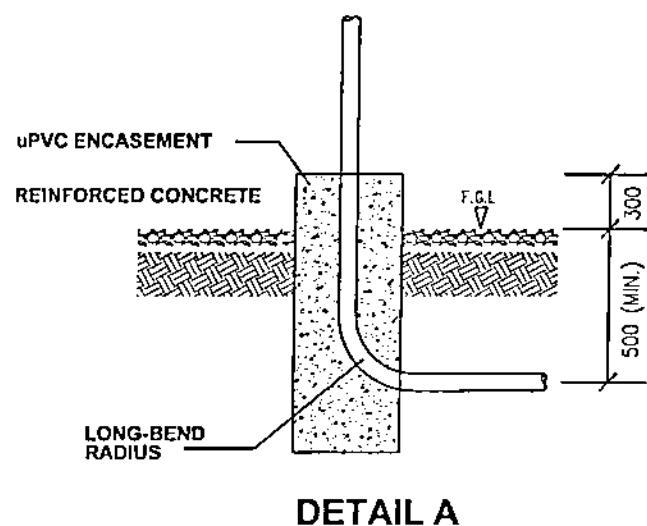
**SECTION B-B**

**NOTES:**

1. TRANSFORMER HIGH VOLTAGE AND LOW VOLTAGE BUSHINGS SHALL BE PROVIDED WITH INSULATING SHROUDS. DETAILS OF TERMINATION SHALL BE REFERRED TO BID DRAWING NO. TagDPP-BDE-17.009.
2. ALL EQUIPMENT/STRUCTURES DRAWN IN HIDDEN LINES ARE EXISTING. ALL OTHERS ARE INCLUDED IN THE CONTRACT.

**LEGEND:**

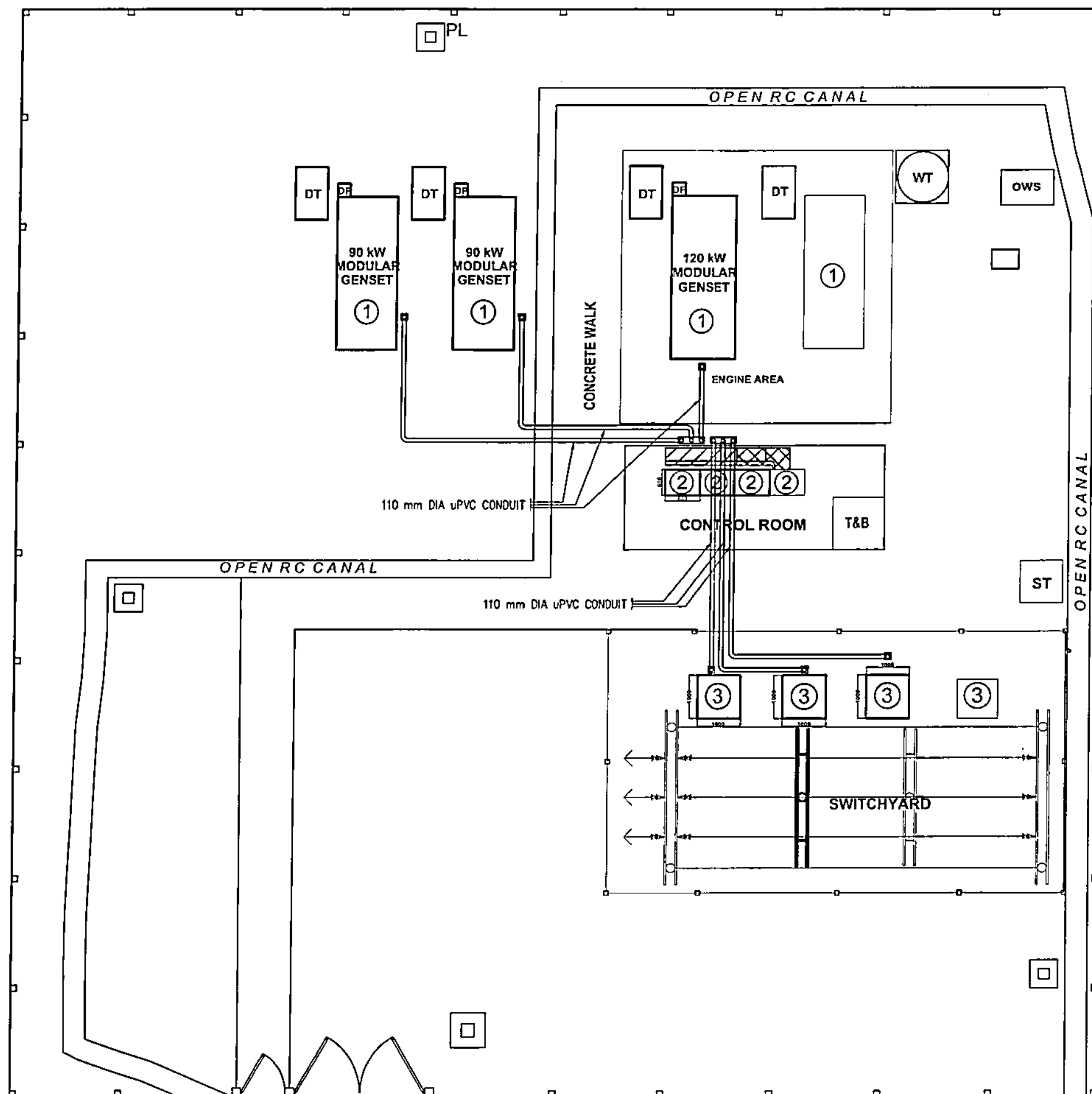
- 1 — 2/0 AWG ACSR
- 2 — POWER CABLE, 25 SQ. MM, 15kV XLPE
- 3 — FUSE DISCONNECT SWITCH W/ LA COMBINATION
- 4 — HOT LINE CLAMP
- 5 — TERMINATION KIT
- 6 — SEALANT
- 7 — 110MM DIA. uPVC CONDUIT
- 8 — CONDUIT SUPPORT
- 9 — GROUND CLAMP
- 10 — 25FT. STEEL POLE
- 11 — CROSSARM, STEEL, HDG
- 12 — BRACE, STEEL, HDG
- 13 — HV ELECTRICAL INSULATING SHROUD
- 14 — LV ELECTRICAL INSULATING SHROUD
- 15 — POWER CABLE, 600V THHN/THWN-2
- 16 — 3/8" HIGH STRENGTH GRADE STEEL GALVANIZED OVERHEAD GROUND WIRE




**SECTION A-A**

OWNER: <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP	
LOCATION: SITIO PALMA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO	
TITLE: <b>TAKE-OFF STRUCTURE DETAILS</b> (1 x 120kW & 2 X 90kW D/G SET - TAGUBANHAN DPP)	
DESIGNED	BY: <b>B. M. ABUULA</b> PRINCIPAL ENGINEER A. EECOD
DRAWN	JAC
REVIEWED	PRINCIPAL ENGR. / ARCHT.
CIVIL/ARCHT	RECOMMENDED: <b>C. Z. C. LUGOD, JR.</b> MANAGER, EECOD
ELEC.	M/RP
MECH.	APPROVED: <b>N. G. SORIANO</b> MANAGER, DSS
DWS NO. TagDPP-BDE-17.003	
SPECS NO. VisP21Z1282Se	
SCALE: 1:100	BID DRAWING
REV. 0	




REV.	DATE	NATURE OF REVISION	CHKD.	RECD.	APPD.



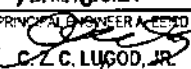



## NOTES:

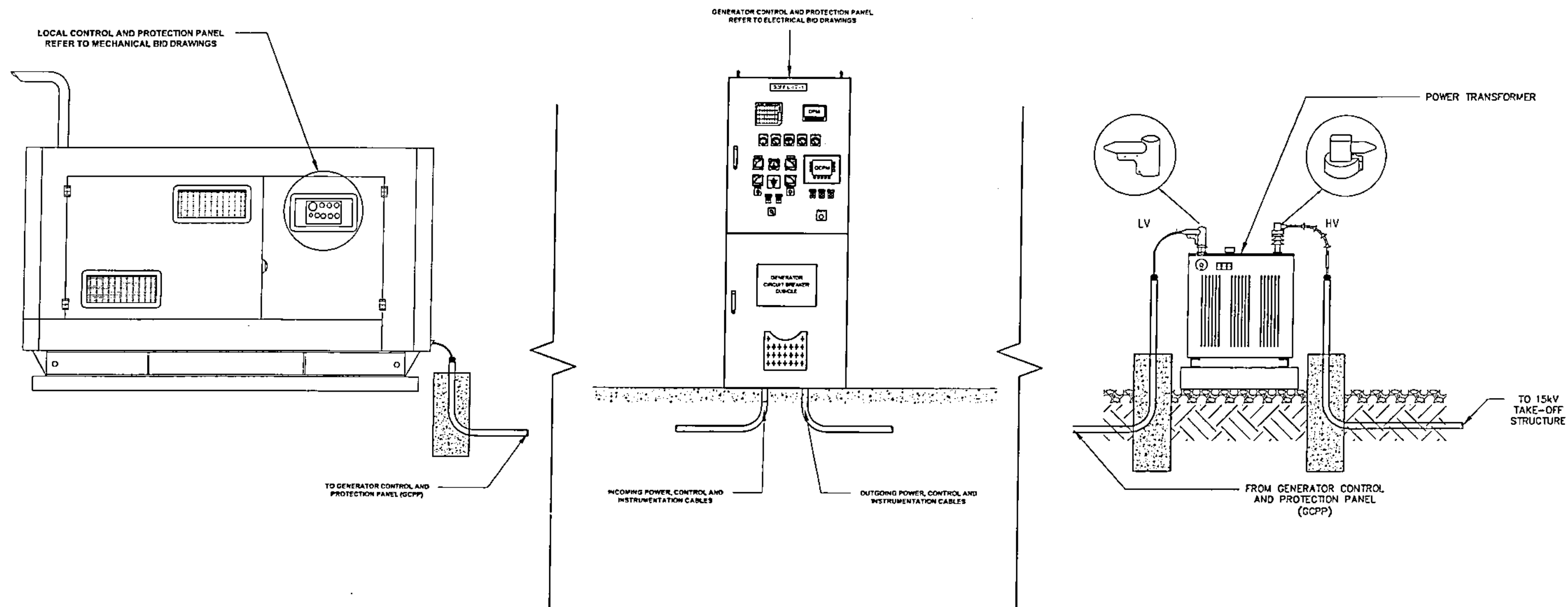
- THIS DRAWING IS FOR BIDDING PURPOSES ONLY. THE SUPPLIER SHALL SUBMIT THE ACTUAL ROUTE OF CABLE TRAY LAYOUT AND CONDUIT PLAN FOR NPC APPROVAL.
- FINAL LOCATIONS OF CABLE TRAY AND ACCESSORIES/APPURTENANCES TO BE SUPPLIED, INSTALLED OR CONSTRUCTED BY THE SUPPLIER SHALL BE CLOSELY COORDINATED WITH SPUG MANAGEMENT AND PLANT HEADS/PLANT IN CHARGE TO SUIT ACTUAL SITE CONDITIONS PRIOR TO DELIVERY/INSTALLATION/ CONSTRUCTION FOR THE TIMELY AND EFFICIENT IMPLEMENTATION OF THE PROJECT.
- ALL DIMENSIONS INDICATED ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- CABLE TRAYS IN SHADED PORTION  ARE INCLUDED IN THE CONTRACT.
- THIS DRAWING SHALL BE WORKED WITH CIVIL AND MECHANICAL WORKS BID DRAWINGS.

## LEGEND:

- ① - DIESEL GENERATOR
- ② - GENERATOR CONTROL AND PROTECTION PANEL (GCPP)
- ③ - GENERATOR TRANSFORMER
-  - NEW CABLE TRAY
-  - EXISTING CABLE TRAY
-  - uPVC CONDUIT

OWNER:				<b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2x90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHON DPP					
LOCATION: SITIO PALMA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO					
TITLE: <b>ROUTE OF CABLE TRAY AND CONDUIT PLAN</b> (1 x 120kW & 2 X 90kW D/G SET - TAGUBANHON DPP)					
DESIGNED	BY	CHKD	DATE	SUBMITTED:	
DRAWN	JAC			RECOMMENDED:	
REVIEWED	PRINCIPAL ENGR. / ARCHT.			APPROVED:	
CIVIL/ARCHT.					
ELEC.	MJP				
MECH.					
DWG. NO. TagDPP-BDE-17.004				SPECS. NO. VisP21Z1282Se	
SCALE: 1:150				BID DRAWING	
REV. 0				REV. 0	

REV.	DATE	NATURE OF REVISION	CHKD.	RECD.	APPD.




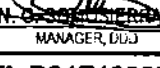


# NOTES:

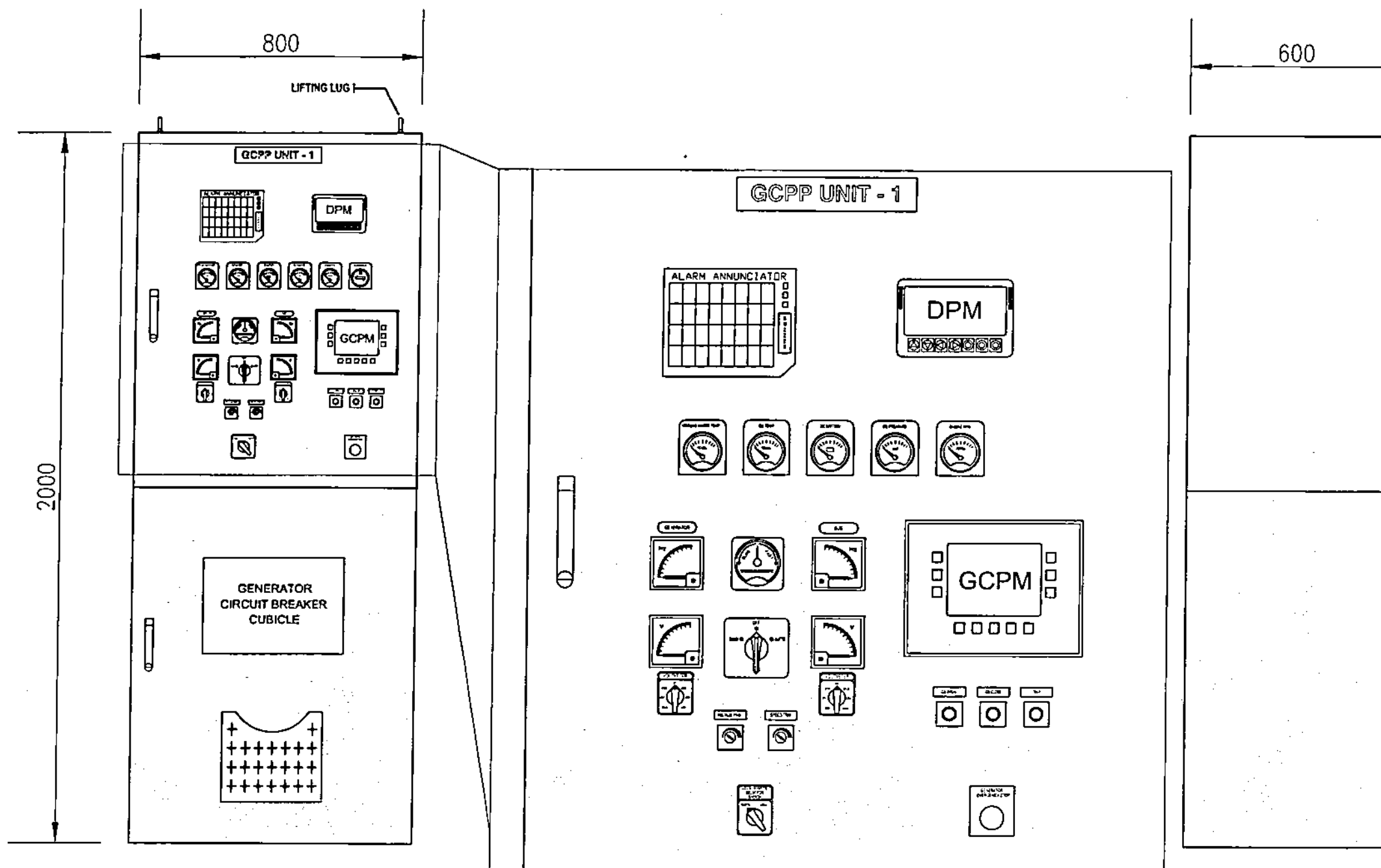
- THIS DRAWING IS INTENDED FOR BIDDING PURPOSES ONLY. THE LOCATION AND LAYOUT OF ALL THE EQUIPMENT TO BE SUPPLIED SHALL BE REFERRED TO THE CIVIL, MECHANICAL AND ELECTRICAL BID DRAWINGS.
- ALL THE DETAILS OF THE FOLLOWING EQUIPMENT SHALL BE IN ACCORDANCE WITH ALL THE TECHNICAL SPECIFICATIONS INDICATED IN THIS DOCUMENT. NON-COMPLIANCE TO THE REQUIREMENTS SHALL BE GROUNDS FOR DISQUALIFICATION.

# LEGEND:

- LCPP - LOCAL CONTROL AND PROTECTION PANEL
- GCPP - GENERATOR CONTROL AND PROTECTION PANEL
- DPM - DIGITAL POWER METER

OWNER:		 <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>SYSTEM CONFIGURATION</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JAC	js	
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.	MJP	kyb	
MECH.			
SUBMITTED:		 B. M. AGUILA PRINCIPAL ENGINEER / EECOD	
RECOMMENDED:		 E. Z. C. LUGOD JR. MANAGER / EECOD	
APPROVED:		 N. O. SISON MANAGER, DDD	
DWG. NO. TagDPP-BDE-17.005		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		BID DRAWING	
REV. 0			

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.


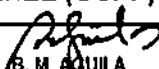
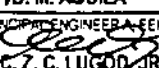
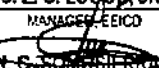


# NOTES:

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
2. THE GENERATOR CONTROL AND PROTECTION PANEL ENCLOSURE SHALL BE COLORED RAL 7032 AND ITS STEEL SHEET THICKNESS SHALL BE AT LEAST 2.0 MILLIMETERS.
3. THE SUPPLIER SHALL PROVIDE PROTECTION MODULE EQUIPPED WITH THE ENGINE-GENERATOR PROTECTION AS SHOWN IN THE BID DRAWING NO. TagDPP-BDE-15.001 AND ELECTRICAL WORKS TECHNICAL SPECIFICATIONS.
4. THE SUPPLIER SHALL DESIGN THE CABLE ENTRY FOR ALL THE POWER, CONTROL AND INSTRUMENTATION TO BE USED.
5. THE SUPPLIER SHALL PROVIDE THE BROCHURES/CATALOGUES OF THE GENERATOR CONTROL AND PROTECTION PANEL COMPONENTS FOR METERING, PROTECTION, CONTROL AND MONITORING PURPOSES FOR APPROVAL OF NPC.
6. THE METERING, CONTROL AND PROTECTION IN THIS DRAWING SHALL BE THE MINIMUM REQUIREMENTS OF THE PANEL AND SHALL BE WORKED IN ACCORDANCE WITH BOTH THE SPECIFICATIONS OF MECHANICAL AND ELECTRICAL WORKS.

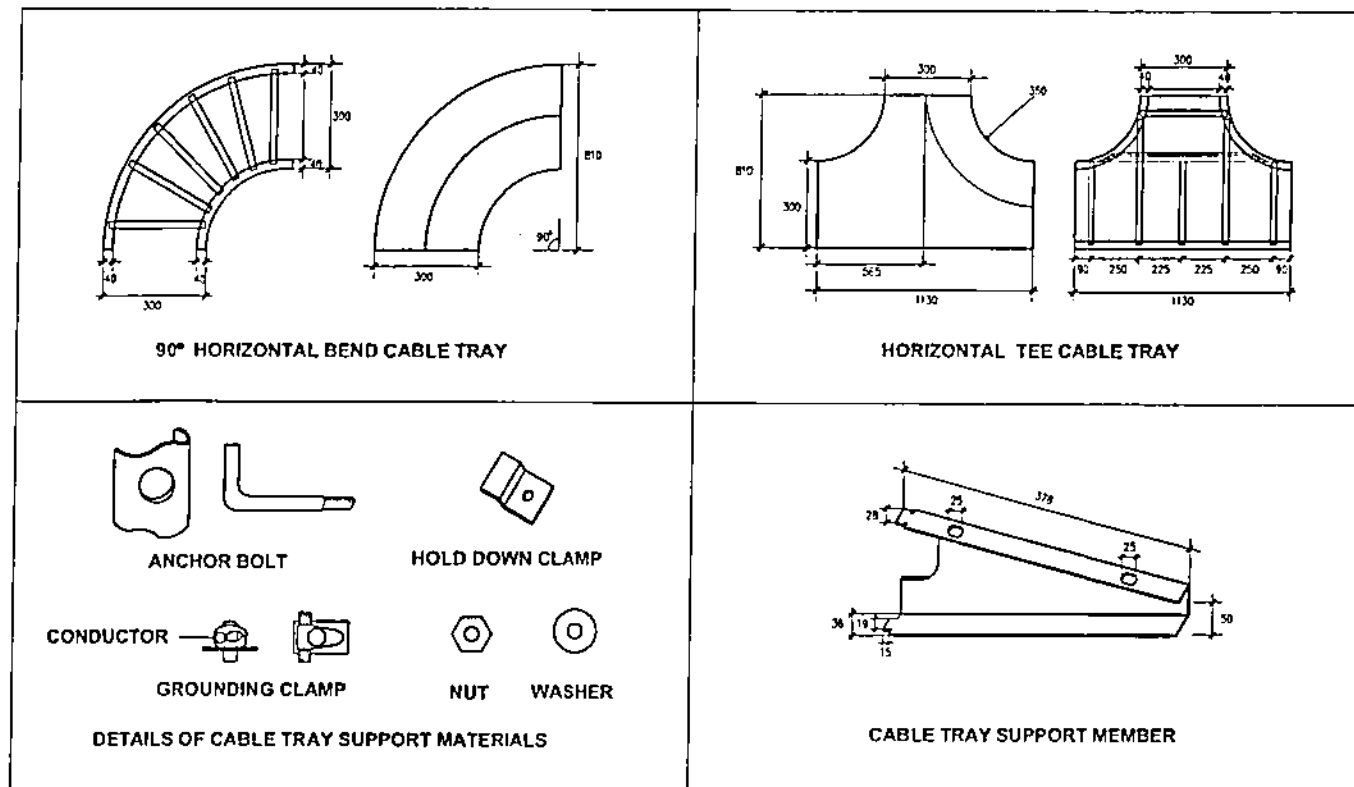
# LEGEND:

GCPM - GENERATOR CONTROL AND PROTECTION MODULE  
DPM - DIGITAL POWER METER

OWNER:		 <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, R.O.D.			
TITLE: <b>OUTLINE DRAWING OF GENERATOR CONTROL AND PROTECTION PANEL (GCPP)</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JAC		
REVIEWED	PRINCIPAL ENGR./ARCHT.		
CIVIL/ARCHT			
ELEC.	MJP		
MECH.			
SUBMITTED:		 <b>B. M. AQUILA</b> PRINCIPAL ENGINEER - EECO	
RECOMMENDED:		 <b>C. Z. C. LUGOD, JR.</b> MANAGER - EECO	
APPROVED:		 <b>N. S. SORIANO</b> MANAGER, DDO	
DWG. NO. TagDPP-BDE-17.006		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		BID DRAWING	
REV. 0			

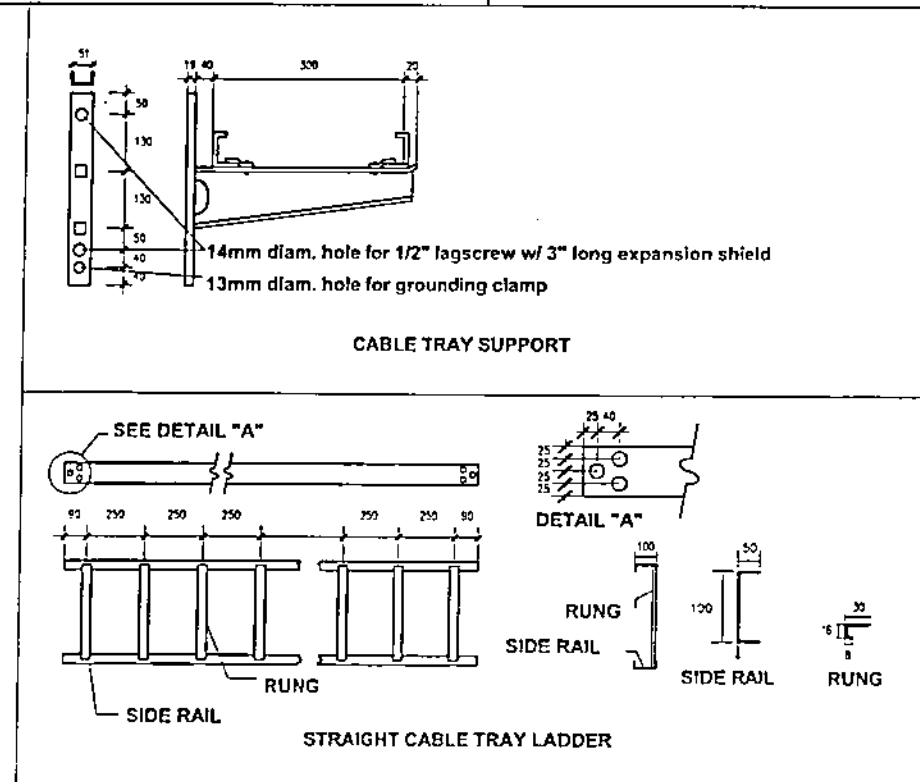
REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.



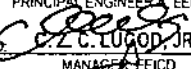

# DETAILS OF CABLE TRAY



## NOTES:

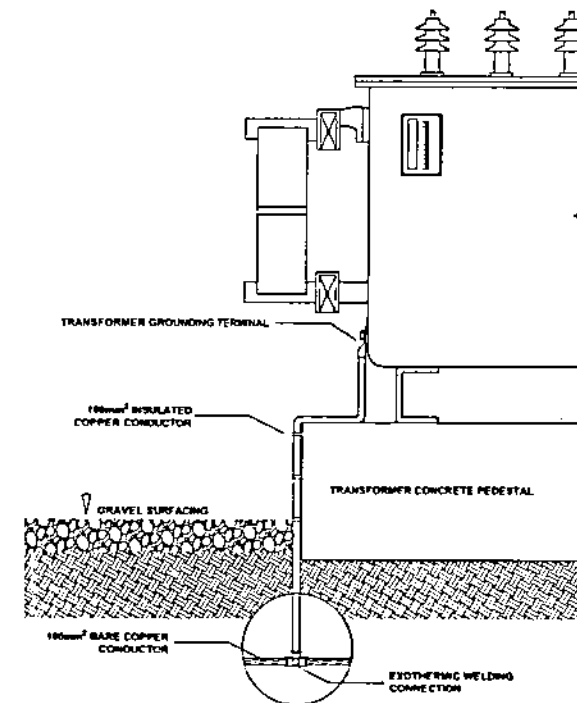
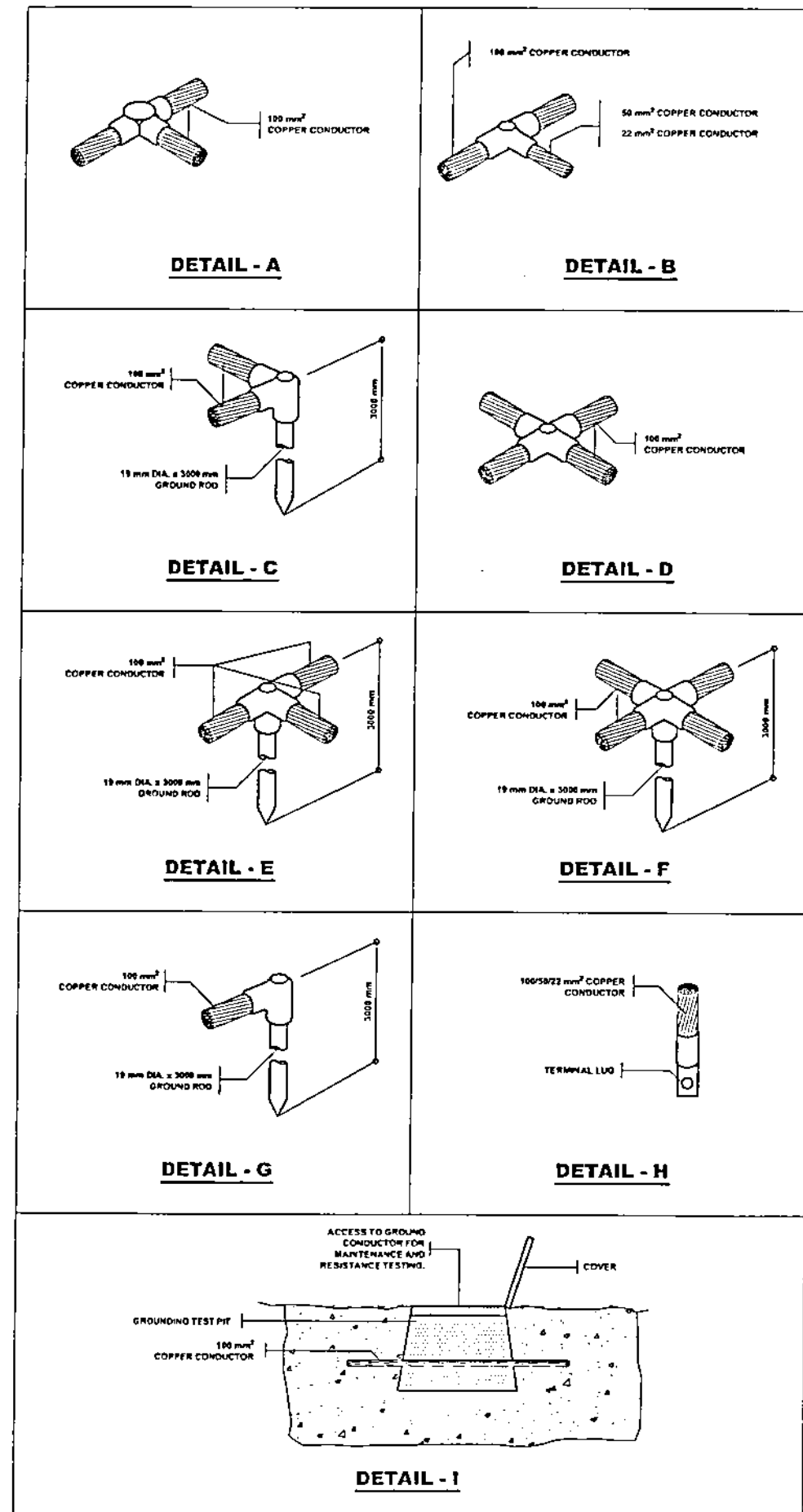
1. ALL CABLE TRAY SUPPORTS, BRACKETS AND ACCESSORIES SHALL BE HOT-DIPPED GALVANIZED STEEL.
2. ALL CABLE TRAY SUPPORTS, BRACKETS AND CONNECTORS SHALL HAVE A MINIMUM THICKNESS OF 3.0mm.
3. CABLE TRAY LADDER RUNGS, TEES, AND ELBOW SHALL HAVE A THICKNESS OF NOT LESS THAN 2.0mm.
4. OPEN HOLES SHALL BE 13mmØ UNLESS OTHERWISE SPECIFIED.
5. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE SPECIFIED.



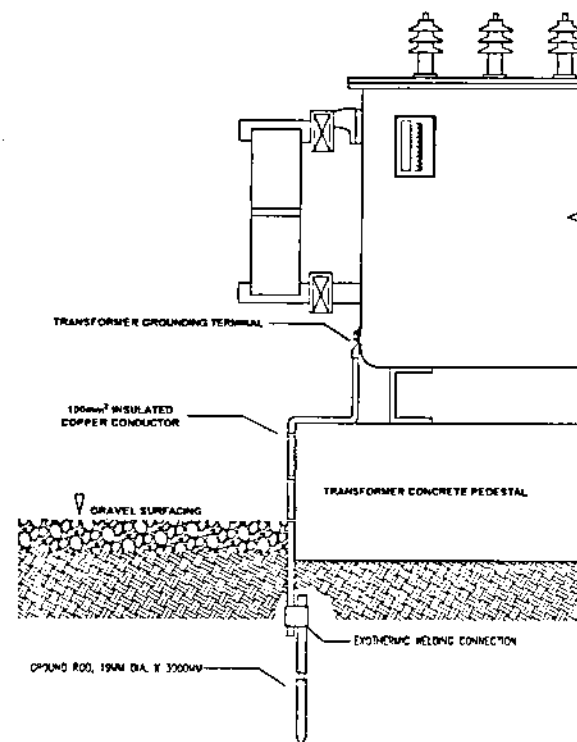
OWNER:		 <b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X30 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>DETAILS OF CABLE TRAY</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JAC		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.	MJP		
MECH.			
SUBMITTED:		 <b>B. M. AQUILA</b> PRINCIPAL ENGINEER & EEICD	
RECOMMENDED:		 <b>P. Z. C. LUGOD, JR.</b> MANAGER-EEICD	
APPROVED:		 <b>N. D. PERALTA</b> MANAGER, ODD	
DWG. NO. TagDPP-BDE-17.007		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		BID DRAWING	
REV. 0			

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.

# DETAILS OF EXOTHERMIC WELDING CONNECTION



EQUIPMENT GROUNDING CONNECTION -1



EQUIPMENT GROUNDING CONNECTION -2

## NOTES:

- ALL DIMENSIONS INDICATED ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- INSTALLATION OF NEW GROUNDING SYSTEM SHALL BE WORKED WITH EQUIPMENT GROUNDING CONNECTION-1 AND DETAILS OF EXOTHERMIC WELDING CONNECTION.
- GROUNDING CONDUCTOR SHALL BE EMBEDDED AT LEAST 0.60M.
- ALL EQUIPMENT GROUNDING SHALL BE CONNECTED TO THE EXISTING GROUNDING MAT.
- THE SUPPLIER SHALL PROVIDE TWO (2) TERMINALS FOR EQUIPMENT BODY GROUNDING OF ALL MAJOR EQUIPMENT (i.e. DIESEL GENERATOR, GENERATOR CONTROL AND PROTECTION PANEL, GENERATOR TRANSFORMER) AND SHALL BE CONNECTED TO THE EXISTING/NEW GROUNDING MAT USING 100MM² INSULATED COPPER CONDUCTOR AND EXOTHERMIC WELDING PROCESS.
- CT/PT, AUTOMATIC CIRCUIT RECLOSER, STEEL POLES AND FENCE EARTHING SHALL BE PROPERLY GROUNDING WITH 50MM² INSULATED COPPER CONDUCTOR.
- CABLE TRAYS SHALL BE PROPERLY GROUNDING WITH 22MM² INSULATED COPPER CONDUCTOR.
- IF THERE IS NO EXISTING GROUNDING MAT OR INSTALLATION OF NEW GROUNDING SYSTEM ON THE PLANT SITE, THE SUPPLIER SHALL USE GROUNDING RODS FOR ALL EQUIPMENT GROUNDING AS SHOWN ON EQUIPMENT GROUNDING CONNECTION-2.

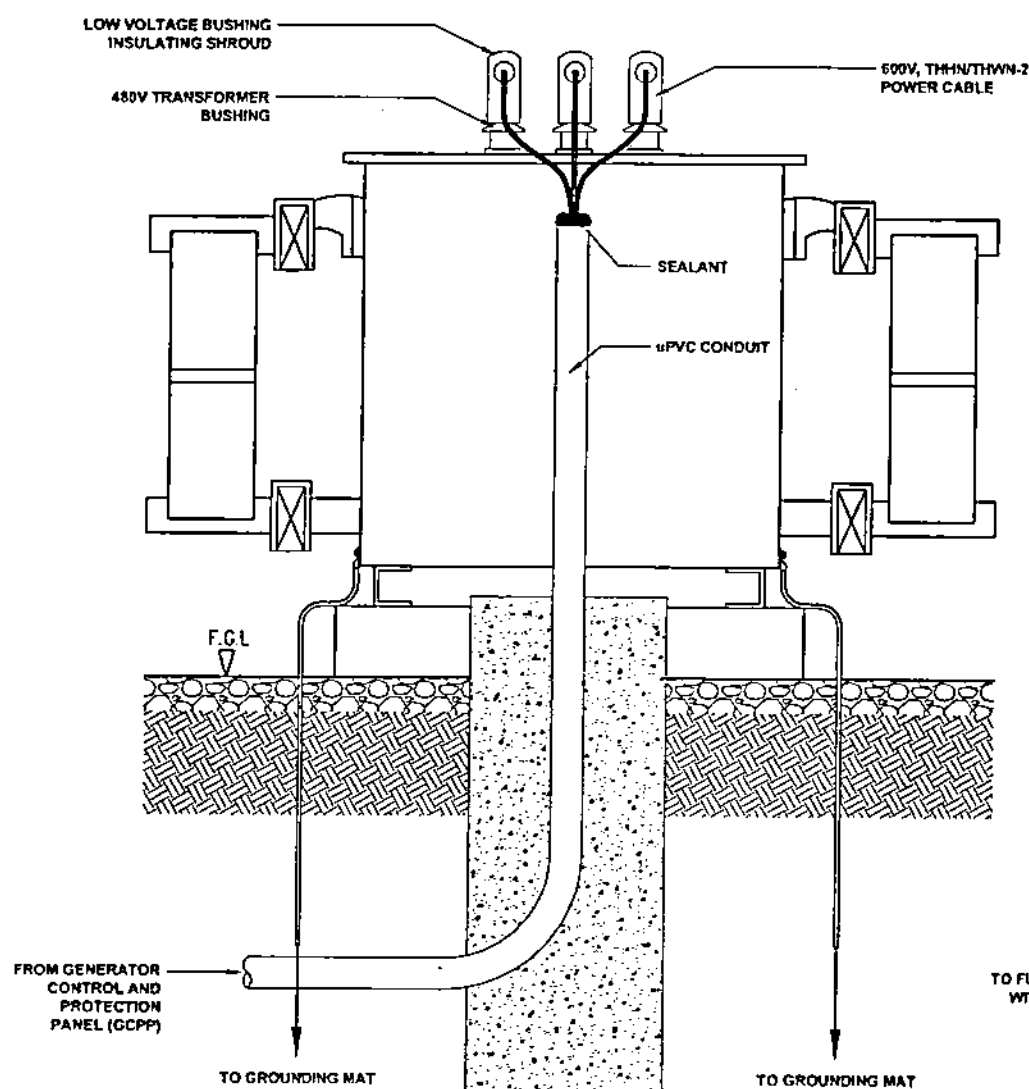
OWNER:		<b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2x20 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP LOCATION: SITIO PALINA GRANDE, BRGY. BANGCONGON, CONCEPCION, ILOILO			
TITLE:			
<b>DETAILS OF EQUIPMENT GROUND CONNECTION</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JAC	ja	
REVIEWED	PRINCIPAL ENGR. / ARCHT.		SUBMITTED: <i>B. M. ABILA</i> PRINCIPAL ENGINEER / EECDD
CIVIL/ARCHT			RECOMMENDED: <i>E. Z. C. LUGOD, JR.</i> MANAGER, EECDD
ELEC.	MJR	gk	APPROVED: <i>N. G. SORIANO</i> MANAGER, DDD
MECH.			
DWG. NO. TagDPP-BDE-17.008		SPECS NO VisP21Z1282Se	
SCALE: NTS		<b>BID DRAWING</b> REV. 0	

REV.	DATE	NATURE OF REVISION	BY	CHKD	REC'D	APP'D.

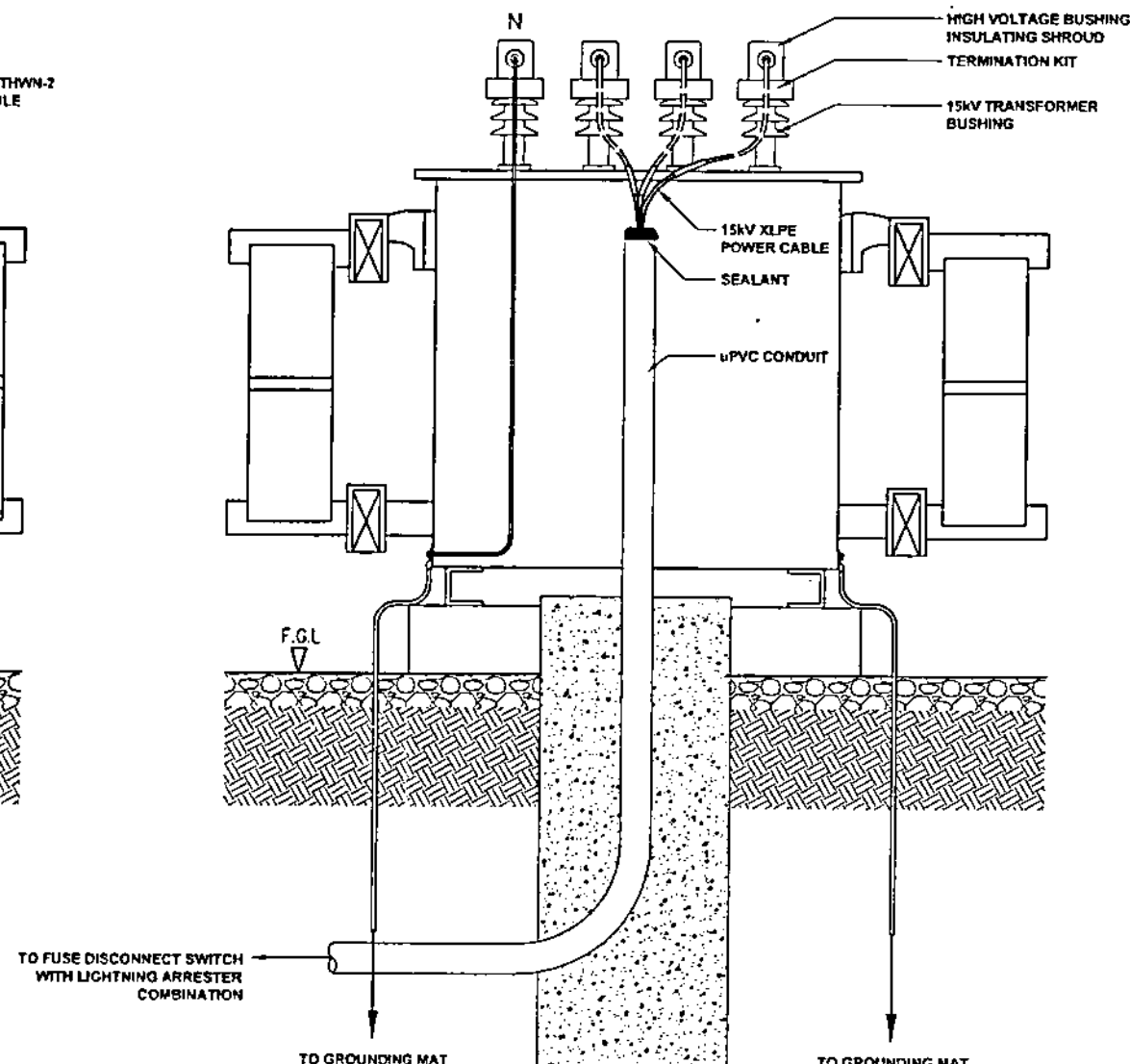


# NOTES:

1. THE NUMBER OF POWER CABLES PER PHASE FOR THE LOW VOLTAGE (LV) SIDE IS FOR BIDDING PURPOSES ONLY. THE SUPPLIER SHALL VERIFY WHAT IS INDICATED IN THE SINGLE LINE DIAGRAM AND SHALL PROVIDE PROPER CABLE TERMINATION.
2. THE SUPPLIER SHALL PROVIDE TERMINATION KIT FOR THE HIGH VOLTAGE (HV) POWER CABLES AND SHALL DESIGN PROPER TERMINATION FOR THE NEUTRAL CABLE.
3. THE LV AND HV TERMINATIONS SHALL BE PROVIDED WITH SUITABLE INSULATING SHROUD. THE INSULATING SHROUD SHALL BE MANUFACTURED THROUGH DIP MOULDING PROCESS AND SHALL BE MADE FROM FLEXIBLE POLYVINYL CHLORIDE (PVC) MATERIAL, SUITABLE FOR LOW VOLTAGE TO HIGH VOLTAGE APPLICATIONS.
4. THE INSULATING SHROUD SHALL BE FLAME RETARDANT, CONFORMING WITH THE UL 94 STANDARDS AND SHALL BE TYPE TESTED FOR ELECTRIC STRENGTH IN ACCORDANCE WITH IEC 60243-1 OR APPROVED EQUIVALENT STANDARDS.



TRANSFORMER LOW VOLTAGE CABLE TERMINATION




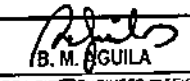


TRANSFORMER HIGH VOLTAGE CABLE TERMINATION

OWNER:		<b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP LOCATION: SITO PALINA GRANDE, BRGY. BANGCONGON, CONCEPCION, ILOILO			
TITLE: <b>DETAILS OF TRANSFORMER TERMINATION</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JAC		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.	MJRP	4/96	
MECH.			
SUBMITTED:		 <b>B. M. AGUILERA</b> PRINCIPAL ENGINEER, EEICD	
RECOMMENDED:		 <b>C. Z. C. LUGO, JR.</b> MANAGER, EEICD	
APPROVED:		 <b>N. C. S. SERRERA</b> MANAGER, DDD	
DWG. NO. TagDPP-BDE-17.009		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		<b>BID DRAWING</b> REV 0	

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.

## GENERAL NOTES:

1. THE GENERATOR BEARINGS SHALL BE DESIGNED TO ALLOW MINIMAL STRESS INDUCED IN THE SHAFT. GENERATORS RATED 500KW AND BELOW SHALL HAVE A SINGLE OR DOUBLE BEARING DESIGN. HOWEVER, GENERATORS RATED ABOVE 500KW SHALL ADOPT A DOUBLE BEARING DESIGN.
2. SPACE HEATERS SHALL BE INSTALLED ON THE GENERATOR FRAME TO MAINTAIN TEMPERATURE OF THE ENTIRE GENERATOR ABOVE THE DEW POINT WHILE NOT IN USE. POWER SUPPLY SHALL BE 240VAC SINGLE PHASE AND SHALL BE SOURCED FROM THE EXISTING STATION SERVICE TRANSFORMER. AUTOMATIC CONTROL FOR SPACE HEATERS SHALL BE INTEGRATED IN THE GENERATOR CONTROL AND PROTECTION PANEL (GCPP).
3. TEMPERATURE DETECTORS SHALL BE PROVIDED IN THE STATOR SLOTS AND AT THE END OF THE VENTILATING DUCTS ARRANGED TO RECEIVE HEAT FROM THE HOTTEST SPOT OF THE WINDINGS WITH APPROPRIATE CONTACTS FOR MONITORING, ALARM, DETECTION AND PROTECTION OF THE WINDINGS PROVIDED AT THE GCPP. AT CERTAIN PRE-SET TEMPERATURE (ALARM SETTING), THE TEMPERATURE DETECTOR WILL TRIGGER AN ALARM SO THAT AN ADJUSTMENT OR ACTION BEFORE ANY INSULATION DAMAGE OCCURS MAY BE DONE. THE CIRCUIT BREAKER FOR THE ALTERNATOR WILL AUTOMATICALLY TRIP IN THE EVENT THAT THE TEMPERATURE DETECTORS MEASURE THE WINDING TEMPERATURE TO BE ABOVE THE (SHUTDOWN SETTING) VALUE
4. ALL WORKS TO BE DONE AND EQUIPMENT TO BE SUPPLIED SHALL BE IN COMPLIANT TO THE LATEST PROVISIONS OF THE FOLLOWING STANDARDS:
  - a. ANSI/IEEE - AMERICAN NATIONAL STANDARDS INSTITUTE AND/OR INSTITUTE OF ELECTRICAL & ELECTRONIC ENGINEERS
    - C37.60 - REQUIREMENTS FOR OVERHEAD, PAD-MOUNTED, DRY VAULT AND SUBMERSIBLE AUTOMATIC CIRCUIT RECLOSERS AND FAULT INTERRUPTERS FOR AC SYSTEMS
    - C57.12.20 - STANDARD FOR OVERHEAD-TYPE DISTRIBUTION TRANSFORMER 500KVA AND SMALLER: HIGH VOLTAGE 34500V AND BELOW; LOW VOLTAGE, 7970/13800V AND BELOW
  - b. NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
    - MG 1 - STANDARD FOR MOTORS AND GENERATORS
    - WC-5 - THERMOPLASTIC-INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY
    - AB 1 - MOLDED CASE CIRCUIT BREAKER
    - ICS2 - INDUSTRIAL CONTROLS AND SYSTEMS: CONTROLLERS, CONTACTORS AND OVERLOAD RELAYS RATED 600VOLTS
    - ICS - GENERAL STANDARDS FOR INDUSTRIAL CONTROL AND SYSTEMS
    - MG-1 - MOTORS AND GENERATORS
    - MG-2 - SAFETY STANDARD FOR CONSTRUCTION & GUIDE FOR SELECTION, INSTALLATION AND USE OF ELECTRIC MOTORS AND GENERATORS
  - c. UL - UNDERWRITERS LABORATORIES, INC. (ALL PARTS APPLY)
    - 44 - RUBBER-INSULATED WIRES AND CABLES
    - 83 - THERMOPLASTIC INSULATED WIRES AND CABLES
    - 508A - INDUSTRIAL CONTROL EQUIPMENT
    - 1063 - MACHINE TOOL WIRE (MTW) FOR STRANDED CONDUCTOR ONLY
  - d. IEC - INTERNATIONAL ELECTRO-TECHNICAL COMMISSION
    - 60255 - ELECTRICAL RELAYS
    - 60044 - INSTRUMENT TRANSFORMER
    - 60071 - INSULATION COORDINATION
    - 60076 - POWER TRANSFORMERS, PARTS 1-5
    - 60060 - HIGH VOLTAGE TEST TECHNIQUE
    - 62271 - HIGH VOLTAGE SWITCHGEAR AND CONTROL GEAR
    - 60502 - POWER CABLES WITH EXTRUDED INSULATION AND THEIR ACCESSORIES FOR RATED VOLTAGES PARTS 1 & 2
    - 60694 - COMMON SPECIFICATION FOR HIGH VOLTAGE SWITCHGEAR AND CONTROL GEAR STANDARDS
  - e. NFPA - NATIONAL FIRE PROTECTION ASSOCIATION
    - 272 - STANDARD METHOD OF TEST FOR FIRE AND SMOKE CHARACTERISTICS OF WIRES AND CABLES
  - f. ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS
  - g. ISO - INTERNATIONAL STANDARDS ORGANIZATION
    - 9001 - QUALITY SYSTEM MODEL FOR QUALITY ASSURANCE IN DESIGN/DEVELOPMENT, MANUFACTURE AND TESTING
    - 9002 - QUALITY SYSTEM MODEL FOR QUALITY ASSURANCE IN PRODUCTION, INSTALLATION & SERVICING
  - h. PEC - PHILIPPINE ELECTRICAL CODE
5. THE SUPPLIER'S EQUIPMENT TO BE SUPPLIED SHALL BE SUBJECT TO ALL TESTS AND INSPECTION TO ENSURE THE SATISFACTORY PERFORMANCE OF ALL THE EQUIPMENT. ALL THE TESTS AND INSPECTION SHALL BE DONE WITH NO ADDITIONAL COST TO NPC AND SHALL BE COMPLIANT TO THE REQUIREMENTS OF THIS TENDER:
  - a. EW-4.14 INSPECTION AND TESTING FOR AC GENERATORS
  - b. EW-5.8 TESTS TO BE PERFORMED FOR POWER TRANSFORMERS
  - c. FACTORY ASSEMBLY AND TESTS
6. NON-COMPLIANCE TO THE REQUIREMENTS STATED IN THIS TENDER SHALL BE GROUNDS FOR DISQUALIFICATION.

OWNER: 		<b>NATIONAL POWER CORPORATION</b> AGHAM ROAD, DILIMAN, QUEZON CITY	
PROJECT: SUPPLY, DELIVERY, INSTALLATION, TEST AND COMMISSIONING OF 1x120 KW AND 2X90 KW MODULAR DIESEL GENSETS, AND ASSOCIATED ELECTRICAL EQUIPMENT FOR TAGUBANHAN DPP			
LOCATION: SITIO PALINA GRANDE, BRGY. BANGONGON, CONCEPCION, ILOILO			
TITLE: <b>GENERAL NOTES</b>			
DESIGNED	BY	CHKD	DATE
DRAWN	JAC		
REVIEWED	PRINCIPAL ENGR. / ARCHT.		
CIVIL/ARCHT			
ELEC.	MJRP		
MECH.			
SUBMITTED: 		B. M. AGUILA PRINCIPAL ENGINEER / EEC	
RECOMMENDED: 		E. Z. C. LUGO, JR. MANAGER / EEC	
APPROVED: 		H. C. ... MANAGER, DDO	
DWG. NO. TagDPP-BDE-17.010		SPECS. NO. VisP21Z1282Se	
SCALE: NTS		<b>BID DRAWING</b>	
REV. 0			

REV.	DATE	NATURE OF REVISION	BY	CHKD.	RECD.	APPD.