

REPUBLIC OF THE PHILIPPINES NATIONAL POWER CORPORATION

(Pambansang Korporasyon sa Elektrisidad)

BID DOCUMENTS

Name of Project: CONSTRUCTION OF POWER FACILITIES FOR THE

FOUR (4) UNITS MODULAR DIESEL GENERATING SETS

INCLUDING HAULING, INSTALLATION, TEST AND

COMMISSIONING OF BALANCE OF PLANT IN

CALUTCOT, BURDEOS QUEZON AND BUTAWANAN,

SIRUMA, CAMARINES SUR

Location

: CALUTCOT, BURDEOS, QUEZON AND BUTAWANAN,

SIRUMA, CAMARINES SUR

Specs No.

: LuzP21Z1311Sc / HB-PB21-016 (PB2)

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BID DOCUMENTS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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SECTION I

INVITATION TO BID



National Power Corporation INVITATION TO BID PUBLIC BIDDING – BCS 2022-0112

The NATIONAL POWER CORPORATION (NPC), through its approved Corporate Budget
of CY 2022 intends to apply the sum of (<u>Please see schedule below</u>) 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
HO-PIB21-016 / PB220118-HG00516 (PB3) Construction of Power Facilities for the Four (4) Units Modular Diesel Generating Sets Including Hauling, Installation, Test and Commissioning of Balance of Plant in Calutcot, Burdeos Quezon and Butawanan, Siruma, Camarines Sur PCAB License: License Category of at least "Category of at least "Category D — General Building" and registration classification of at least "Small B — Building and Industrial Plant"	Construction of Industrial Building, Warehouse, Office Building	15 March 2022 9:30 A.M	28 March 2022 9:30 A.M	₽ 24,450,000.00 / ₽ 25,000.00
S1-IDP22-002 / PB220223-NA00041 (PB2) Supply and Delivery of Intermediate Overhauling Spare Parts of (Nameplate: 192.5kW) 160kW FG-Wilson, 6 Cyl, Model P300-1, Serial No. FGWNAV04KJSW00254 of Itbayat DPP	Supply and Delivery of Diesel Generating Sets or Mechanical and/or Electrical Parts / Components / Equipment for Diesel Generating Sets	15 March 2022 9:30 A.M	28 March 2022 9:30 A.M	P 1,148,048.00 / P 5,000.00
S1-CTL22-002 / PB220328-RM00042 Supply, Delivery and Installation of Collapsible / Containerized Bunker for Catanduanes 69kV T/L & S/S	Supply, Delivery and Installation of Collapsible, Containerized House / Office or Staff Room or Other Containerized Structures	15 March 2022 9:30 A.M	28 March 2022 9:30 A.M	₽ 1,876,048.00 / ₽ 5,000.00

S3-BAI22-002 / PB220328-SV00043 Supply and Delivery of Various Electrical Spare Parts for MAN Diesel 6L21/31 Generator Sets of Basilan DPP	Supply and Delivery of Diesel Generating Sets or Mechanical and/or Electrical Parts / Components / Equipment for Diesel Generating Sets	15 March 2022 9:30 A.M	28 March 2022 9:30 A.M	P 3,605,000.00 / P 5,000.00
Venue: Kañao Function Room, NPC Bldg. Diliman, Quezon City				

2. The NPC now invites bids for Items 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
HO-PIB21-016	Two Hundred Ten (210) Calendar Days	
S1-IDP22-002	Ninety (90) Calendar Days	Ten (10) Years
S1-CTL22-002	Ninety (90) Calendar Days	Five (5) Years
S3-BAI22-002	Sixty (60) Calendar Days	Ten (10) Years

3. 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.

- 4. 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.
- 5. 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. <u>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.</u>
- 6. 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:

- a. Only a maximum of two (2) representatives from each bidder / company shall be allowed to participate during the virtual pre-bid conference.
- b. 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.
- c. The requirements herein stated including the medium of submission shall be subject to GPPB Resolution No. 09-2020 dated 07 May 2020
- d. The Guidelines on the Implementation of Early Procurement Activities (EPA) shall be subject to GPPB Circular No. 06-2019 dated 17 July 2019
- 7. 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.
- 8. 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.
- 10. 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 5361/5397/5504

Fax No.: 8922-1622

Email: bcsd@napocor.gov.ph / bcsd_napocor@yahoo.com

12. You may visit the following websites:

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

Vice President, Pewer Engineering Services and Chairman, Bids and Awards Committee

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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SECTION II

INSTRUCTION TO BIDDERS



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SECTION II - INSTRUCTIONS TO BIDDERS

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SECTION II - INSTRUCTIONS TO BIDDERS

1. Scope of Bid

NPC invites Bids for the CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR, with Project Identification Number LuzP21Z1311Sc.

The Procurement Project (referred to herein as "Project") is for the construction of Works, as described in Section VI (Specifications).

2. Funding Information

The GOP through the source of funding as indicated below for CY 2021 in the amount of specified in the Invitation to Bid. The source of funding is the proposed Corporate Operating Budget of the National Power Corporation (NPC).

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 Manual 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 invitation to bid 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 inspected the site, determined the general characteristics of the contracted Works and the conditions for this Project, such as the location and the nature of the work; (b) climatic conditions; (c) transportation facilities; (c) nature and condition of the terrain, geological conditions at the site communication facilities, requirements, location and availability of construction aggregates and other materials, labor, water, electric power and access roads; and (d) 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, Coercive, and Obstructive Practices

The Procuring Entity, as well as the Bidders and Contractors, 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.



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5.2. The Bidder must have an experience of having completed a Single Largest Completed Contract (SLCC) that is similar to this Project, equivalent to at least fifty percent (50%) of the ABC adjusted, if necessary, by the Bidder to current prices using the PSA's CPI, except under conditions provided for in Section 23.4.2.4 of the 2016 revised IRR of RA No. 9184.

A contract is considered to be "similar" to the contract to be bid if it has the major categories of work stated in the BDS.

- 5.3. For Foreign-funded Procurement, the Procuring Entity and the foreign government/foreign or international financing institution may agree on another track record requirement, as specified in the Bidding Document prepared for this purpose.
- 5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.2 of the 2016 IRR of RA No. 9184.

6. Origin of Associated 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.

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 fifty percent (50%) of the Project.
- 7.1. The Bidder must submit together with its Bid the documentary requirements of the subcontractor(s) complying with the eligibility criterial stated in ITB Clause 5 in accordance with Section 23.4 of the 2016 revised IRR of RA No. 9184 pursuant to Section 23.1 thereof.
- 7.2. Subcontracting of any portion of the Project does not relieve the Contractor 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 Contractor's own acts, defaults, or negligence, or those of its agents, servants, or workmen.

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.



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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 Form NPCSF-INFR-01 Checklist of Technical and Financial Documents, Section VIII Bidding Forms.
- 10.2. 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. 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.
- 10.3. A valid PCAB License is required, and in case of joint ventures, a valid special PCAB License, and registration for the type and cost of the contract for this Project. Any additional type of Contractor license or permit shall be indicated in the BDS.
- 10.4. A List of Contractor's key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen) assigned to the contract to be bid, with their complete qualification and experience data shall be provided. These key personnel must meet the required minimum years of experience set in the BDS.
- 10.5. A List of Contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be, must meet the minimum requirements for the contract set 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 Form NPCSF-INFR-01 Checklist of Technical and Financial Documents, Section VIII Bidding Forms.
- 11.2. Any bid exceeding the ABC indicated in paragraph 1 of the IB shall not be accepted.
- 11.3. 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. Alternative Bids

Bidders shall submit offers that comply with the requirements of the Bidding Documents, including the basic technical design as indicated in the drawings and specifications. Unless there is a value engineering clause in the BDS, alternative Bids shall not be accepted.



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13. Bid Prices

All bid prices for the given scope of work in the Project as awarded shall be considered as fixed prices, and therefore not subject to price escalation during contract implementation, except under extraordinary circumstances as determined by the NEDA and approved by the GPPB pursuant to the revised Guidelines for Contract Price Escalation guidelines.

14. Bid and Payment Currencies

- 14.1. 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.
- 14.2. Payment of the contract price shall be made in Philippine Pesos.

15. Bid Security

- 15.1. 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.
- 15.2. The Bid and bid security shall be valid until 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.

16. 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 to the given website 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.

17. Deadline for Submission of Bids

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.

18. Opening and Preliminary Examination of Bids

18.1. 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



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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.

18.2. The preliminary examination of Bids shall be governed by Section 30 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 2016 revised IRR of RA No. 9184.
- 19.2. If the Project allows partial bids, all Bids and combinations of Bids as indicated in the BDS shall be received by the same deadline and opened and evaluated simultaneously so as to determine the Bid or combination of Bids offering the lowest calculated cost to the Procuring Entity. Bid Security as required by ITB Clause 15 shall be submitted for each contract (lot) separately.
- 19.3. In all cases, the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184 must be sufficient for the total of the ABCs for all the lots participated in by the prospective Bidder.

20. Post Qualification

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

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.



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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SECTION III

BID DATA SHEET



SECTION III - BID DATA SHEET

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SECTION III - BID DATA SHEET

ITB Clause	
5.2	For this purpose, contracts similar to the Project refer to contracts which have the same major categories of work, which shall be construction of industrial building, warehouse, office building.
	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.
7.1	Only a maximum of fifty percent (50%) of the Works may be subcontracted. All Subcontractors must be approved by NPC.
10.1	The list of on-going contracts (Form No. NPCSF-INFR-02) shall be supported by the following documents for each on-going contract to be submitted during Post-Qualification:
	Contract/Purchase Order and/or Notice of Award
	Certification coming from the project owner/client that the performance is satisfactory as of the bidding date.
	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.
	The Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid (Form No. NPCSF-INFR-03) shall be supported by the following documents to be submitted during Bid Opening:
	Contract/Purchase Order
	 Owner's Certificate of Final Acceptance issued by the project owner other than the contractor or a final rating of at least Satisfactory in the Constructors Performance Evaluation System (CPES). In case of contracts with the private sector, an equivalent document (Ex. Official Receipt or Sales Invoice) shall be submitted.
10.3	The required License issued by the Philippine Contractors Accreditation Board (PCAB): License Category of at least "CATEGORY D – GENERAL BUILDING" and registration classification of at least "SMALL B – BUILDING & INDUSTRIAL PLANT"



SECTION III - BID DATA SHEET

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10.4	The list of key personnel shall include the following minimum requirements:
	a. One (1) Project Engineer
	Registered Civil Engineer who had supervised at least a project similar in nature as to the type and cost of the proposed project within the last 10 years. Must have at least 3 years professional experience as Civil Engineer on similar project.
	b. One (1) Materials Engineer
	Registered Civil Engineer with valid accreditation from the Department of Public Works and Highways (DPWH) as Materials Engineer I
	c. One (1) Safety Officer 2
,	Construction Safety Officer who has completed at least forty (40) hours of Construction Safety and Health Training (COSH) from Occupational Safety and Health Center (OSHC) or Safety Training Organizations (STOs) accredited by the Department of Labor and Employment (DOLE)
	Valid Professional Regulations Commission (PRC) license for professional personnel, Construction Safety and Health Training Certificate from OSHC/STOs accredited by DOLE for the Safety Officer, certificate of accreditation including ID card issued by DPWH for Materials Engineer, shall be submitted and included as an attachment in the Standard Form NPCSF-INFR-09: List of Key Personnel Proposed to be Assign to the Contract.
	The above key personnel must either be employed by the Bidder or contracted by the Bidder to be employed for the contract to be bid.
10.5	The list of construction equipment (owned or leased) shall include the following minimum requirements:
	a. Welding Machine (300 A) b. Oxy-Acetylene Cutting Outfit c. Portable Generator (300kVA) d. Bar Cutter (25 mm ø capable) e. Concrete Vibrator (3.5HP min) f. Concrete Mixer (2 bagger) g. Service Vehicle (4x4 pickup) - 1 unit
10.6	Bidders shall also submit the following requirements in their first envelope, Eligibility and Technical Component of their bid:
	Completely Filled out and duly signed Technical Data Sheets Mechanical Works (MW) and Electrical Works (EW) – Part II, Section VI - Technical Specifications
	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 disqualification if the submitted brochures, manuals and other supporting documents are

SECTION III - BID DATA SHEET

	determined not complying with the specifications during technical evaluation and post-qualification process.
	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. 2. Complete eligibility documents of the proposed sub-contractor, if any
10.7	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.
12	No further instructions
15.1	The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts:
	 The amount of not less than 2% of ABC, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit;
	2. The amount of not less than 5% of ABC if bid security is in Surety Bond.
19.2	Partial Bid is not allowed
20	 a. Contract/Purchase Order and/or Notice of Award for the contracts stated in the List of all Ongoing Government & Private Contracts Including Contracts Awarded but not yet Started (NPCSF-INFR-02);
	 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-INFR-02.
	c. Data and information to be submitted during post-qualification process as specified in Technical Specifications, if any.
	d. The licenses and permits relevant to the Project and the corresponding law requiring it as specified in the Technical Specifications, if any.
21	The following documents shall form part of the contract:
	Notice to Proceed
	2. Construction schedule and S-curve
	3. Manpower Schedule
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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION III - BID DATA SHEET

- 4. Construction Methods
- 5. Equipment Utilization Schedule
- Construction safety and health program of the contractor duly approved by the Bureau of Working Condition (BWC) of the Department of Labor and Employment (DOLE) or proof of submission to BWC
- 7. PERT/CPM.



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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SECTION IV

GENERAL CONDITIONS OF CONTRACT



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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.

2. Sectional Completion of Works

If sectional completion is specified in the Special Conditions of Contract (SCC), references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date shall apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

3. Possession of Site

- 3.1 The Procuring Entity shall give possession of all or parts of the Site to the Contractor based on the schedule of delivery indicated in the SCC, which corresponds to the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.
 - 3.2 If possession of a portion is not given by the above date, the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay may be addressed through contract extension provided under Annex "E" of the 2016 revised IRR of RA No. 9184.

4. The Contractor's Obligations

The Contractor shall employ the key personnel named in the Schedule of Key Personnel indicating their designation, in accordance with ITB Clause 10.3 and specified in the BDS, to carry out the supervision of the Works.

The Procuring Entity will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are equal to or better than those of the personnel listed in the Schedule.



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5. Performance Security

- 5.1. Within ten (10) calendar days from receipt of the Notice of Award 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.
- 5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

6. Site Investigation Reports

The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the SCC supplemented by any information obtained by the Contractor.

7. Warranty

- 7.1. In case the Contractor fails to undertake the repair works under Section 62.2.2 of the 2016 revised IRR, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GOP in his favor shall be offset to recover the costs.
- 7.2. The warranty against Structural Defects/Failures, except that occasioned-on force majeure, shall cover the period from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity. Specific duration of the warranty is found in the SCC.

8. Liability of the Contractor

Subject to additional provisions, if any, set forth in the SCC, the Contractor's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

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

9. Termination for Other Causes

Contract termination shall be initiated in case it is determined *prima facie* by the Procuring Entity that the Contractor has engaged, before, or during the implementation of the contract, in unlawful deeds and behaviors relative to contract acquisition and implementation, such as, but not limited to corrupt, fraudulent, collusive, coercive, and obstructive practices as stated in ITB Clause 4.



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10. Dayworks

Subject to the guidelines on Variation Order in Annex "E" of the 2016 revised IRR of RA No. 9184, and if applicable as indicated in the SCC, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Procuring Entity's Representative has given written instructions in advance for additional work to be paid for in that way.

11. Program of Work

- 11.1. The Contractor shall submit to the Procuring Entity's Representative for approval the said Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works. The submissions of the Program of Work are indicated in the SCC.
- 11.2. The Contractor shall submit to the Procuring Entity's Representative for approval an updated Program of Work at intervals no longer than the period stated in the SCC. If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity's Representative may withhold the amount stated in the SCC from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.

12. Instructions, Inspections and Audits

The Contractor shall permit the GOP or the Procuring Entity to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors of the GOP or the Procuring Entity, as may be required.

13. Advance Payment

The Procuring Entity shall, upon a written request of the Contractor which shall be submitted as a Contract document, make an advance payment to the Contractor in an amount not exceeding fifteen percent (15%) of the total contract price, to be made in lump sum, or at the most two installments according to a schedule specified in the SCC, subject to the requirements in Annex "E" of the 2016 revised IRR of RA No. 9184.

14. Progress Payments

The Contractor may submit a request for payment for Work accomplished. Such requests for payment shall be verified and certified by the Procuring Entity's Representative/Project Engineer. Except as otherwise stipulated in the SCC, materials and equipment delivered on the site but not completely put in place shall not be included for payment.



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15. Operating and Maintenance Manuals

- 15.1. If required, the Contractor will provide "as built" Drawings and/or operating and maintenance manuals as specified in the SCC.
- 15.2. If the Contractor does not provide the Drawings and/or manuals by the dates stated above, or they do not receive the Procuring Entity's Representative's approval, the Procuring Entity's Representative may withhold the amount stated in the SCC from payments due to the Contractor.

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SECTION V

SPECIAL CONDITIONS OF CONTRACT



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SECTION V - SPECIAL CONDITIONS OF CONTRACT

GCC Clause	
2	Sectional completion is not specified.
4	It shall also be the obligation and responsibility of the Contractor to carry out the Works properly and in accordance with this Contract, including but not limited to the following conditions:
	a. The Contractor shall conduct the Works with due regard to safety and health in accordance with its Construction Safety and Health Program (CSHP) duly approved by the Department of Labor & Employment (DOLE) and in compliance with the DOLE Department Order No. 13 – The Guidelines Governing Occupational Safety and Health in the Construction Industry.
	Failure to comply with the approved CSHP will be considered as non-compliance with the Contract and shall result to the imposition of Section 19, Violation and Penalties of the DOLE Department Order No. 13 and any appropriate sanctions such as, but not limited to:
	 Suspend the work until the Contractor complies with the approved CSHP with the condition that the work resumption will not incur additional cost to the Corporation;
	Suspend payment of the portion of work under question;
	 Correct the situation by employing 3rd party and charge all expenses incurred to the Contractor's collectibles/securities; and
	 Report the condition to the Bureau of Working Conditions of the DOLE for their appropriate action.
	b. The Contractor shall be responsible for the strict compliance with the provision of the Philippine Laws affecting labor and operation of Work under the contract and shall be responsible for the payment of all indemnities arising out of any labor accident which may occur in the execution of the Works and for which he may be responsible under Republic Act 3428, as amended, known as the Workmen's Compensation Law.
	c. The Contractor is obliged to exercise due care so as not to endanger life and property in the vicinity of the Works where he operates in connection with this Contract. He shall be liable for all damages incurred in any manner by acts of negligence of his own, or his agents, employees, or workmen.
	d. It is the responsibility of the Contractor for the strict compliance with the requirements of the Philippine Clean Air Act of 1999 (R.A. 8749) and Philippine Clean Water Act of 2004 (R.A. 9275). The Contractor shall be liable for any damages/destructions to the environment including penalties that will be imposed by the Department of Environment and Natural Resources (DENR) arising from non-

	compliance of the requirements thereof.
	compliance of the requirements thereof.
	e. The Contractor shall be responsible for the strict compliance with the requirements of the Environmental Compliance Certificate (ECC) issued for this project (if any) and DENR Administrative Order No. 26. He shall be liable for any damages/destructions to the environment including penalties that will be imposed by the DENR arising from non-compliance thereof, in any manner by his acts or negligence, or by his agents, employees, or workmen in the execution of the Works. The Contractor may employ a Pollution Control Officer accredited with the DENR for the duration of the project, if so required by the DENR Administrative Order No. 26
	f. It shall be the Contractor's responsibility for the correctness, accuracy and quality of works. NPC's approval does not relieve his contractual obligation and responsibility under this contract.
	g. Payment of all forms of taxes, such as value added tax (VAT) including municipal licenses and permits, and others that may be imposed by the Philippine Government or any of its agencies and political subdivisions in connection with the Contract shall be for the account of the Contractor.
	h. In general, the Contractor is totally responsible for the execution of the Works and therefore, takes upon himself all the technical, legal and economic risks and all obligations which could arise therefrom or connected therewith. The overall responsibility of the Contractor includes the responsibility for actions or omissions of his own personnel as well as the personnel of the sub-contractors.
4.1	NPC shall give access to the Site for the Contractor to commence and proceed with the works on the start date. The access to the site referred herein shall not be exclusive to the Contractor but only to enable him to execute the Work.
5	 The following must be indicated in the performance bond to be posted by the Contractor: Company Name Correct amount of the Bond Contract/Purchase Order Reference Number Purpose of the Bond:
	contract (should be specific date reckoned from the contract effectivity) plus sixty (60) days after NPC's acceptance of the last delivery/final acceptance of the project.

	<u> </u>
	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.
	Other required conditions in addition to the standard policy terms issued by the Bonding Company:
	 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;
	 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;
	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.
6	No site investigation report.
7.2	In case of permanent structures, such as buildings of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron, or concrete which comply with relevant structural codes (e.g., DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnels, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures: Fifteen (15) years.
	In case of semi-permanent structures, such as buildings of types 1, 2, and 3 as classified under the National Building Code of the Philippines, concrete/asphalt roads, concrete river control, drainage, irrigation lined canals, river landing, deep wells, rock causeway, pedestrian overpass, and other similar semi-permanent structures: Five (5) years.
	In case of other structures, such as Bailey and wooden bridges, shallow wells, spring developments, and other similar structures: Two (2) years.
10	No dayworks are applicable to the contract.
11.1	The Contractor shall submit the Program of Work to the Procuring Entity's Representative within Ten (10) calendar days of delivery of the Notice of Award/Letter of Acceptance.
	 -

The period between Program of Work updates is Thirty (30) calendar days. The amount to be withheld for late submission of an updated Program of Work is One percent (1%) of contract amount. 12 During contract implementation, the Procuring Entity shall conduct Constructors Performance Evaluation in accordance with Section 12, Annex E of the Revised Implementing Rules and Regulation of R.A. 9184 using the NPC Constructors Performance Evaluation System (CPES) Guidelines. CPES ratings shall be used for the following purposes: a) eligibility screening/post-qualification; b) awarding of contracts; c) project monitoring & control; d) issuance of Certificate of Completion; and in adopting measures to further improve performance of contractors in the prosecution of government projects. Qualified Constructors Performance Evaluators (CPE) shall conduct project evaluation as follows: (a) During Construction - Except for those projects with a duration of 90 calendar days and below which may be subjected to at least one (1) visit, all projects shall be subjected to a minimum of two (2) evaluations to be performed by the CPE. The number of evaluations beyond the prescribed minimum shall be determined by the CPES-Implementing Unit based on the size, nature and complexity of the project and shall be subject to approval by the proper authorities within the agency. The first evaluation shall be performed when the project is at least thirty percent (30%) physically complete or as maybe required by the CPES-IU using the S-curve or other appropriate means to determine whether there is substantial work completed for evaluation. (b) Upon Completion - only one evaluation shall be performed by the CPE right after the Project Implementation Group reports one hundred percent (100%) completion of the project. The maximum amount of advance payment is fifteen percent (15%) of the Contract Price and paid in lump sum. 13 The date by which "as built" drawings and operating and maintenance manuals are required is within thirty (30) calend		
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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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SECTION VI

TECHNICAL SPECIFICATIONS

SECTION VI - TECHNICAL SPECIFICATIONS

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SECTION VI - TECHNICAL SPECIFICATIONS

PROJECT HIGHLIGHTS

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SECTION VI - TECHNICAL SPECIFICATIONS

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PROJECT HIGHLIGHTS

PH - 1.0 GENERAL

The Supply, Delivery, Installation, Test and Commissioning of Eight (8) Units Modular Diesel Generating Sets Including Balance of Plant for the Electrification of New Areas in Occidental Mindoro, Schedule II has been cancelled. The Generating Sets and equipment/ materials intended for these areas that were already purchased by the Contractor are delivered at NPC Minuyan, San Jose Del Monte Bulacan. The NPC Management has decided to pursue and implement the electrification projects in this Tender Documents for Calutcot, Burdeos Quezon, and Butawanan, Siruma, Camarines Sur utilizing the Gensets and equipment that are to be delivered at NPC Minuyan.

PH - 2.0 PROJECT LOCATION

The project is located in two (2) separate new plant sites, Brgy. Calutcot, Calutcot Is., Burdeos, Province of Quezon and Brgy. Butawanan, Butawanan Is., Siruma, Province of Camarines Sur.

PH - 3.0 SCOPE OF WORK

The works and services to be performed for this undertaking shall essentially consist of, but not limited to the following:

a. Moving-in including furnishing, construction, operation and maintenance of general construction facilities and moving-out thereof after completion and acceptance.

b. All Civil Works:

- 1. Clearing and Grubbing;
- Structural excavation and backfill for equipment foundations of diesel generating sets and its auxiliaries, transformers, and for all miscellaneous Balance-of-Plant (BOP) structures required;
- Concreting works for equipment foundations of diesel generating sets and its auxiliaries, transformers and for all miscellaneous Balance-of-Plant (BOP) structures required;
- Furnishing and installation of drainage systems and appurtenance structures, septic tank, oil water separator, open rc canal, drain pit and catch basin;



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- Fabrication and erection of structural steel supports for water storage tank and fuel oil day tank supports;
- 6. Complete construction of prefab container house;
- 7. Complete construction of flagpole and perimeter lighting support foundation;
- 8. Complete construction/installation of perimeter fence and seclusion fence including entrance gates;
- Furnishing and erection and install for steel pole and steel crossarms braces;
- Laying surface gravel at the switchyard area and genset area;
 and
- 11. All other works and services required to complete the project.
- c. All Architectural Works:
 - 1. Complete construction and installation of prefabricated container house.
- d. All Mechanical Works:

The scope of work shall cover the on-site hauling, installation/erection, assistance to test and commissioning of the diesel engine-generator set and its auxiliaries including supply, installation and test of balance-of-plant, but not limited to the following:

- Packing/crating, Transportation, Hauling, Assembling, Installation, and Assistance to Testing of all Mechanical Equipment and Systems' Auxiliaries and other accessories to be transferred including but not limited to:
 - 1.1. Two (2) sets of 50 kW Modular Diesel Gensets and its systems' auxiliaries FOR CALUTCOT DPP;
 - One (1) set of 50 kW and one (1) set of 30 kW Modular Diesel Gensets and its systems' auxiliaries – FOR BUTAWANAN DPP;
 - 1.3. Spare Parts for Four (4) Genset as listed in Clause MW-2.0, Item a.3 of the Mechanical Works Specifications;
- 2. Assistance during the conduct of test and commissioning of the diesel generating sets by NPC.



SECTION VI - TECHNICAL SPECIFICATIONS

- One (1) set of 1,000-liter fuel oil day tank per genset complete with manhole, inlet and outlet nozzles, nozzles for vent, overflow, drain and level gauge/switch, and structural supports;
- 4. One (1) lot Fuel Oil Piping System complete with valves, strainers, pipe and fittings, gaskets, flanges, bolts and nuts, pipe supports and other required accessories to complete the piping systems for the fuel oil unloading, transfer of fuel oil to day tanks, day tanks to and from diesel gensets including flowmeters (supply and return), waste water/oil from powerhouse drain pit to oil water separator including necessary excavation, backfilling and asphalt jute application to embedded pipes;
- 5. One (1) lot of Well Drilling Works consisting of casing installation, well development, pumping test and disinfection;
- 6. Two (2) sets of Fuel Oil Hand Pump per plant complete with accessories:
- 7. One (1) set of Elevated Water Storage Tank (polyethylene) 600 liters capacity per plant complete with accessories;
- One (1) lot of Domestic Water Supply Piping System, including valves, pipe fittings, pipe supports, excavation and backfilling of embedded pipes and other pipe accessories including disinfection of the system;
- 9. One (1) unit of Inverter/Window type Air Conditioner, 7,000 kJ/h minimum cooling capacity for control house and One (1) unit of Wall mounted Exhaust Fan for toilet, 100 m³/h minimum capacity, propeller type, direct motor driven, 220V, 60 hz, 1-phase power supply for all air conditioning and ventilation units per plant site, all complete with mounting accessories and controls:
- 10. Two (2) sets of Portable Type Fire Extinguishers, Clean Agent (HCFC or Halotron I Type), 7.1 kg. (15.5 lbs), non-expiry, multi shots, wall-hung and UL/FM approved- per Plant Site;
- 11. One (1) lot of various Miscellaneous Equipment and Materials as listed in Clause MW-2.0, Item b.7 and MW-10.0 of the Mechanical Works Specifications;
- 12. Hydrostatic testing of field-installed piping systems under the presence of NPC;



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI-TECHNICAL SPECIFICATIONS

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- 13. One (1) lot of Painting Materials to be applied to all equipment, pipes, steel structures, tanks, pipe supports and other incidentals;
- 14. Provide Labels or Standard Plant Identification Number (SPIN) for all equipment, valves, piping and instruments supplied;
- 15.All other works and services including those that are not specifically detailed herein but are required to fully complete the project;

NOTE: Refer to Mechanical Works Technical Specifications for detailed scope of works.

e. All Electrical Works:

- Hauling, Installation and Test of 2 x 50 kW (for Calutcot DPP) and 1 x 30 kW & 1 x 50 kW (for Butawanan DPP), 480V, 3-phase, 60Hz AC Generator and associated auxiliary electrical equipment including grounding materials that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- Hauling, Installation and Test of Generator Control and Protection Panel (GCPP) for 2 x 50 kW D/G sets (for Calutcot DPP) and 1 x 30 kW & 1 x 50 kW D/G sets (for Butawanan DPP) equipped with monitoring, metering, control, protection and synchronizing equipment/devices;
- Supply of One (1) Spare Circuit Breaker for 50 kW D/G set (for Calutcot DPP) and for 1 x 30 kW & 1 x 50 kW D/G sets (for Butawanan DPP);
- 4. Hauling, Installation and Test of 2 x 75 kVA (for Calutcot DPP) and 1 x 75 kVA & 1 x 37.5 kVA (for Calutcot DPP), 480V/13.8kV, 3-Phase, 60Hz Generator Transformer that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- 5. Hauling, Installation and Test of 15 kVA, 7.97kV/240V, 1-Phase, 60 Hz Station Service Transformer that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- 6. Supply, Installation and Test of 800A, 60 Hz, 15kV, 12kA, Automatic Circuit Recloser;
- 7. Supply, Installation and Test of 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
- 8. Supply, Installation and Test of Kilowatt-hour Demand Meter and associated Instrument Transformers and Accessories:



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- Supply, Installation and Test of Bus Conductor and Line Materials and Hardware;
- Supply, Laying and Test of Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the interfacing of supplied equipment;
- 11. Supply, Installation and Test of Grounding System;
- 12. Supply, Installation and Test of Lightning Protection System;
- Supply, Installation and Test of Lighting & Power System and its Accessories:
- 14. Supply and Installation of Conduit System;
- 15. Supply and Delivery of Special Tools;
- 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
- 17. All other works and services including those not specifically detailed herein but are required to fully complete the project.

PH - 4.0 CONTRACT PERIOD

The contractor shall complete the works as specified within **Two Hundred Ten (210)** calendar days. The contract duration is inclusive of Fifteen (15) unworkable days considered unfavorable for the prosecution of works at the site. The total contract duration shall be reckoned from the date of contract effectivity as specified in the **Notice to Proceed**.

PH - 5.0 CONTRACTOR'S CLASSIFICATION

The Contractor must have a valid Philippine Contractors Accreditation Board (PCAB) license with Registration Particulars of at least "CATEGORY D - GENERAL BUILDING" and registration classification of at least "SMALL B - BUILDING OR INDUSTRIAL PLANT".

The Contractor must have undertaken similar contract such as construction of industrial building, warehouse, office building.

PH - 6.0 MINIMUM REQUIRED KEY PESONNEL

 One (1) Project Engineer – Registered Civil Engineer who had supervised at least a project similar in nature as to the type. Must have



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at least 3 years professional experience as Civil Engineer on similar project.

- One (1) Materials Engineer Registered Civil Engineer with valid accreditation from the Department of Public Works and Highways (DPWH) as Materials Engineer I.
- One (1) Safety and Health Officer Construction Safety and Health Officer who is an Occupational Safety and Health Practitioner (OSH Practitioner) in Construction with accreditation from the Department of Labor and Employment (DOLE).

Valid Professional Regulations Commission (PRC) license for professional personnel, certificate of accreditation from DOLE for Construction Safety and Health Officer, certificate of accreditation including ID card issued by DPWH for Materials Engineer, shall be submitted and included as an attachment in the Standard Form NPCSF-INFR-09: List of Key Personnel Proposed to be Assigned to the Contract.

The above key personnel must either be employed by the Bidder or contracted by the Bidder to be employed for the contract to be bid.

PH – 7.0 MINIMUM REQUIRED CONSTRUCTION EQUIPMENT (Owned or Leased)

The works and services to be performed under this undertaking shall essentially consist of, but not limited to the following:

a.	Welding Machine (300 Amp)	- 1 unit
b.	Oxyacetylene cutting outfit	- 1 unit
C.	Portable Generator (300 kVA)	- 1 unit
đ.	Bar cutter (25mm	- 1 unit
e.	Concrete Vibrator (3.5HP)	- 1 unit
f.	Concrete Mixer (2-bagger)	- 1 unit
g.	Service Vehicle (4x4 pick up)	- 1 unit



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SECTION VI

TECHNICAL SPECIFICATIONS (CIVIL WORKS)



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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 CAMPFACILITIES

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



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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 CAMPSECURITY

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



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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 Bill of Quantities.

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 Bill of Quantities 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.



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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:

- 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 DENRaccredited 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.
- 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 shallowrooted species like grasses, herbs or creepers.



- 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.
- 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 Bill of Quantities.

CW-4.0 SITE GRADING

CW-4.1 SCOPE

In accordance with the specifications contained herein and in conformance with the lines, slopes, grades and extent shown on the plans or otherwise directed by the NPC, the Contractor shall furnish all equipment, labor and materials and shall perform the required grading work.

CW-4.2 CLEARING, GRUBBING AND MISCELLANEOUS WORK

CW-4.2.1 CLEARING AND GRUBBING

The Contractor shall perform clearing and grubbing on the project site. The site shall be cleared and grubbed of all trees and brush except particular trees, which may be retained by the NPC for preservation. Particular trees to be left in place shall be protected from scarring and/or other injuries during clearing and grubbing work and other construction operations.

All stumps, roots and brush shall be removed to a depth of thirty (30) cm below original ground surface and disposed of in a place designated by the NPC. Downed timber, which may be ordered saved by the NPC for future use, shall be cut into logs as directed and neatly piled in a place designated by the NPC, otherwise they shall be disposed of same as above.



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CW-4.2.2 MISCELLANEOUS WORK

Where shown on the drawings or if not shown but directed by the NPC, the Contractor shall perform miscellaneous work like demolition, removal, chipping, replacement or transfer of existing structures and other miscellaneous work. All demolished structures shall be disposed of as directed by NPC.

CW-4.3 GRADING

CW-4.3.1 GENERAL

The word "grading" as defined herein means bringing to required grades all areas in accordance with the lines, slopes, elevations and grades shown on the drawings or as directed by the NPC.

CW-4.3.2 CLASSIFICATION OF MATERIALS

All materials in grading work shall be unclassified regardless of the nature of materials encountered during grading excavation and of materials used in grading fill. It is on the basis of unclassified material that Contractor shall determine his unit bid price for grading excavation and grading fill.

CW-4.3.3 STRIPPING

Fill areas to be brought to grade shall first be stripped of their top soil as directed but in no case less than twenty (20) centimeters in depth and disposed of properly in spoil areas designated by the NPC. Only materials from grading excavation and intended to be used for filling or backfilling purposes shall be stripped of top soilin the same manner as above.

CW-4.3.4 EXCAVATION AND FILL

Areas required to be brought to grade shall be excavated or filled as the case may be. Grading work shall be carried out in such a manner that the free drainage is maintained at all times and nowhere shall pondage be found in any part of the work.

The NPC may require the modification of slopes and grades according to the conditions actually encountered during excavation, but such change or modification shall not be construed to mean by the Contractor as a basis for additional compensation over and above the contract unit prices.

Any over-excavation performed by the Contractor for any purpose or reason, except as may be ordered by the NPC, shall be at the Contractor's expense and any excess of excavation shall be refilled, where required, with approved materials that shall be furnished, place and properly compacted at the expense of the Contractor.

Unsuitable materials, as determined by the NPC, which may be encountered below established grade, shall be removed to a depth as directed and accordingly replaced with suitable materials approved by the



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NPC. The removal and proper disposal of such unsuitable materials shall be paid for at the contract unit price for the item, Grading Excavation, and payment for placing and compacting suitable material be made at the contract unit price for the item, Grading Fill, in the Bill of Quantities.

Fill work shall not be started until the area has been inspected and approved by the NPC after stripping. Grading fill shall be spread and compacted in layers of 15 cm. loose volume and compacted with approved roller weighing not less than 10 tons. Each layer shall be moistened or dried as directed for maximum compaction. No succeeding layer shall be placed thereon unless the preceding layer has been tested for compaction and approved by the NPC.

In the event that construction of concrete footing or other concrete foundations is on fill, the fill shall be compacted efficiently and thoroughly so that when the fill is tested for compaction at the required foundation elevation for the structure, the required bearing capacity is attained but in no case less than 144kpa. In no case shall filling and compaction work to be done without the presence of NPC's inspectors. The Contractor shall be held liable for any structural instability or damage that might result in consequence to non-compliance of this requirement. The Contractor shall institute corrective measures to bring the foundation base to a condition or state that will conform to the required bearing capacity; and also to repair and make good any damage on the structure to the satisfaction and at no cost to NPC.

CW-4.3.5 SLIDES

In the event that slides occur along excavated slopes during grading operations or after completion of grading but prior to acceptance of the work, the Contractor shall removed and dispose the slide materials and also to trim the slopes as directed to leave the slopes in a safe and neat condition all at no additional cost to NPC, unless occurrence of such slides is occasioned by causes beyond control of the Contractor. In such event, payment for the satisfactory removal and proper disposal of slide material and finishing and rounding of slopes will be paid for at the equivalent of thirty percent (30%) of the contract unit price per cubic meter for the item Grading Excavation.

CW-4.3.6 SLIP-OUTS

In the event of slip-outs in any part of the grading fill prior to final acceptance of the work, the Contractor shall rebuild such portion of the fill. In the case it is determined that the slip-outs was caused through the fault of the Contractor, the rebuilding of the fill shall be performed by the Contractor at no extra cost to NPC; otherwise, the reconstruction of the fill will be paid for thirty percent (30%) of the contract unit for the item, Grading Fill.

CW-4.4 DISPOSAL

All excess materials from grading work (including excess materials in structural excavation and miscellaneous work) shall be disposed of the by the Contractor. The acquisition of the right-of-way for the area of disposal including the access thereto, permits, and other requirements,



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shall be the responsibility of the Contractor at no cost to NPC. The Contractor shall be held solely liable for any claim by third parties that may arise from improper transport and disposal of excess materials. The cost of acquisition of the above-mentioned right-of-way shall be included in the unit bid price for excavation.

CW-4.5 SOURCES OF FILL MATERIALS

When suitable materials from grading excavation are deficient to meet the quantity required for grading fill, additional fill materials shall be obtained from other sources proposed by the Contractor and approved by the NPC. Cost of excavating, hauling, placing and compacting additional materials from borrow sources shall be included in the unit price bid for the item, Grading Fill. Acquisition of right-of-way to these sources shall be the responsibility and account of the Contractor.

CW-4.6 ENVIRONMENTAL REQUIREMENTS

All construction activities to be performed by the Contractor shall be in accordance with the restrictions stated in the approved Environmental Clearance Certificate (ECC) and the conditions set forth in Clause 3.0 — Environmental Requirements for Civil Works.

CW-4.7 MEASUREMENT AND PAYMENT

CW-4.7.1 CLEARING AND GRUBBING

Unless otherwise specified in the bill of quantities, no separate measurement and payment will be made for Clearing and Grubbing. Corresponding cost hereof shall be included in the unit bid price of relevant item(s) in the bill of quantities.

CW-4.7.2 MISCELLANEOUS WORKS

Measurement for payment for miscellaneous work such as demolition, restoration, etc., shall be made on a lot basis unless otherwise specified in the bill of quantities. Payment will be made at the contract unit price for the item Miscellaneous Works, which payment shall cover all cost for furnishing labor, equipment and incidentals necessary for demolition and restoration, disposal, and other related works required to complete the item.

CW-4.7.3 STRIPPING

Unless otherwise specified in the bill of quantities, no separate measurement and payment will be made for Stripping. Corresponding cost hereof shall be included in the unit bid price of relevant item(s) in the bill of quantities.

CW-4.7.4 GRADING EXCAVATION

Measurement for payment for Grading Excavation shall be based on the number of cubic meters excavated and properly disposed. Volume shall be computed by the average end area method which shall be the volume



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between the original ground (as determined by survey to be made by representatives of both NPC and the Contractor) and graded surface on the drawings or as established by NPC. To this volume shall be added, for purpose of payment, all authorized excavations below grade.

Payment will be made at the contract unit price for the item Grading Excavation in the Bill of Quantities, which payment shall constitute full compensation for furnishing of all labor, construction equipment and incidentals necessary excavate, dispose and other related work required to complete the work item.

CW-4.7.5 GRADING FILL

Measurement for payment for Grading Fillshall be based on the number of cubic meters of the materials placed, graded, compacted and accepted. Volume shall be computed by the average end area method which shall be the volume between the ground surface after strippingand the finished grade surfaces on the drawings or as established by NPC.

Payment will be made at the contract unit price for the item Grading Fill in the Bill of Quantities, which payment shall constitute full compensation for furnishing of all materials, labor, construction equipment and incidentals necessary to complete the work item.

CW-5.0 STRUCTURAL EXCAVATION, FILL AND BACKFILL

CW-5.1 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-5.2 MATERIALS

CW-5.2.1 STRUCTURAL EXCAVATION

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

CW-5.2.2 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:

Sieve Designation (Square Mesh Sieves)

Percentage by Weight Passing



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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-5.2.3 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:

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-5.2.4 STRUCTURAL BACKFILL

<u>Backfill for Structures Other Than Pipes</u> – 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.

<u>Backfill for Sewerage and Drainage Pipes</u> – 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.

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



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CW-5.3 CONSTRUCTION

CW-5.3.1 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. <u>Drainage and Sewerage Pipes and Cable Trench</u>

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.



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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-5.3.2 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-5.3.3 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-5.3.1b.

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-5.2.3.

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

CW-5.3.4 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 cm²of 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



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herein shall be placed in layers as directed, each layer either dried or moistened as directed and 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-5.4 MEASUREMENT AND PAYMENT

CW-5.4.1 STRUCTURAL EXCAVATION

Measurement for 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 Bill of Quantities, which payment shall constitute full compensation for furnishing all labor and equipment necessary for excavation work and proper disposal of excess material excavated.

CW-5.4.2 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 Bill of Quantities, 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-5.4.3 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 Bill of Quantities, which payment shall cover all costs for furnishing all labor, materials, equipment and tools necessary to complete the item.

CW-5.4.4 STRUCTURAL BACKFILL

Measurement for payment for Structural Backfill (except backfill for drainage and sewerage pipes, appurtenances and other structures of



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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 Bill of Quantities, which payment shall constitute full compensation for furnishing all labor, materials and equipment necessary for backfilling work.

CW-5.4.5 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 Bill of Quantities.

CW-6.0 CONCRETE

CW-6.1 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-6.2 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-6.3 MATERIALS

CW-6.3.1 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 (ASTM C150).

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.



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CW-6.3.2 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-6.3.3 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-6.3.4 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-6.4 STORAGE OF MATERIALS

CW-6.4.1 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-6.4.2 REINFORCING STEEL

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



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CW-6.5 CONCRETING

CW-6.5.1 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-6.5.2 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-6.5.3 MIXING CONCRETE

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

CW-6.5.4 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 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-6.5.5 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.



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CW-6.5.6 REMOVAL OF FORMS

Forms shall be removed as soon as practicable in order to avoid delay in curing and to make possible earliest practicable repair of surface imperfections, but in no case shall they be removed without approval. Any needed repair or treatment shall be performed at once and shall be followed immediately by the specified curing. Forms shall be removed with care so as to avoid injury to the concrete and any concrete so damaged shall be repaired as directed.

CW-6.5.7 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-6.5.8 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.

Test cylinders shall be prepared from the concrete samples and tested. At least one set of four (4) cylinder samples shall be made for each major structural member. 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.

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



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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-6.5.9 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-6.5.10 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-6.6 MEASUREMENT AND PAYMENT

Measurement for payment for Concrete (except concrete which shall be measured for separate payment) 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 contract unit price for the various items of concrete shown in the Bill of Quantities. 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.

CW-7.0 REINFORCING STEEL

CW-7.1 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.



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MATERIAL REQUIREMENT CW-7.2

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.

BAR REINFORCEMENT CW-7.2.1

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.

SAMPLING CW-7.2.2

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.

CONSTRUCTION REQUIREMENT CW-7.3

ORDER LIST FOR BENT BARS CW-7.3.1

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.

FABRICATION CW-7.3.2

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 6mmΦ to 20mmΦ inclusive

D=6d D=8d

Bars 25mmΦ and 28mmΦ

Bars 32mmΦ and greater

D=10d

Bends and hooks in stirrups and lateral ties may be bent to the diameter of the principal bar enclosed therein. VI-CW-19



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CW-7.3.3 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-7.3.4 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.



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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 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 takes 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	+25mm

. Spacing bars in walls and solid slabs

d. Spacing bars in beams and ±6mm footings

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 boits 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-7.3.5 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



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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.

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:

Splice Type	Grade 40 Min.Lap	But Not Less Than
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 (11/2) turns or by butt-welding unless otherwise shown on the drawings.

CW-7.4 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>	Size (mm)	Weight (kg/m)
#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



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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.

The accepted quantity shall be paid at the corresponding unit price for the item, Reinforcing Steel as shown in the Bill of Quantities which price and payment shall be made in full compensation for furnishing materials, labor, equipment and incidentals necessary to complete this item.

CW-8.0 STRUCTURAL STEEL

CW-8.1 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-8.1.1 SUBMITTALS

<u>Shop Drawings</u> 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.

<u>Erection Plan</u> 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.

<u>Certificates of Conformance</u> for the following:

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

<u>Chemical Analysis and Tensile Strength Test</u> 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.



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CW-8.1.2 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-8.2 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-8.2.1 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

ASTM A328

(Soldier Piles):

CW-8.2.2 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-8.2.3 ACCESSORIES:

Welding electrodes and steel structural members shall use:

Rods

E70XX electrodes

Non-shrink Grout

ASTM C827, non-metallic



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CW-8.3 EXECUTION

CW-8.3.1 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-8.3.2 WELDING OF STRUCTURAL STEELWORK:

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-8.3.3 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 in a workmanlike manner, 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.
- <u>Marking</u>: 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.



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CW-8.3.4 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.

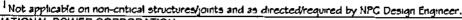
Any structure that does not conform shall be repaired, removed and/or erected anew by the Contractor at no additional cost to NPC.

Tolerances on structural steel shall be in accordance with the "Code of Standard Practice" of the AISC "Manual of Steel Construction".

CW-8.3.5 TESTS AND INSPECTIONS

<u>Visual Inspection of Welding</u>: 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 Testing¹: 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





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areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

CW-8.4 MEASUREMENT AND PAYMENT

Measurement for payment for structural steel shall be based on the total kilogram of structural steel placed and accepted.

Payment will be made at the contract unit price for the item Structural Steel in the Bill of Quantities, which payment shall constitute full compensation for furnishing all labor, materials and equipment necessary to complete the item.

CW-9.0 REINFORCED CONCRETE FOUNDATION AND ASSOCIATED STRUCTURES FOR EQUIPMENT AND OTHER COMPONENT (DESIGNED/CONSTRUCTED BY CONTRACTOR)

CW-9.1 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-9.2 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 toNPC'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
- Reinforcing steel shall conform to Philippine National Standards grade DSB 275
- 3. Compacted sand and gravel bedding shall be 150 mm thick
- Soil bearing capacity shall be subject to the Contractor's determination and verification at the site
- 5. Wind velocity: 270 kph
- 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
- 7. Top of foundations/pedestals shall be 300 mm above the finished ground elevation
- 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



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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-9.3 Measurement and Payment

Unless otherwise indicated in the Bill of Quantities, 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 for the entire works shall be included in the supply and installation of associated mechanical and/or electrical equipment/works where they are required.

CW-10.0 DRAINAGE SYSTEM AND APPURTENANT STRUCTURES

CW-10.1 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, drainage outlets, etc. as well as joints and connections as may be required to complete the system.

CW-10.2 Materials

CW-10.2.1 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-10.2.2 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



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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-10.2.3 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-10.2.4 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-6.0 – Concrete. Foundation base material for concrete canal shall be sand and gravel as described in Section CW-5.0.

CW-10.2.5 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-10.3 Construction

CW-10.3.1 Trench Excavation and Backfill

Trench excavation and backfill work shall be done in accordance with the pertinent provisions of Section CW-5.0.

CW-10.3.2 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.



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CW-10.3.3 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, 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-10.4 Pipe Installation

CW-10.4.1 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-10.4.2 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.



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CW-10.5 Measurement and Payment

CW-10.5.1 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 Bill of Quantities. Payment shall 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-10.5.2 Concrete Drainage Pipes and PVC Pipes

Non-reinforced and reinforced concrete drain pipes, and perforated 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 Bill of Quantities. 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-10.5.3 Appurtenant Structures

Measurement for payment of appurtenant structures like street inlet, street inlet-catch basin combination, manhole, catch basin for downspouts, catch basin for intersecting perforated PVC pipes, septic tank, 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 Bill of Quantities. 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-10.5.4 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 Bill of Quantities, which payment shall constitute full compensation for furnishing all labor, materials, equipment and tools necessary to complete the items.



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CW-11.0 PERIMETER AND SECLUSION FENCE(S)

CW-11.1 SCOPE

In accordance with the specifications contained herein, the Contractor shall furnish all labor, materials, equipment and tools for the construction of perimeter and seclusion fences, including the fabrication and installation of vehicular and pedestrian gates, to the length or extent shown on the drawing or as established in the field.

CW-11.2 MATERIALS

CW-11.2.1 CEMENT AND REINFORCING STEEL

Cement and reinforcing steel shall conform to the requirements set forth in CW-7.0 – Concrete. Class of concrete shall be 20.7 MPa or as shown on the drawings.

CW-11.2.2 CONCRETE HOLLOW BLOCKS (CHB)

Concrete hollow blocks shall be 150 mm x 200 mm x 400 mm (6"x 8"x 16") non-load bearing with a compressive strength of 3.10MPa. CHB units shall be free of chips, splits or other defects, which in the opinion of the NPC, might impair their strength and durability. At the option of the NPC, CHB units delivered to the site shall be tested to check on their specified strength. One specimen taken at random representing 500 units shall be tested. Sampling shall be done by the NPC. The group represented by a specimen that fails the compression test shall not be used in the work.

CW-11.2.3 FINE AND COARSE AGGREGATES AND WATER

Fine and coarse aggregates and water shall conform to the requirements stated in CW-7.0 – Concrete.

CW-11.2.4 STRUCTURAL STEEL

All structural steel (rolled shapes and plates) for the fabrication of the vehicular and pedestrian gates, unless otherwise specified on the drawings, shall conform to ASTM A36.

CW-11.2.5 HEAVY GALVANIZED CYCLONE WIRE

The material shall be made from steel wire helically wound and interwoven in such a manner as to provide a continuous mesh without knots or ties except in the form of knuckling or of twisting and barbing the ends of the wires to form the selvage of the fabric. The base metal shall be steel of such quality and purity that, when drawn to the size of wire specified and coated with zinc either before or after fabrication, the finished fencing shall be or uniform quality and have the properties and characteristics conforming to ASTM Designation A392. Fabric that is zinc coated after weaving and produced in accordance with this specification shall be hot-dip galvanized. Fabric that is zinc coated before waving may be either electronically or hot-dip galvanized.



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CW-11.3 CONSTRUCTION

CW-11.3.1 GENERAL

Excavation, backfilling and concreting work shall be in accordance with the applicable provisions of CW-5.0 – Structural Excavation, Fill and Backfill, CW-7.0 – Concrete and CW-8.0 – Reinforcing Steel and as prescribed hereunder.

CW-11.3.2 CHB Construction

a) Laying

All masonry units shall be plumbed, leveled and accurately spaced. All units shall be wetted before laying. The block should be laid on full mortar bedding and in such a way that no cracks are formed between the blocks and the mortar at the time it is laid. Any horizontal and vertical CHB wall reinforcements shall be anchored to concrete works by means of 10 mm (3/8") round by 609 mm (24") long dowels. Embedding of anchor bolts, expansion shields, conduits, etc. shall be done as the erection progresses.

b) Cutting and Patching

Cutting and patching of masonry, as may be required to accommodate the work of other trades, shall be performed by masonry mechanics.

c) Finishing

All hollow block wall surfaces to be applied with cement plaster will be cleaned, evenly wet slushed with a wash of neat cement and sand followed by 1:2 cement mortar mix 10 mm (3/8") thick which shall be applied with a wooden float.

d) Mortar Proportions

Cement mortar for laying concrete hollow blocks shall consist of one (1) part Portland cement, one-fourth (1/4) part lime and three (3) part sand. Only sufficient water to make a workable mix will be permitted.

Masonry grout for filling cells of concrete hollow blocks shall consist of one (1) Portland cement, one-fourth (1/4) part lime, three (3) parts sand to which three (3) parts gravel is added by volume. Mortar materials shall be accurately measured by volume and thoroughly mixed until evenly distributed throughout the batch mechanical mix. The actual mixing time shall not less than two minutes.

e) Reinforcement

All horizontal reinforcement shall be tied to vertical reinforcement.



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CW-11.3.3 VEHICULAR/PEDESTRIAN GATES

Fabrication and installation of vehicular and pedestrian gates shall conform to the requirements of the drawings or as directed by the NPC.

Welding Works

All welding work shall conform to the Specifications for Welded Highway and Railway Bridges of the American Welding Society (AWS).

Galvanized surfaces to be painted, in addition to being cleaned with mineral spirits or other solvents, will require surface treatment to which paint will adhere. The galvanized surfaces, therefore, shall be coated with a solution of 7.5 grams of copper sulfate to a liter of water, allowing the coating to remain on the surface of at least twelve (12) hours, and dusting off with stiff brushes.

Surfaces to be painted shall be clean, dry, smooth and free from dust, rust, grease or oil. Sufficient time shall be allowed between coats of paints to insure complete drying but in no case less than 24 hours. No painting shall take place during the presence of rain, fog, dew or where the surfaces may otherwise be damp. All work shall be done in a workmanlike manner, leaving finished surfaces free from runs and sags.

CW-11.3.4 CYCLONE AND BARBED WIRES

Fabrication and installation of the heavy galvanized cyclone wire seclusion fence and gate, including barbed and razor (line, single coil or cross coil) wires, shall be in accordance with the drawings or as directed by the NPC.

CW-11.4 MEASUREMENT AND PAYMENT

CW-11.4.1 PERIMETER FENCE

Measurement for payment for perimeter fence will be based on the number of linear meters of fence constructed and accepted or as indicated in the Bill of Quantities.

CW-11.4.3 CYCLONE AND BARBED WIRE FENCE(S)

Measurement for payment for cyclone and/or barbed wire fences will be based on the length of fence in linear meters furnished, installed and accepted including wire anchorage as indicated in the Bill of Quantities.

CW-11.4.4 VEHICULAR/PEDESTRIAN GATE

Unless otherwise indicated in the Bill of Quantities, no separate measurement and payment will be made for the fabrication and installation of vehicular and/or pedestrian gates. All costs hereof shall be included in the payment for perimeter or seclusion fences, as applicable, or as indicated in the Bill of Quantities.



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CW-12.0 STEEL POLE WITH CROSS-ARMS AND BRACES

CW-12.1 Description

This specification covers the technical and associated requirements for the supply and erection of steel pole complete with cross arms and braces.

CW-12.2 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-12.3 Pole Erection

The Contractor shall use standard and accepted practice and method of erecting the poles depending on their location. The Contractor shall excavate holes for poles setting to a depth indicated below:

Depth of Pole Setting					
Length of Poles In Earth In F					ock
Meter	Feet	Meter	Meter Feet		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



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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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 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 hardwares 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 Contractor in accordance with the drawings. All nuts shall be tightened adequately.

CW-12.4 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 Bill of Quantities, which payment shall constitute full compensation for furnishing of all materials, labor and hardwares and accessories necessary to complete the items.



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SECTION VI

TECHNICAL SPECIFICATIONS (ARCHITECTURAL WORKS)

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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PART I - TECHNICAL SPECIFICATIONS

AW - ARCHITECTURAL WORKS

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AW- ARCHITECTURAL WORKS

AW-1.0 GENERAL ARCHITECTURAL REQUIREMENTS

AW-1.1 General

The work to be done under this section shall include the furnishing of all labor, materials, equipment, tools, storage, and stockyards of the pertinent materials and structural components and other incidentals for all architectural works enumerated hereunder, as shown on the accompanying drawings or as otherwise directed.

The work shall be performed and completed with high-quality workmanship, in accordance with generally accepted modern practice in carpentry fenestrations, tinsmithing, plumbing, painting, landscaping and masonry work, etc. notwithstanding any omission from these Specifications or drawings.

Materials and structural parts that the Contractor shall supply and install and which will be incorporated in the structure shall be new and unused. They shall be suitable for their intended purpose and appropriately matched to each other complying with all applicable regulations, quality and dimensions standards. Defective work is not acceptable.

AW-1.2 Submission of Samples

At least one (1) month before the start of any installation or application of materials, the Contractor shall submit samples of materials for all sections for evaluation and approval. No work shall be done until after samples are approved by the NPC Representative in writing. All work must strictly conform to approved samples as to quality, texture, color, and finish.

Failure of the Contractor to comply with the preceding stipulation shall not entitle them of any extension of time nor any claim whatsoever for any delay in the work after rectification due to disapproval of work.

To avoid unnecessary delay, it is suggested that the orders and/or purchase of imported or local materials shall be made within a sufficient period in order that adequate supply is available at any time when needed.

AW-1.3 Substitution of Materials

The Contractor shall submit a written request for substitution of materials in lieu of those specified when deemed very necessary and urgent. Such a request shall indicate the reasons for substitution. No substitute material shall be used without written authorization from the NPC Representative.

In the case of approved substitution of an inferior kind of material, a reduction in the contract price equal to the difference in cost of the two kinds of materials shall be made. Market prices at the provincial capital or at a commercial center agreed upon by the NPC Representative and the Contractor on the date upon



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which authority for substitution is granted shall be the basis of said price reduction. Price differentials shall be determined and agreed upon immediately by both parties and incorporated in the approved letter of substitution.

The Contractor shall submit a written request for substitution at least one (1) month before such materials are actually needed. Such a request shall be accompanied by samples to be substituted and corresponding certification.

No price increase will be allowed for a better kind of material.

AW-1.4 Certification of Materials

The Contractor shall submit to the NPC Representative signed certificates from the manufacturer or sole distributor of equipment and materials to be furnished and installed by the Contractor/Contactor, certifying as to the kind, quality, rated capacity, quantity, performance and other descriptions of the equipment and materials delivered under a receipt number and date. No equipment or materials shall be erected, installed or applied such as electrical fixtures and accessories, concrete reinforcing steel, cement, G.I. and C.I. pipes, valves and fittings, plumbing and sanitary fixtures, building materials and finishes, paint and waterproofing, etc., without the required certificates.

AW-1.5 Other works which even if not specifically mentioned in the Section and Bill of Quantities shall be included:

- The measurements for the execution and payment of the Works, including provisions of the measuring equipment and the engagement of labor
- Connecting up of water, gas, and electricity from the mains of the site indicated by the NPC Representative to the points of use
- Provision of small equipment and tools
- Safeguarding the Works against surface water, which shall normally be reckoned with, and its possible necessary removal
- Protecting the Works from heat, wind, and rain
- Protection and safety measures required
- Protecting the executed works and the items handed over the execution of same from damage and theft up to the time of acceptance
- Supplying of the operational materials
- Supplying of consumable stores
- Supplying of fitting dowels
- Supplying of simple type pipe covering, e.g., in the shape of pipe sheathings with corrugated cardboard and the like
- Supplying and fitting pipe fastening elements, e.g., pipe clips, hangers, etc.
- installing and dismantling as well as providing all framework and scaffolds
- Making blackouts on concrete



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- Chemical preservation of timber
- Instructing the operating and maintenance personnel

NOTE:

The above provisions are general for all types of buildings. The Contractor shall be guided accordingly by the applicable provisions in the specifications and what is shown in the drawings for each type.

AW-1.6 Measurement and Payment

Measurement for payment for different items in **Architectural Works** will be based on the areas, lengths, volumes, and quantity placed and accepted by the NPC Representative.

Payments for each architectural item will be made at the corresponding contract unit price per square meter, linear meter, cubic meter and the number of pieces/sets, for the pertinent items under Architectural Works in the Bill of Quantities.

Payment shall constitute full compensation for all labor, materials, equipment, tools, and incidentals necessary for the completion of each work.

AW-2.0 PREFABRICATED CONTAINER HOUSE

AW-2.1 General

The specification covers the features and technical requirements for the supply, delivery and erection/installation of one (1) unit, 20ft. Prefabricated Container House. Other parts and accessories which are not specifically mentioned herein but are necessary for the proper assembly and erection of the staff house shall be included to be furnished.

All materials to be used and incorporated into the staff house shall be new and unused. They shall be suitable for the intended purpose and shall comply with all applicable regulations, quality, and standards.

The Contractor shall accept full responsibility for his work including design, performance qualifications, specifications, documentation, reports, fabrication, assembly, corrosion protection, shop testing, preparation for shipment, field testing, warranty provisions and compliance with the applicable codes and standards and the requirements of this Specification.

AW-2.2 Work Scope

The works and services to be performed by the successful bidder shall cover the supply, delivery, and complete erection/installation of one (1) unit, 20ft. Prefabricated Container House which shall essentially consist of but not limited to the following:

 Moving-in including furnishing, installation, construction, operation and maintenance of general construction facilities.



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- 2. Clearing and grading of the project site and disposal of all excess materials to designated areas.
- Construction of reinforced concrete foundation including all required structural excavation, backfill and proper disposal of all excess excavated materials as per detailed drawings.
- 4. Supply and installation of one (1) unit twenty (20) feet Prefabricated Container House with the following specifications and fixtures:

Dimensions	6.0 meters length by 2.4 meters width by 2.6m height
Container Frame	Square tubing, 4 mm base metal thickness, pre- painted.
Wall Panels	50mm Polysterene insulation with double-sided 0.45mm pre-painted GI sheet
Roof Panels	50mm Glasswool insulation with pre-painted GI sheet roof and interior ceiling
Flooring	MGO board with linoleum tiles
Windows (4 sets - 1.0mx 1.0m)	Aluminum sliding windows
Door (1 set - 0.80m x 2.1m)	Steel Door
Toilet & Bath (Office Area) (1 set – 1.20m x 1.20m)	Complete with fixtures & fittings, including ceramic floor tiles, door, window and plumbing

- 5. Application of touch up paint for scratch during installation.
- Removal/clearing of all debris and waste/excess materials prior to demobilization.

AW-2.3 Design Criteria for Prefabricated Container House

The prefabricated container house shall be designed for the erection on the concrete foundation. All materials under these specifications shall be designed, constructed and erected in accordance with the requirement of the specification and codes of AISC, ASTM and other such regular published and accepted codes except were modified or supplemented by these specifications.



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Wind load

The wind load shall be based on the latest edition of NSCP.

AW-2.4 Measurement and Payment

Measurement and payment for prefabricated container house will be based on the corresponding contract unit price (set) under the architectural work's Bill of Quantities.

Payment shall be made at the contract unit price, which payment shall cover costs of furnishing all materials and labor including equipment and tools required to complete the work and all associated costs for site grading, foundation/ slab construction including transport to site.

AW-3.0 PLUMBING FIXTURES AND FITTINGS

AW-3.1 General

The work covered by this section of the Specifications consists in furnishing all plant, labor, equipment and tools, articles, appliances and materials and in performing all operations in connections with the installation of all plumbing fixtures, fittings and accessories, complete, in strict accord with this section of the Specifications or indicated on the drawings, are included in this work.

AW-3.2 Make

The model numbers herein given intended to illustrate the quality and design of fixtures that will be required. American standard fixtures specified herein and any substitution made to any item of fixtures specified must first be approved by the NPC Representative.

AW-3.3 Trade Marks

All plumbing fixtures and fittings must bear the trademarks of the manufacturer.

Maintenance Manual shall be submitted including complete instructions for replacing valve washers and strainers and give manufacturer's recommendations as to cleaning finish fixture surfaces.

Submit samples of valves, faucets, trims, and others for approval of the NPC Representative.

AW-3.4 Fixtures

Water Closet - as shown in the drawings or as specified in the Bill of Quantities

- a) Bibbs Nickel Plated Copper or Brass Alloy
- b) Kitchen Sink Stainless
- c) Floor Drain Stainless or Brass Alloy



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d) Clean-outs - Brass alloy

AW-3.5 Installation

Plumbing fixtures shall be installed free and open in a manner to afford access for cleaning. All brackets, cleat, plates, and anchors required to support the fixtures shall be furnished in a rigid manner. Water closets shall be sat on Boll-Wax.

Installed plumbing fixtures shall be kept clean and in working order for adequate protection so as not be used by anybody until issuance of Certificate of Completion.

All fixtures shall be provided with individual control stop so that each fixture may be separately controlled without affecting any other fixture.

All flush valves shall be equipped with vacuum breaking devices.

AW-3.6 Toilet Accessories

- Soap Holders colored, vitreous China to match fixtures quality, brand and wainscoting color.
- b) Tissue Paper Holder colored, to follow Water Closet brand and quality. Provide and fit, ready for use, on the most convenient side of the wall inside each water closet compartment, 750mm (30") above the finish floor.
- c) Liquid Soap Dispenser

AW-3.7 Measurement and Payment

Measurement and payment for **Plumbing Fixtures** will be based on the number of sets/pieces installed and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per set/piece for the pertinent item under Architectural Works in the Bill of Quantities.

Payment shall constitute full compensation for all labor, materials, equipment, tools, and incidentals necessary for the completion of this work.

AW-4.0 ROOFING AND SIDING SHEETS

AW-4.1 General

The Contractor shall furnish all labor, materials, and operations including tools, other implements and accessories for the complete installation of roofing sheets wherever indicated in the drawings.

Installation shall be performed by skilled workmen in accordance with the construction and shop drawings and the manufacturer's standard.



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Shop drawings and manufacturer's catalogue showing product standards and technical data will be provided by the Contractor to the NPC Representative for approval.

AW-4.2 Materials

Material for roofing shall be UPR-250 pre-insulated composite roofing panel (25mm thick) or approved equal. Effective width is 1m and with base metal of 0.60mm thick for Top Metal Skin and 0.40mm thick for Bottom Metal Skin. Bended sheets such as flat barge caps, flashings, ridge rolls, capping, moldings and gutter must be 0.6mm thick.

AW-4.3 Workmanship

Installation of the roofing shall be done by the manufacturer or his authorized installer in strict accordance with the specification of the manufacturer.

AW-4.4 Measurement and Payment

Measurement and payment for Roofing and Siding Sheet will be based on the projected area inspected and accepted by the NPC Representative. No measurement & payment will be made on hidden areas covered by side & end overlaps, the cost for these being included in the projected area.

Payment will be made at the corresponding unit price per square meter for pertinent items under Architectural Works in the Bill of Quantities.

AW-5.0 DOWNSPOUTS AND ROOF DRAINS

AW-5.1 Scope of Works

a) Downspouts

Downspouts shall be 150 mm diameter unplasticised PVC, or as indicated in the drawings complete with fittings and accessories down to the catch basin and water storage tank.

b) Roof Drain

Roof drain shall be of high grade, strong, stainless. Casting shall be free from blowholes, porosity hard spots, excessive shrinkage, cracks, or other injurious defects shall be smooth and well cleaned both inside and outside and all fin sand roughness removed. Roof drains shall conform to the diameter of downspouts. Roof drains shall be provided at the upper end of all downspouts.



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AW-5.2 Measurement and Payment

- Downspouts
 Measurement for payment will be based on the length installed and accepted.
- Roof Drains
 Measurement for payment for Roof Drain will be based on the number of set installed and accepted.

Payment shall constitute full compensation for labor, materials, equipment, tools and incidentals necessary for the completion of the work.



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SECTION VI

TECHNICAL SPECIFICATIONS (ELECTRICAL WORKS)



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PART I - TECHNICAL SPECIFICATIONS

SECTION EW - ELECTRICAL WORKS

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SECTION EW - ELECTRICAL WORKS

EW-1.0 GENERAL

The supply of associated electrical equipment for high and low voltage installation shall be complete with all the requirements firmly and safely connected and interconnected with operating switches, interlocks, signalization, alarms and metering instruments to the extent required to put the power plant in satisfactory operating conditions.

The Contractor must supply all minor items (such as auxiliary relays, terminal blocks, accessories, etc.) which are necessary although not expressly described in the Technical Specifications, in order to guarantee the trouble free operation and ease in the maintenance of the supplied equipment (or parts of equipment supplied) with particular reference to the provisions to be taken into consideration in order to avoid dangerous or wrong operations.

The electrical equipment shall be designed in such a way as to bear without damage and permanent deformation the consequences of overvoltage of internal or atmospheric origin and short circuit calculations shall be provided, giving full evidence, that each electrical component can withstand the maximum stresses under fault conditions, e.g., upon failure of the corresponding main protection device and time-delayed fault clearing by the back-up protection device.

Outdoor installations shall be protected against solar radiation by means of adequate covers, where required, with non-deteriorating material to be supplied by the Contractor.

The Contractor shall ensure that all equipment supplied is insensitive to any signals emitted by wireless communication equipment.

All the metallic frames of the electrical equipment shall be securely connected to the general earthing system in compliance with accepted Standards.

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:

Calutcot Diesel Power Plant

a) Hauling, Transportation, Packing/Unpacking as applicable, assembly, Installation, Erection and assistance to testing and commissioning of all Electrical Equipment and Auxiliaries and other accessories that will be transferred from NPC-Minuyan, San Jose



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Del Monte. Bulacan to the Calutcot Diesel Power Plant, Burdeos, Quezon, but not limited to the following:

- a.1 Two (2) sets of 50 kW Diesel Generating Set including all necessary accessories/auxiliaries;
- a.2 Two (2) sets of 75 kVA Transformer for 50 kW Diesel Generating Set including all necessary accessories/auxiliaries;
- a.3 Two (2) units of Generator Control and Protection Panels (GCPP) complete with all necessary monitoring, metering, control, protection and synchronizing equipment/devices;
- a.4 One (1) unit of 15 kVA, 13.8kV/240V, 3-Phase, 60 Hz Station Service Transformer;
- a.5 One (1) unit of 800 A, 60 Hz, 15 kV, 12 kA, Automatic Circuit Recloser;
- a.6 12 kV Lightning Arresters;
- a.7 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
- a.8 Kilowatt-hour Demand Meters and associated Instrument Transformers and Accessories:
- a.9 Bus Conductor, Line Materials/Hardware, Lightning Protection and other accessories necessary for the Take-Off Structure;
- a.10 Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the installation and interfacing of the supplied equipment;
- a.11 Grounding System complete with the required grounding grid conductor, equipment bonding riser, exothermic welding materials, test pit, ground rods and all other necessary accessories:
- a.12 Lighting and power system of the plant site complete with the required panelboard, lighting fixtures, switches, outlets, cables, conduits, boxes and all other necessary fittings;
- a.13 Conduit System;
- a.14 Special Tools.
- b) Supply, delivery, installation, test and commissioning of all electrical equipment necessary for the complete, safe and reliable operation of the Calutcot Diesel Power Plant, but not limited to the following:

- b.1 Bus Conductor, Line Materials/Hardware, Lightning Protection and other accessories necessary for the Take-Off Structure;
- b.2 Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the installation and interfacing of the supplied equipment;
- b.3 Grounding System complete with the required grounding grid conductor, equipment bonding riser, exothermic welding materials, test pit, ground rods and all other necessary accessories:
- b.4 Lighting and power system of the plant site complete with the required panelboard, lighting fixtures, switches, outlets, cables, conduits, boxes and all other necessary fittings;
- b.5 One (1) Spare Circuit Breaker for 50 kW D/G set;
- b.6 Special Tools:
- b.7 Two (2) sets of Job Site Cameras to be installed before the start of construction and/or installation of equipment; and
- b.8 All other works and services including those not specifically detailed herein but are required to fully complete the project.

Butawanan Diesel Power Plant

- a) Hauling, Transportation, Packing/Unpacking as applicable, assembly, Installation, Erection and assistance to testing and commissioning of all Electrical Equipment and Auxiliaries and other accessories that will be transferred from NPC-Minuyan, San Jose Del Monte. Bulacan to the Butawanan Diesel Power Plant, Burdeos, Quezon, but not limited to the following:
 - a.1 One (1) set of 30 kW Diesel Generating Set including all necessary accessories/auxiliaries;
 - a.2 One (1) set of 50 kW Diesel Generating Set including all necessary accessories/auxiliaries;
 - a.3 One (1) set of 37.5 kVA Transformer for 30 kW Diesel Generating Set including all necessary accessories/auxiliaries;
 - a.4 One (1) set of 75 kVA Transformer for 50 kW Diesel Generating Set including all necessary accessories/auxiliaries;
 - a.5 Two (2) units of Generator Control and Protection Panels (GCPP) complete with all necessary monitoring, metering, control, protection and synchronizing equipment/devices;



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- a.6 One (1) unit of 15 kVA, 13.8kV/240V, 3-Phase, 60 Hz Station Service Transformer;
- a.7 One (1) unit of 800 A, 60 Hz, 15 kV, 12 kA, Automatic Circuit Recloser;
- a.8 12 kV Lightning Arresters;
- a.9 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
- a.10 Kilowatt-hour Demand Meters and associated Instrument Transformers and Accessories;
- a.11 Bus Conductor, Line Materials/Hardware, Lightning Protection and other accessories necessary for the Take-Off Structure;
- a.12 Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the installation and interfacing of the supplied equipment;
- a.13 Grounding System complete with the required grounding grid conductor, equipment bonding riser, exothermic welding materials, test pit, ground rods and all other necessary accessories:
- a.14 Lighting and power system of the plant site complete with the required panelboard, lighting fixtures, switches, outlets, cables, conduits, boxes and all other necessary fittings;
- a.15 Conduit System;
- a.16 Special Tools.
- b) Supply, delivery, installation, test and commissioning of all electrical equipment necessary for the complete, safe and reliable operation of the Butawanan Diesel Power Plant, but not limited to the following:
 - b.1 Bus Conductor, Line Materials/Hardware, Lightning Protection and other accessories necessary for the Take-Off Structure;
 - b.2 Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the installation and interfacing of the supplied equipment;
 - b.3 Grounding System complete with the required grounding grid conductor, equipment bonding riser, exothermic welding materials, test pit, ground rods and all other necessary accessories;



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- b.4 Lighting and power system of the plant site complete with the required panelboard, lighting fixtures, switches, outlets, cables, conduits, boxes and all other necessary fittings;
- b.5 One (1) Spare Circuit Breaker for 50 kW D/G set:
- b.6 Special Tools:
- b.7 Two (2) sets of Job Site Cameras to be installed before the start of construction and/or installation of equipment; and
- b.8 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 Contractor:

- Provision of services of highly qualified and competent engineers for the direct supervision during the test and commissioning of all supplied equipment.
- Submission of drawings and documents i.e., Equipment Manufacturer's drawings, Operation and Maintenance Manuals, etc.
- Conduct inspection to verify and assess the extent of the related and incidental works needed to implement the project competently and efficiently.

The Contractor 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 Contractor 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



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Reclosers	and	Fault	Interrupters	fог	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

UL Underwriters Laboratories, Inc. (all parts apply)

Motors and Generators

44	Rubber-In	sulate	d Wires	and Cab	ies	
83	Thermopl	astic Ir	sulated	d Wires at	nd Ca	ables
508A	Industrial	Contro	l Equip	ment		
1063	Machine	Tool	Wire	(MTW)	for	Stranded
	Conducto			,		

IEC International Electro-Technical Commission

Electrical Relays

60255

00233	Liectrical inclays
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
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



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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 Contractor 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 Contractor 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 Contractor shall submit copies of such standards for NPC's review and approval.

EW-4.0 HAULING OF EQUIPMENT

The Contractor shall properly haul/transport, unload and install all electrical equipment and materials to be transferred from NPC Minuyan to Calutcot DPP and Butawanan DPP as shown on bid drawings.

The Contractor shall identify the most convenient access and manner of moving the equipment. All necessary equipment, tools and labor for electrical electrical works i.e. transportation, storage, assembly and installation, etc. shall be furnished by the Contractor.

Utmost care shall be strictly observed by the Contractor during the conduct of work to avoid pilferage and damage of any kind to existing structure, equipment and installations. In the event that any such damage, breakage or losses should occur due to the carelessness, negligence or fault of the Contractor, the Contractor shall repair, replace, or otherwise make good all damaged items at his own expense and to the satisfaction of NPC.



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EW-5.0 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.

All cables shall be designed to withstand the short-circuit condition and voltage drop of 3% (max.).

EW-5.1 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-5.1.1 Insulation

Insulation shall be of the type specified in the Technical Data Sheets.

EW-5.1.2 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-5.1.3 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-5.1.4 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-6.0 GROUNDING SYSTEM

This specification covers the technical and associated requirements for the entire grounding system of the electric generating plants and/or



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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.

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 Contractor at no additional cost to NPC.

EW-6.1 Technical Characteristics and Design Requirements

EW-6.1.1 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 Contractor 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 Contractor 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 Contractor-designed and installed ground grid is higher than specified in the Technical Data Sheets, the Contractor 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 Contractor 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).

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EW-6.2 Equipment and Materials Requirements

EW-6.2.1 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.

EW-6.2.2 Ground Rods

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-6.2.3 Exothermic Welding Materials

The Contractor shall supply exothermic welding materials for cable-to-cable, cable-to-ground rod and cable-to-steel structure grounding connections. The Contractor should submit detailed information describing the proposed process.

EW-6.2.4 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-6.2.5 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-6.2.6 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.



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Lightning Arrester

Lightning arresters shall be connected to the earthing grid with 50 mm²tinannealed 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 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 mm²tinannealed 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-6.2.7 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-6.2.8 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-6.2.9 Pipe Earthing

All piping shall be earthed at all service points in an approved manner.



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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-6.2.10 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-7.0 LIGHTING SYSTEM

The lighting system covered by this specification shall include all indoor and outdoor lighting system of an electric generating plants and/or switchyard. Lighting system includes outlets (convenience and power), switches, associated conduits and cables, lighting fixtures (indoor, outdoor and emergency), fittings, distribution panelboards, lighting transformers, contactors, timers, etc.

All materials and parts which are not specifically mentioned herein but are necessary for the proper installation, assembly and safe operation of the lighting system shall be identified by the Contractor and furnished by the Contractor at no cost to the NPC. Any cost involve are deemed to be included in the price for the Lighting System.

EW-7.1 Design Requirements

EW-7.1.1 Technical Characteristics and Requirements

Contar	mination	and A	aina	Factor
Contar	ninaiion	ano <i>e</i>	Kaina.	-actor

a.	Indoor	:	1.25
b.	Outdoor	•	1.67
Illuminatio	n Level Requirement, lux		
a.	Control room	:	400
b.	Conference room	;	300
C.	Loading Ramp, Staircase	:	100
d.	Lavatory, Kitchen	:	100
e.	Battery Room	:	200
f.	Hallway, Comidor, Foyer	:	50
g.	Pump house	:	100
h.	Warehouse	:	200
i.	Roads	:	50
j.	Switchyard area	:	30
k.	Guard house	:	100
I,	Office	:	500



SECTION VI -	TECHNICAL	SPECIFICATIONS

INICAL SPECIFICATIONS		LuzP21Z1311Sc
m. Perimeter fence	:	50
n. Safety lighting	:	10
 Control building eaves 	:	100
 p. Control Building Façade Lighting 	;	As Recommended by Contractor
Administration Building		
a. Engineering/ Technical Room	:	500
b. Administrative Room	:	500
c. Manager's Office	:	400
d. Disbursing Room	:	400
e. Hallway, Corridor, Foyer	:	50
f. Toilet/Utility Rooms	:	100
g. Eaves	:	100
h. Façade Lighting	:	As Recommended by Contractor

Normal lighting/small power outlet and emergency lighting systems shall consist of:

- a. 240 VAC, 1-phase, 60Hz, normal station lighting system, including outlets (indoor and outdoor) and emergency lighting system (inside control house only);
- b. Automatic Stand-alone Emergency Lamp (12 VDC), dual lamp, portable type emergency station lighting system for warehouse, door entrances, guardhouse. This emergency lighting system must be switched on automatically in the event of a lighting failure.

The normal station lighting/small power and convenience outlet system, and the automatic stand-alone lamps power shall be supplied from the powerhouse 240 Volt AC lighting and power panelboard.

Circuits shall be separated between normal lighting, emergency lighting, single-phase outlets.

The plant lighting switching shall be designed as follows:

- a. Lighting not normally required during daylight hours shall be controlled by photocells and by separate switches from the station lighting/small power outlet distribution board.
- Lighting branch circuits shall be switched locally at each room door or close to the lighting areas.

Replacement of fixture bulbs or tubes shall be possible without disconnecting any part of the power supply and risk of touching live parts of the installation.

CHNICAL SPECIFICATIONS		LuzP21Z1311Sc
m. Perimeter fence	:	50
n. Safety lighting	:	10
 Control building eaves 	:	100
 p. Control Building Façade Lighting 	:	As Recommended by Contractor
Administration Building		
a. Engineering/ Technical Room	:	500
b. Administrative Room	:	500
c. Manager's Office	:	400
d. Disbursing Room	:	400
e. Hallway, Corridor, Foyer	:	50
f. Toilet/Utility Rooms	:	100
g. Eaves	:	100
h. Façade Lighting	:	As Recommended by Contractor

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EW-7.2 Luminaires (Lighting Fixtures) and Accessories

The Contractor shall submit for approval complete photometry data and type of lighting fixture to be installed together with the shop drawings.

All luminaires when installed shall be free of leaks, warps, dents and other irregularities.

The hangers and brackets of all kinds for safety and proper installation of lighting fixtures shall be furnished and installed by the Contractor at his own expense.

The housings shall be fabricated of steel sheet, corrosion resistant, good ventilation and easy installation.

Samples and catalogues of all luminaires to be supplied shall be submitted for NPC's review and approval prior to the order. No luminaire shall be installed without approval of NPC.

Luminaires shall be wired with approved fixture wire, 90°C insulation. Each fixture shall be wired to a single point with an adequate slack for proper connection. All luminaires shall be protected from damage during installation. Any broken luminaire, receptacles, stems and the like, shall be replaced with new parts, at no cost to NPC.

Types of luminaires to be supplied, installed and tested are as follows:

Surface Mounted Type Luminaires

Light Emitting Diode (LED) tube luminaires shall be quick start, electronic type ballast with high power factor, easily accessible when the luminaire is mounted in position.

When used in damp and wet locations, it shall have an explosion and corrosion proof body and sealed.

2. Compact Lighting Luminaires

Compact Light Emitting Diode (LED) Luminaires shall be rated 240V AC, 60 Hz operations. Lamp holders shall have a medium screw base and be of porcelain or brass.

When used in damp and wet locations, it shall have an explosion and corrosion proof body and sealed.

3. Automatic Stand Alone Emergency Lamps

The Contractor shall supply and install the automatic stand-alone emergency lamp of the self-contained battery unit as specified herein.

When the AC main supply is interrupted, the lamps shall be automatically switched ON with a time delay of 1 second to the battery-powered operation. Lamps shall be switched OFF when the



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batteries are discharged at the low-level voltage (below 7.5V). The charging system of both maximum-constant voltage and constant current shall be able to recharge the completely discharged batteries to their full capacity within 20 hours or less. The charging system shall cut-off automatically and instantaneously upon reaching fully charged state.

Batteries shall be of long life, maintenance free, sealed lead acid type. The batteries shall have sufficient capacity to operate the lamps at full luminous efficiency for up to 3 hours after failure of the main supply.

Rated input voltage of the automatic stand-alone emergency lamps shall be 240 VAC, 1-phase, 60 Hz. Rated Output of the batteries shall be 12 Volt DC.

4. Street/Perimeter Light

Street/Perimeter Compact LED Lamp shall be used for illuminating roads, parking spaces, perimeter fence area and outdoor equipment areas.

Support for street/perimeter lighting luminaries shall consist of a pole and a bracket arm, giving a mounting height of approximately 6m and the arm shall overhang by 1.8m. Pole and brackets shall be fabricated from galvanized steel or aluminum. Suitably enclosed terminals mounted 600mm above finished ground level shall be provided in each pole, for connection of the luminaires and looping of the power supply cable.

5. Flood Light

Light Emitting Diode (LED) Flood Light shall be forged with high quality aluminum alloy with clear tempered glass and built-in cooling fins.

Under normal supply, the charging system shall ensure and maintain the batteries in a fully charged state ready to supply power and shall be equipped with a reliable protective device to protect the batteries against overload and short circuit.

EW-7.3 Switches and Single Phase Outlets

EW-7.3.1 General

Switches and single phase outlets shall comply with NEMA Standard. The ratings of switches and single phase outlets with one conductor earthed shall be as specific herein. All switches and single phase outlets shall be flush mounted, impact resistant and splash proof type.



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EW-7.3.2 Switches

Switches for lighting fixtures shall be of the toggle quiet and flush mounted and fixed to the wall 1.37 m above the finished floor level. The rating of the switches shall be 10A, 240VAC, single-phase.

EW-7.3.3 Single Phase Outlets

All outlets shall be provided with separate earthing pins connected to the yellow/green part in the feeder cable. Outlets with rated voltage not exceeding 250 Volts shall be in accordance with PEC for 2-pole three-wire (indoor and outdoor).

EW-7.4 Outlet Boxes and Pull Boxes

EW-7.4.1 Outlet Boxes

All outlet boxes for concealed work shall be of hot-dipped galvanized steel. Outlet boxes shall be firmly anchored in place and where required provided with fixture supports. The Contractor shall provide special supports for recessed lighting fixtures, etc. Suitable expansion screws shall be used for securing boxes to solid masonry and approved type toggles for securing to hallow masonry units.

All wall boxes on exposed work shall be of aluminum blasted cast iron.

EW-7.4.2 Pull Boxes

Pull boxes shall be installed at all necessary points, to prevent damage to the insulation or other damage that might result from pulling resistance or for other reasons related to improper installation. All pulling boxes shall be made of galvanized sheet steel not less than 2mm. Where pulling boxes are used in connection with exposed conduits, plain covers attached to the pulling box with a suitable number of countersunk flathead machine screws may be used.

EW-7.5 Lighting and Power Panelboard

The Panelboards for Lighting and Power system shall be manufactured to NEMA standards and shall be totally enclosed, recess or surface-mounted.

EW-7.5.1 Circuit Breaker

AC three phase and single phase circuit breakers shall be rated 600V, 60Hz. DC circuit breaker, if to be provided, shall be rated 250 VDC.

Circuit breakers shall be quick-make, quick-break with thermal magnetic trip. The circuit breakers shall have interrupting rating of not less than 10,000 RMS Amps.



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The circuit breakers shall be installed so as to permit the removal and reinstallation or replacement of an individual circuit breaker without requiring the removal of any other circuit breaker or the disconnection of main or branch circuit connectors.

EW-7.5.3 Grounding Electrode

Lighting and Power Panelboard shall be effectively grounded. LPP shall be provided with one copper bonded grounding electrode connected through cable conductor with rating equivalent to the ampacity of the panel.

EW-7.5.4 Cables

Cables shall be stranded annealed copper conductor suitable for continuous temperature of 90°C. The minimum size of line conductor to be used shall be 3.5 mm².

Insulation shall be suitable for wet and dry locations, fungi resistant and ultraviolet stable. All cables shall be moisture and heat resistant thermoplastic or cross-linked synthetic polymer unless otherwise specified by NPC.

EW-7.5.5 Cable installation

The Contractor shall furnish the following miscellaneous materials required for proper cable installation:

- a. Cable ties, clamps and markers.
- b. Connectors, tapes and other splicing and terminating materials.
- c. Fire barriers, duct and conduit sealant, sand and planks.
- d. Pulling lubricants.

The cable entries into buildings, panels and other equipment shall be sealed off by an approved type of sealant suitable for the purpose.

Cables pulled through conduits shall be supported in an approved manner so as to avoid damaged to the insulation. Grease or oily substance shall not be used to facilitate the passage of the cable in conduits.

The pull shall be applied to cables only by means of approved grips and the end portion of the cable, which has been marked or deformed by the grip, shall be cut-off by the Contractor.

All cable runs shall be continuous and all termination shall be at the terminal boards, equipment, etc. No splices are allowed in conduit or cable tray.

Prior to installation of cables, conduits shall be thoroughly cleaned to prevent damage to cables during installation. After cables have been installed, cables shall be tested for continuity and insulation, and shall be tagged with respective cable number.



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EW-7.5.6 Nameplates

A unit identification nameplate shall be furnished at the top front of each panelboard. All nameplates shall be black satin finish with white core engraved to show white lettering. Nameplate engraving shall be in accordance with the nameplate designations shown on the accompanying drawings.

EW-8.0 CONDUIT SYSTEM

This specification covers the technical and associated requirements for the supply, laying and installation of conduits as required within the plant complex, including associated fittings, accessories (elbows, tees, steps, crossings etc.), supporting racks and brackets and all hardware.

All materials and parts which are not specifically mentioned herein but are necessary for the proper laying and installation of conduits shall be furnished at no additional cost to NPC.

EW-8.1 Technical Requirements and Characteristics

The conduit 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:
- Spacers, inserts and ties for conduits:
- Conduit splicing solvent and connector material for uPVC conduit, if uPVC conduits are used; and
- 4. Fire barriers, duct and conduit sealant;

Conduit edges shall be reamed and smoothen to avoid damage to cable outer sheath during cable installation. The conduits 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 Contractor. The required quantities of various items of conduits and associated materials shall be furnished in accordance with the installation requirements.

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



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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 check 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 damaged 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.

EW-9.0 FACTORY ASSEMBLY AND TESTS

EW-9.1 General

The Contractor 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.



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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.

The test equipment, test method, measurements and computations shall be in accordance with the latest applicable requirements of ANSI and IEC standard.

EW-9.2 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-9.3 Other Requirements

The Contractor 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 Contractor 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-10.0 OTHER SITE REQUIREMENTS

EW-10.1 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.



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EW-10.2 **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.

Job site cameras must be installed before works shall be done in the sites. Placement/ location of cameras shall be approved by NPC.

The Contractor 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 Contractor 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-10.3 **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



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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
I. 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 Contractor 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-11.0 MEASUREMENT OF PAYMENT

Measurement of payment for all electrical works shall be based on the bid price of each item as shown in the Bill of Quantities — Electrical 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.



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E-4.0	Spare Parts and Tools	VI-TDS(EW)-3

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PART II

TECHNICAL DATA SHEETS

EW - Electrical Works

Technical Requirements

- The Bidder is required to provide all the information required under the column "Contractor's Data". Although not given by NPC, The Contractor's Data shall be based on the International Standard.
- NPC's requirements are indicated below. The Contractor shall indicate their data corresponding to the said NPC requirements to facilitate evaluation of Contractor's compliance to the specifications.
- 3. Non-compliance with the requirements shall be ground for disqualification.

Name of Firm Name & Signature of Representative Designation



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E-1.0 BUS CONDUCTOR

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-1.1	Manufacturer	By Contractor	. ,
E-1.2	Type designation	Aluminum Conductor Steel Reinforced (ACSR)	
E-1.3	Conductor size	Refer to Single Line Diagram	· · · · · ·
E-1.4	Ampacity, A	230 / 270	

E-2.0 POWER, CONTROL & INSTRUMENTATION CABLE

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
15kV Pov	ver Cable		
E-2.1	Manufacturer	By Contractor	
E-2.2	Continuous current carrying capacity of conductor at 90°C Operating Temperature	Manufacturer's Data	
E-2.3	Conductor Cross-Section, mm ²	Refer to Single Line Diagram	
E-2.4	Conductor Material	Annealed Copper	
E-2.5	Insulation Material	Cross-linked polyethylene (XLPE)	
600V Pov	ver, Instrumentation and Co	ntrol Cable	
E-2.6	Manufacturer	By Contractor	
E-2.7	Туре		
	a. Power	THHN/THWN-2	
	b. Control & Instrumentation	Royal Cord	
E-2.8	Continuous current carrying capacity of conductor at 75°C Operating Temperature		
	a. THHN/THWN-2	Refer to Single Line Diagram	

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Name & Signature of Representative

Designation



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI - TECHNICAL SPECIFICATIONS

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ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
	b. Royal Cord	By Contractor	
E-2.9	Conductor Material	Annealed Copper	

E-3.0 GROUNDING SYSTEM

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-3.1	Grounding connection	Exothermic	
E-3.2	Permissible temperature rise of grid copper conductor, ^o C	300	
E-3.3	Grid conductor		
	a. Manufacturer	By Contractor	
	b. Minimum Size, mm²	100	
	c. Material	tin-annealed copper stranded conductor (bare)	
E-3.4	Bonding Conductor		
	a. Manufacturer	By Contractor	
	b. Size, mm²	100, 50 & 22	
	c. Material	tin-annealed copper stranded conductor with 1.2 kV PVC Insulation	
E-3.5	Copper Ground Rod		
	a. Manufacturer	By Contractor	
	b. Diameter, mm	≥ 19 mm	
	c. Length/section, m	<u>≥</u> 3 m	

E-4.0 SPARE PARTS AND TOOLS

ITEM	DESCRIPTION 3	QTY.1	UNIT PRICE	TOTAL PRICE ²
E-4.1	Generator Circuit Breaker for Generator Control & Protection Panel	1 set		

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ITEM	DESCRIPTION 3	QTY.1	UNIT PRICE	TOTAL PRICE ²
E-4.2	Telescopic Hot Stick with Tip Lock Features, Material: Epoxy glass Minimum Length: 35 ft. No. of Sections: 8	1 Set		
E-4.3	Lineman's Rubber Gloves Size: 14" Maximum Usage: 17,000 Volts	2 Pairs		
E-4.4	Lineman's Belt Maximum Length:42" Minimum Length: 34" D-to-D distance: 56 cm Center Hole: 38"	1 Set		
E-4.5	Positioning Strap, Nylon Maximum Length: 2.0m Minimum Length: 1.3m Adjustable Range: 0.7m	1Set		
E-4.6	Heavy Duty Hard Hat with strap & NPC (Passed Safety Standard)	3 Pcs		
E-4.7				
E-4.8				
E-4.9				
E-4.10				

Note:

- Minimum requirements but the Contractor 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 Contractor at no cost to NPC.
- 2. Indicated Price shall be used for reference in future purchase orders.
- 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	Name & Signature of Representative	Designation

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PART I - TECHNICAL SPECIFICATIONS

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SECTION EW - ELECTRICAL WORKS

EW-1.0 GENERAL

This section covers the technical and associated requirements for the Construction of Power Facilities for the Four (4) Units Modular Diesel Generating Sets Including Hauling, Installation, Test and Commissioning of Balance of Plant in Calutcot, Burdeos Quezon and Butawanan, Siruma, Camarines Sur.

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 Contractor 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 Contractor 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:

CALUTCOT DIESEL POWERPLANT

- Hauling, Installation and Test of 2 x 50 kW, 480V, 3-phase, 60Hz AC Generator and associated auxiliary electrical equipment including grounding materials that will be transferred from NPC-Minuyan, SJDM, Bulaçan;
- 2. Hauling, Installation and Test of Generator Control and Protection Panel (GCPP) for 2 x 50 kW D/G sets equipped with monitoring, metering, control, protection and synchronizing equipment/devices that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- 3. Supply of One (1) Spare Circuit Breaker for 50 kW D/G set;
- 4. Hauling, Installation and Test of 2 x 75 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer;
- Hauling, Installation and Test of 15 kVA, 7.97kV/240V, 1-Phase, 60 Hz Station Service Transformer that will be transferred from NPC-Minuyan, SJDM, Bulacan;



- Supply, Installation and Test of 800A, 60 Hz, 15kV, 12kA, Automatic Circuit Recloser:
- 7. Supply, Installation and Test of 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
- 8. Supply, Installation and Test of Kilowatt-hour Demand Meter and associated Instrument Transformers and Accessories:
- Supply, Installation and Test of Bus Conductor and Line Materials and Hardware;
- Supply, Laying and Test of Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the interfacing of supplied equipment;
- 11. Supply, Installation and Test of Grounding System;
- 12. Supply, Installation and Test of Lightning Protection System:
- 13. Supply, Installation and Test of Lighting & Power System and its Accessories;
- 14. Supply and Installation of Conduit System;
- Supply and Delivery of Special Tools;
- 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
- 17. All other works and services including those not specifically detailed herein but are required to fully complete the project.

BUTAWANAN DIESEL POWERPLANT

- Hauling, Installation and Test of 1 x 30 kW & 1 x 50 kW, 480V, 3-phase, 60Hz AC Generator and associated auxiliary electrical equipment including grounding materials that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- Hauling, Installation and Test of Generator Control and Protection Panel (GCPP) for 1 x 30 kW & 1 x 50 kW D/G sets equipped with monitoring, metering, control, protection and synchronizing equipment/devices that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- 3. Supply of One (1) Spare Circuit Breaker for each D/G set rating;
- Hauling, Installation and Test of 1 x 37.5 kVA & 1 x 75 kVA, 480V/13.8kV, 3-Phase, 60Hz Generator Transformer that will be transferred from NPC-Minuyan, SJDM, Bulacan;
- 5. Hauling, Installation and Test of 15 kVA, 7.97kV/240V, 1-Phase, 60 Hz Station Service Transformer that will be transferred from NPC-Minuyan, SJDM, Bulacan;



- 6. Supply, Installation and Test of 800A, 60 Hz, 15kV, 12kA, Automatic Circuit Recloser;
- 7. Supply, Installation and Test of 15 kV Fuse Disconnect Switches with Lightning Arrester Combination;
- 8. Supply, Installation and Test of Kilowatt-hour Demand Meter and associated Instrument Transformers and Accessories:
- Supply, Installation and Test of Bus Conductor and Line Materials and Hardware;
- 10. Supply, Laying and Test of Power, Control and Instrumentation Cables including ground conductors and other appurtenances required for the interfacing of supplied equipment;
- 11. Supply, Installation and Test of Grounding System;
- 12. Supply, Installation and Test of Lightning Protection System;
- 13. Supply, Installation and Test of Lighting & Power System and its Accessories;
- Supply and Installation of Conduit System;
- 15. Supply and Delivery of Special Tools;
- 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
- 17. 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 Contractor:

- Provision of services of highly qualified and competent engineers for the direct supervision during the test and commissioning of all supplied equipment.
- Submission of drawings and documents i.e., Equipment Manufacturer's drawings, Operation and Maintenance Manuals, etc.
- Conduct inspection to verify and assess the extent of the related and incidental works needed to implement the project competently and efficiently.

The Contractor 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.



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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 Contractor 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



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	60076 60060 62271 60502 60694	Power Transformers, Parts 1-5 High Voltage Test Technique High Voltage Switchgear and Control Gear Power cables with extruded insulation and their accessories for rated voltages 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	Internation	nal 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 Contractor 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 Contractor 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 Contractor shall submit copies of such standards for NPC's review and approval.

EW-4.0 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.



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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 Contractor at no additional cost to NPC.

EW-4.1 Automatic Circuit Recloser

EW-4.1.1 General

The Automatic Circuit Recloser shall have rated characteristics as specified in the Technical Data Sheets (Part II of the Technical Specification).

The Automatic Circuit Recloser shall be mechanically and electrically trip free. Any applied close signal, either mechanically or electrically, shall not inhibit the recloser from tripping on the programmed time-current curve.

A manual operating handle shall be provided including an indicator flag for contact position indication.

Close and trip capacitors shall be used to store the necessary energy for operating the recloser. Only the close capacitor energy shall be used for closing while both capacitors are available for opening. Trip energy shall be available following any electrical close.

EW-4.1.2 Interrupting Medium

The interrupting medium shall be vacuum type.

EW-4.1.3 Insulation Medium

Environmentally friendly cycloaliphatic epoxy or equivalent shall be used as dielectric medium. SF6 gas shall not be used.

EW-4.1.4 Housing Materials

The tank shall be manufactured from a hot-dipped galvanized steel, 316 stainless or cast aluminum. Control cubicles shall be manufactured from 316 stainless steel. All support structures and associated bolts and nuts shall be hot dipped galvanized.

EW-4.1.5 Mounting

The Automatic Circuit Recloser shall be suitable for single and double pole/H-frame mounting.

All recloser tanks are to be supplied with standard pole mounting brackets fixed to the rear of the tank. The bracket shall be designed to ensure that the recloser live parts have statutory clearances from the pole and the earthed metal equipment.



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The brackets and tank wall are to be of adequate strength to limit distortion, when mounted. Both the top and bottom bracket shall be suitable to carry the total weight of the tank.

A detailed drawing of the Auto-recloser mounting arrangement shall be submitted together with the proposal. The minimum phase-to-earth clearance including clearance to the structure shall be indicated on the drawing.

EW-4.1.6 Control Cabinet

The control cabinet shall be designed for the service condition specified, and fitted with substantial door securing devices.

The control shall be housed in a weatherproof steel cabinet (IP 65) with a pad lockable internally hinged door and shall include a thermostatically controlled heater.

The control cabinet shall be mounted below the tank and shall be connected by a minimum of 20m long multi-core control cable. The multi-core cable shall be ultra violet stabilized and adequately screened against electrostatic and electromagnetic interference, which can cause malfunctioning of the protection or control equipment. This cable shall connect into both the recloser and the control cabinet by means of plug and socket arrangement.

EW-4.1.7 Earthing

Earthing terminals shall be fitted to equipment. An earthing strap shall be provided between the lid and the tank,

EW-4.1.8 Surge Arrester Bracket

Surge arrester bracket shall be provided for the arrester mounting which will serve as the connection point for the arrester earth. The brackets shall have an unpainted corrosion resistant metal connecting zone which has the capability to conduct surge arrester current.

EW-4.1.9 Marking and Nameplates

Phase identification marking shall be provided on each bushing of the Auto recloser.

A nameplate shall be provided using a non-ferrous material or stainless steel, with the following information:

- 1. Manufacturer's Name
- 2. Serial No.
- Rated Maximum Voltage
- 4. Rated Continuous Current
- Rated Interrupting Current
- 6. Rated Impulse Withstand Voltage



EW-4.1.10 Operating Mechanism

A low voltage system supplied from a battery or voltage transformer may be used to operate a closing mechanism. Tripping energy shall be supplied from a spring mechanism automatically tensioned when the recloser is closed.

Internal batteries used to operate closing mechanism shall not dependent on recloser load current to maintain its state of charge.

The recloser shall incorporate provision to be manually operated using a standard operating stick in the event of failure in the electrical control system.

EW-4.1.11 Bushing

The HV bushing shall be of high quality glazed porcelain, or cycloaliphatic epoxy resin having a creep age length as specified in the Technical Data Sheet.

The Contractor shall provide bird guards for insulation protection between the load side and line side bushings.

EW-4.1.12 Current Transformer

A sensing multi-ratio bushing current transformer for use with the recloser control and protection functions shall be an integral part of the recloser.

They shall be of class and ratio adequate to ensure they do not saturate under fault conditions up to the full rated interrupting current.

Current transformers shall be thermally rated to the recloser current rating regardless of the ratio selected.

EW-4.1.13 Auxiliary Supply

The operating power shall be supplied from an external 240 VAC. A 12Vdc battery with sufficient ampere hour shall be provided for back up control operation in the event of loss of primary supply. The battery shall be capable of operating the control for a minimum of 72 hours. If the primary supply has not been restored within the allowable discharge time of the battery, the control shall automatically shut down. The cable for the external auxiliary supply of approx. 20 m long shall be included in the contract.

EW-4.1.14 Control Design Features

The design of the control shall include the following:

- Relay Module
- CPU Module
- Power Supply Module
- 4. Communication Interface Module
- 5. Front Operating& Display Module
- Ethernet /USB / Wi-Fi / Fiber Optic/RS 232 Communication Module



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The panel includes an LCD that shall allow customizable display for viewing operational data of the control. The LCD shall include complete metering information including all current, voltage and power values along with trip values for all profiles. All modules should be replaceable on site without removing the recloser controller unit.

Local Control and Indication

The recloser shall be equipped with the following local operation features through push-buttons operation:

- 1. Trip (with no reclosing)
- 2. Close (Single Shot)
- Auto reclose ON/OFF
- 4. Local remote operation
- View trip Sequences and status information

SCADA Operation and Indication

The recloser is required to be controlled and operated using a remote compatible PC with phone modem and applicable software via DNP 3.0 communication protocol.

As a minimum requirement, the following controls and indications shall be provided to the Remote SCADA system using the above protocol:

Control and Indication

- 1. Tripping and closing
- 2. Enable and disable automatic sequences (reclosing)
- 3. Enable and disable protection
- Change protection setting
- 5. Reset fault flags and currents
- 6. Read and display metering data including a summary page
- 7. Read the operation counter
- 8. Read the event recorder and display at least 5000 events in time sequence complete with feeder current at the time of the event
- Display a summary page which shows the number of fault trips since it was last reset
- Examine recloser/control system malfunction alarms
- 11. Read all existing recloser settings
- 12. Switch status (open/close) indications
- Trip sequences and status information i.e., Protective device and sequence which initiated the trip, date and time, Interrupted current, etc.
- 14. Buzzer Alarm Trip, Open/Close and Trip Alarm Indications
- 15. Hotline Tag should be configurable in the control panel for safety and protection of personnel during off-line maintenance work.



EW-4.1.15 Sequence of Operation

In the event of fault on the line controlled by the recloser, the recloser shall automatically open, and after a minimum dead time, it shall automatically reclose and remain closed should the fault along the line is cleared.

In case the fault persists, the recloser shall again disconnect the line being controlled. The recloser shall be capable of not less than three automatic reclose operations at rated short circuit current should the fault persist and then lock out in the open position until reset by hand or remote control.

If the fault is of a transient in nature, the equipment shall remain closed, and the operating mechanism shall automatically reset.

The number of operations to lockout shall be adjustable in any combination of instantaneous and time-delayed trips up to a minimum of four with a minimum dead time of 0.5 seconds for the first operations.

The Automatic Circuit Recloser shall be mechanically and electrically trip free. Any applied close signal, either mechanically or electrically, shall not inhibit the recloser from tripping on the programmed time-current curve.

Close and trip capacitors shall be used to store the necessary energy for operating the recloser. Only the close capacitor energy shall be used for closing while both capacitors are available for opening. Trip energy shall be available following any electrical close operation.

EW-4.1.16 Protection

The Automatic Circuit Recloser to be supplied shall be equipped with but not limited with the following protections:

- 1. Directional Overcurrent and Earth Fault Protection
- 2. Instantaneous and AC Time Overcurrent Protection
- Under/Over Voltage
- Under/Over Frequency
- 5. Harmonics Protection
- 6. Negative Phase Sequence Protection
- 7. Auto Change Over Protection

All other protections specified in the Technical Data Sheets (TDS).

The controller shall include a sensitive ground/earth fault trip feature that will provide tripping of the recloser after a programmable, definite time for ground currents below normal ground minimum trip levels. The feature shall have a programmable operation to lockout and reclose intervals independent of the ground settings. This feature shall be independently selectable for each protection profile.

A sequence coordination feature shall be included to allow the control to step through selected operation in the operating sequence without tripping.



The control shall include a cold load pick up feature to prevent the control from tripping while energizing non fault system loads.

The Cold Load Pick up feature shall be able to be programmed IN or OUT of service.

EW-4.1.17 Safety Features

The control software shall have a programmable security code to limit access of control programming functions to authorized personnel.

EW-4.1.18 Metering

The control shall provide instantaneous and demand metering with programmable integration intervals for the following minimum functions:

- 1. Real, Reactive and Apparent Power for each phase and total
- Power Factor for each phase and total
- 3. Voltage magnitude for each phase
- 4. Current Magnitude for each phase and neutral
- Positive and Negative Sequence Voltages (magnitude and phase)
- 6. Positive, Negative and Zero Sequence Currents (magnitude and phase)
- 7. Power Quality Monitoring (TDD up 15th Harmonics, HDD Up to 15th Harmonics, Voltage Sags & Swells,)

EW-4.1.19 Event Recorder/Histogram

Event recorder shall be provided to record and store events in a non-volatile memory. The recorder shall include time and date of event and histogram features displays statistical information including tagged min/max values.

EW-4,1,20 Spares

The Contractor shall furnish a detailed list of required spares for two (2) years operations (if there's any) i.e., protection cards/boards, etc. with equivalent cost.

The list shall include relevant information on the availability and delivery of spare parts.

EW-4.1.21 Other Technical Requirements

Operating and Configuration Editor Software Program

Laptop and all software and configuration editor software program including licenses shall be supplied and included in the cost of the equipment in the Bid Price Schedule. A set of each type of software including licenses plus instruction manuals shall be provided by the Contractor.



All Recloser shall be properly configured, calibrated, and set at factory prior to delivery based on the desired initial pick up current trip setting requirement of each site at present and/or forecasted load data to be provided by SPUG.

EW-4.1.22 Test and Inspection

The Contractor shall provide a test specification covering all tests on the Contractor's premises, successful completion, as deemed by NPC, of Inspection and Tests on Contractor's premises shall be a prerequisite to shipment of all materials, equipment, software or system(s). Following successful completion of inspection and tests on his premises, the Contractor shall obtain the approval to proceed with the delivery of the equipment, materials, software or system(s) from NPC in accordance with the Technical Specification for the equipment.

Test report on design and routine tests performed in accordance with ANSI/IEEE and/or IEC standard shall be submitted to NPC for evaluation and approval.

All test certificates shall include the manufacturer's serial number.

Type Test

The test to be performed shall be in accordance with the design test set out in Section 6 of ANSI/IEEE C37.60 and Section 5 of ANSI/IEEE C37.63. In addition, the electronic protection /control unit shall have been subject to the relevant impulse, and high frequency noise immunity tests specified in IEC 60255 or equivalent standard.

The recloser complete with control/protection component (including earths) as a composite unit shall have been tested for the rated impulse withstand level and for immunity against the effects of EMI and RFI.

Routine Test

Routine test shall be carried out and shall be in accordance with the production test set out in Section 7 of ANSI/IEEE C37.60.

EW-4.1.23 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 Automatic Circuit Recloser:
- Manufacturer's Technical Data Sheets of the Automatic Circuit Recloser in accordance with EW-12.3;
- Outline drawings of Automatic Circuit Recloser and accessories;
- Schematic and Wiring Diagram;



5. Description and instructions manual covering the installation, operation and maintenance of the transformer and accessories;

The instruction manual to be provided shall include the following:

- A schematic diagram and component layout of all printed circuit boards
- A detailed list of all component and parts including manufacturers part numbers
- A detailed description of the circuit operation including block diagrams
- A comprehensive trouble-shooting guide to assist in fault-finding
- 6. Duly signed Routine Test Results; and
- 7. Field Test to be performed and Certified Test and Inspection Reports duly signed and witnessed by NPC representative.

EW-4.2 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-4.2.1 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:

- Fuse Support Assembly
- 2. Fuse Holder Assembly
- 3. Mounting Bracket
- 4. Lock Washers



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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.

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 Contractor 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-4.3 Kilowatt-Hour Demand Meter

This specification covers the technical and associated requirements for the kilowatt-hour meter including instrument transformer and accessories required for the electric generating plants.

EW-4.3.1 Technical Characteristics and Requirements

The kilowatt-hour meter shall be furnished and installed by the Contractor as shown on the bid drawings complete with housing and associated metering instruments transformers (current and potential transformers) of appropriate burden and accuracy and other accessories for outdoor metering purposes. It shall be capable to measure the power generated by the plant and feedback power. It shall be designed to operate continuously for the normal life of the



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meter in an outdoor tropical location exposed to various elements which might affect the meter accuracy and reliability.

The Kilowatt-hour meter shall have the following features:

- Pilferage proof
- 2. Tamper Proof
- 3. Wrong Wiring Alarm
- Current Flow display
- 5. Can withstand the temperature of -20°C to +70°C and Humidity of up to 95% non-condensing
- 6. With back light display
- 7. With built-in battery for LCD display and back-up battery
- 8. TOU Programmable Ready
- 9. Measure display (True RMS voltage, Current, Calendar, Time, etc.)

The kilowatt-hour meter and the required metering instruments shall be pole mounted and to be supplied complete with stainless steel bracket, bolts, etc. required for mounting onto flat-faced pole where pole drilling is permitted.

The Contractor shall submit for approval the brochures and/or catalogues with complete technical specification of the kilowatt-hour meter including instrument transformers and accessories to be supplied prior to delivery at site.

EW-4.4 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-4.4.1 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 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-4.5 Maintenance Tools

The following lineman's tools shall be provided by the Contractor for the maintenance in the switchyard area:

Item No.	Description	Qty.	Unit
1	Telescopic Hot Stick with Tip Lock Features, Material: Epoxy glass Minimum Length: 35 ft. No. of Sections: 8	1	set



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Item No.	Description	Qty.	Unit
2	Lineman's Rubber Gloves Size: 14" Maximum Usage: 17,000 Volts	2	pairs
3	Lineman's Belt Maximum Length:42" Minimum Length: 34" D-to-D distance: 56 cm Center Hole: 38"	1	set
4	Positioning Strap, Nylon Maximum Length: 2.0m Minimum Length: 1.3m Adjustable Range: 0.7m	1	set
5	Heavy Duty Hard Hat with strap & NPC (Passed Safety Standard)	3	pcs

EW-5.0 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.

All cables shall be designed to withstand the short-circuit condition and voltage drop of 3% (max.).

EW-5.1 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-5.1.1 Insulation

Insulation shall be of the type specified in the Technical Data Sheets.

EW-5.1.2 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.



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EW-5.1.3 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-5.1.4 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-6.0 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.

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 Contractor at no additional cost to NPC.

EW-6.1 Technical Characteristics and Design Requirements

EW-6.1.1 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 Contractor 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 Contractor 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 Contractor-designed and installed ground grid is higher than specified in the Technical Data Sheets, the Contractor 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 Contractor 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-6.2 Equipment and Materials Requirements

EW-6.2.1 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.

EW-6.2.2 Ground Rods

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 moltenwelded or copper bonded (electro-deposit) to a steel core. The copper clad or pressed type will not be accepted

EW-6.2.3 Exothermic Welding Materials

The Contractor shall supply exothermic welding materials for cable-to-cable, cable-to-ground rod and cable-to-steel structure grounding connections. The Contractor should submit detailed information describing the proposed process.

EW-6.2.4 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-6.2.5 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.



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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-6.2.6 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 mm²tin-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 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 mm²tin-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-6.2.7 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.



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EW-6.2.8 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-6.2.9 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-6.2.10 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-7.0 LIGHTNING PROTECTION SYSTEM

This specification covers the technical and associated requirements for the supply and installation of Lightning Protection System of the plant.

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 in this specification.

EW-7.1 Technical Characteristics and Requirements

EW-7.2.1 Air Terminal and Support

The air termination shall respond dynamically to the appearance of lightning. The materials of the air terminal shall be non-corroding in hostile environment. It shall be located at the highest point of the facility to capture the lightning strike to a preferred point, so that the discharge current can be safely directed via the down conductor to the grounding system.

The air terminal support shall consist of a minimum of 3 meters of galvanized iron piping mast. The conductor shall pass through the center of the mast, with the high voltage termination contained to the upper 1m of the mast. It shall be provided with adequate support to be determined by the Contractor to withstand maximum locally recorded wind velocity in the area. The Contractor shall give technical details of the protection including mounting and installation details for approval.



EW-7.2.2 Down Conductor

The down conductor will provide a low impedance path from the air termination to the ground system so that the lightning current can be safely conducted to earth, without the development of excessively large voltages.

The main copper conductor shall be made of electrical grade copper, with a minimum cross sectional equivalent to 50 mm². The main conductor shall consist of copper strands helically bound by a copper tape conductor designed to evenly distribute the lightning currents concentrically along the conductor length.

In order to reduce the possibility of dangerous sparking (side-flashing), the down conductor route(s) should be as direct as possible with no sharp bends or stress points where the inductance, and hence impedance, is increased under impulse conditions. The down conductor should not be subject to bends of less than 0.5meter radius and shall be secured to the structure by approved metallic fastening at least every 2.0 meters.

EW-8.0 LIGHTING SYSTEM

The lighting system covered by this specification shall include all indoor and outdoor lighting system of an electric generating plants and/or switchyard. Lighting system includes outlets (convenience and power), switches, associated conduits and cables, lighting fixtures (indoor, outdoor and emergency), fittings, distribution panelboards, lighting transformers, contactors, timers, etc.

All materials and parts which are not specifically mentioned herein but are necessary for the proper installation, assembly and safe operation of the lighting system shall be identified by the Contractor and furnished by the Contractor at no cost to the NPC. Any cost involve are deemed to be included in the price for the Lighting System.

EW-8.1 Design Requirements

EW-8.1.1 Technical Characteristics and Requirements

Contamination and Aq	ına r	actor
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a.	Indoor	:	1.25
b.	Outdoor	:	1.67
Illuminatio	n Level Requirement, lux		
a.	Control room	:	400
b.	Conference room	:	300
C.	Loading Ramp, Staircase	:	100
d.	Lavatory, Kitchen	:	100
e.	Battery Room	:	200
f.	Hallway, Corridor, Foyer	:	50
g.	Pump house	:	100
h.	Warehouse	:	200



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i.	Roads	:	50
j.	Switchyard area	:	30
k.	Guard house	:	100
I.	Office	:	500
m.	Perimeter fence	:	50
n.	Safety lighting	:	10
0.	Control building eaves	;	100
p.	Control Building Façade Lighting	:	As Recommended by Contractor
Administr	ation Building		
a.	Engineering/ Technical Room	:	500
b.	Administrative Room	:	500
C.	Manager's Office	:	400
d.	Disbursing Room	:	400
e.	Hallway, Corridor, Foyer	:	50
f.	Toilet/Utility Rooms	:	100
g.	Eaves	:	100
ħ.	Façade Lighting	:	As Recommended by Contractor

Normal lighting/small power outlet and emergency lighting systems shall consist of:

- a. 240 VAC, 1-phase, 60Hz, normal station lighting system, including outlets (indoor and outdoor) and emergency lighting system (inside control house only);
- b. Automatic Stand-alone Emergency Lamp (12 VDC), dual lamp, portable type emergency station lighting system for warehouse, door entrances, guardhouse. This emergency lighting system must be switched on automatically in the event of a lighting failure.

The normal station lighting/small power and convenience outlet system, and the automatic stand-alone lamps power shall be supplied from the powerhouse 240 Volt AC lighting and power panelboard.

Circuits shall be separated between normal lighting, emergency lighting, single-phase outlets.

The plant lighting switching shall be designed as follows:

- Lighting not normally required during daylight hours shall be controlled by photocells and by separate switches from the station lighting/small power outlet distribution board.
- b. Lighting branch circuits shall be switched locally at each room door or close to the lighting areas.

Replacement of fixture bulbs or tubes shall be possible without disconnecting any part of the power supply and risk of touching live parts of the installation.



EW-8.2 Luminaires (Lighting Fixtures) and Accessories

The Contractor shall submit for approval complete photometry data and type of lighting fixture to be installed together with the shop drawings.

All luminaires when installed shall be free of leaks, warps, dents and other irregularities.

The hangers and brackets of all kinds for safety and proper installation of lighting fixtures shall be furnished and installed by the Contractor at his own expense.

The housings shall be fabricated of steel sheet, corrosion resistant, good ventilation and easy installation.

Samples and catalogues of all luminaires to be supplied shall be submitted for NPC's review and approval prior to the order. No luminaire shall be installed without approval of NPC.

Luminaires shall be wired with approved fixture wire, 90°C insulation. Each fixture shall be wired to a single point with an adequate slack for proper connection. All luminaires shall be protected from damage during installation. Any broken luminaire, receptacles, stems and the like, shall be replaced with new parts, at no cost to NPC.

Types of luminaires to be supplied, installed and tested are as follows:

1. Surface Mounted Type Luminaires

Light Emitting Diode (LED) tube luminaires shall be quick start, electronic type ballast with high power factor, easily accessible when the luminaire is mounted in position.

When used in damp and wet locations, it shall have an explosion and corrosion proof body and sealed.

2. Compact Lighting Luminaires

Compact Light Emitting Diode (LED) Luminaires shall be rated 240V AC, 60 Hz operations. Lamp holders shall have a medium screw base and be of porcelain or brass.

When used in damp and wet locations, it shall have an explosion and corrosion proof body and sealed.

3. Automatic Stand Alone Emergency Lamps

The Contractor shall supply and install the automatic stand-alone emergency lamp of the self-contained battery unit as specified herein.

When the AC main supply is interrupted, the lamps shall be automatically switched ON with a time delay of 1 second to the



battery-powered operation. Lamps shall be switched OFF when the batteries are discharged at the low-level voltage (below 7.5V). The charging system of both maximum-constant voltage and constant current shall be able to recharge the completely discharged batteries to their full capacity within 20 hours or less. The charging system shall cut-off automatically and instantaneously upon reaching fully charged state.

Batteries shall be of long life, maintenance free, sealed lead acid type. The batteries shall have sufficient capacity to operate the lamps at full luminous efficiency for up to 3 hours after failure of the main supply.

Rated input voltage of the automatic stand-alone emergency lamps shall be 240 VAC, 1-phase, 60 Hz. Rated Output of the batteries shall be 12 Volt DC.

4. Street/Perimeter Light

Street/Perimeter Compact LED Lamp shall be used for illuminating roads, parking spaces, perimeter fence area and outdoor equipment areas.

Support for street/perimeter lighting luminaries shall consist of a pole and a bracket arm, giving a mounting height of approximately 6m and the arm shall overhang by 1.8m. Pole and brackets shall be fabricated from galvanized steel or aluminum. Suitably enclosed terminals mounted 600mm above finished ground level shall be provided in each pole, for connection of the luminaires and looping of the power supply cable.

5. Flood Light

Light Emitting Diode (LED) Flood Light shall be forged with high quality aluminum alloy with clear tempered glass and built-in cooling fins.

Under normal supply, the charging system shall ensure and maintain the batteries in a fully charged state ready to supply power and shall be equipped with a reliable protective device to protect the batteries against overload and short circuit.

EW-8.3 Switches and Single Phase Outlets

EW-8.3.1 General

Switches and single phase outlets shall comply with NEMA Standard. The ratings of switches and single phase outlets with one conductor earthed shall be as specific herein. All switches and single phase outlets shall be flush mounted, impact resistant and splash proof type.



EW-8.3.2 Switches

Switches for lighting fixtures shall be of the toggle quiet and flush mounted and fixed to the wall 1.37 m above the finished floor level. The rating of the switches shall be 10A, 240VAC, single-phase.

EW-8.3.3 Single Phase Outlets

All outlets shall be provided with separate earthing pins connected to the yellow/green part in the feeder cable. Outlets with rated voltage not exceeding 250 Volts shall be in accordance with PEC for 2-pole three-wire (indoor and outdoor).

EW-8.4 Outlet Boxes and Pull Boxes

EW-8.4.1 Outlet Boxes

All outlet boxes for concealed work shall be of hot-dipped galvanized steel. Outlet boxes shall be firmly anchored in place and where required provided with fixture supports. The Contractor shall provide special supports for recessed lighting fixtures, etc. Suitable expansion screws shall be used for securing boxes to solid masonry and approved type toggles for securing to hallow masonry units.

All wall boxes on exposed work shall be of aluminum blasted cast iron.

EW-8.4.2 Pull Boxes

Pull boxes shall be installed at all necessary points, to prevent damage to the insulation or other damage that might result from pulling resistance or for other reasons related to improper installation. All pulling boxes shall be made of galvanized sheet steel not less than 2mm. Where pulling boxes are used in connection with exposed conduits, plain covers attached to the pulling box with a suitable number of countersunk flathead machine screws may be used.

EW-8.5 Lighting and Power Panelboard

The Panelboards for Lighting and Power system shall be manufactured to NEMA standards and shall be totally enclosed, recess or surface-mounted.

EW-8.5.1 Circuit Breaker

AC three phase and single phase circuit breakers shall be rated 600V, 60Hz. DC circuit breaker, if to be provided, shall be rated 250 VDC.

Circuit breakers shall be quick-make, quick-break with thermal magnetic trip. The circuit breakers shall have interrupting rating of not less than 10,000 RMS Amps.

The circuit breakers shall be installed so as to permit the removal and reinstallation or replacement of an individual circuit breaker without requiring



the removal of any other circuit breaker or the disconnection of main or branch circuit connectors.

EW-8.5.2 Kilowatt-hour Meters

Kilowatt-hour demand meters shall be transformer-connected, single phase, 2-wire, 240VAC, 60 Hz and shall be of the type specified in the Technical Data Sheets.

EW-8.5.3 Grounding Electrode

Lighting and Power Panelboard shall be effectively grounded. LPP shall be provided with one copper bonded grounding electrode connected through cable conductor with rating equivalent to the ampacity of the panel.

EW-8.5.4 Cables

Cables shall be stranded annealed copper conductor suitable for continuous temperature of 90°C. The minimum size of line conductor to be used shall be 3.5 mm².

Insulation shall be suitable for wet and dry locations, fungi resistant and ultraviolet stable. All cables shall be moisture and heat resistant thermoplastic or cross-linked synthetic polymer unless otherwise specified by NPC.

EW-8.5.5 Cable installation

The Contractor shall furnish the following miscellaneous materials required for proper cable installation:

- Cable ties, clamps and markers.
- b. Connectors, tapes and other splicing and terminating materials.
- c. Fire barriers, duct and conduit sealant, sand and planks.
- d. Pulling lubricants.

The cable entries into buildings, panels and other equipment shall be sealed off by an approved type of sealant suitable for the purpose.

Cables pulled through conduits shall be supported in an approved manner so as to avoid damaged to the insulation. Grease or oily substance shall not be used to facilitate the passage of the cable in conduits.

The pull shall be applied to cables only by means of approved grips and the end portion of the cable, which has been marked or deformed by the grip, shall be cut-off by the Contractor.

All cable runs shall be continuous and all termination shall be at the terminal boards, equipment, etc. No splices are allowed in conduit or cable tray.

Prior to installation of cables, conduits shall be thoroughly cleaned to prevent damage to cables during installation. After cables have been installed,



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cables shall be tested for continuity and insulation, and shall be tagged with respective cable number.

EW-8.5.6 Nameplates

A unit identification nameplate shall be furnished at the top front of each panelboard. All nameplates shall be black satin finish with white core engraved to show white lettering. Nameplate engraving shall be in accordance with the nameplate designations shown on the accompanying drawings.

EW-9.0 CONDUIT SYSTEM

This specification covers the technical and associated requirements for the supply, laying and installation of conduits as required within the plant complex, including associated fittings, accessories (elbows, tees, steps, crossings etc.), supporting racks and brackets and all hardware.

All materials and parts which are not specifically mentioned herein but are necessary for the proper laying and installation of conduits shall be furnished at no additional cost to NPC.

EW-9.1 Technical Requirements and Characteristics

The conduit 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;
- Spacers, inserts and ties for conduits;
- Conduit splicing solvent and connector material for uPVC conduit, if uPVC conduits are used; and
- Fire barriers, duct and conduit sealant;

Conduit edges shall be reamed and smoothen to avoid damage to cable outer sheath during cable installation. The conduits shall have the following characteristics:

- 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 Contractor. The required quantities of various items of conduits and associated materials shall be furnished in accordance with the installation requirements.



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 check 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 damaged 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.

EW-10.0 FACTORY ASSEMBLY AND TESTS

EW-10.1 General

The Contractor 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.



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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.

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 Contractor 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 Contractor shall submit the following:

- 1. Routine Test Results per IEC or equivalent UL standard
- 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 batteryoperated cameras. It shall be designed to monitor the construction of diesel power plants and access areas for a routine documentation.

Job site cameras must be installed before works shall be done in the sites. Placement/ location of cameras shall be approved by NPC.

The Contractor 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 Contractor 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

b. Quantity : As specified in the SOR	era
in the SOR	
c. Control Display : Thin-Film-Transistor (TFT Liquid Crystal Display (LCI	
d. Image Sensor Resolution : At least 1.3 Megapixel CMOS	3
e. View Angle : At least 110 degrees	es
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	



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j. Additional Batteries (Spare)	:	Required
k. Enclosure	;	IP64 compliant
I. 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 Contractor 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

Contractor-furnished data and information shall be guaranteed performance data, predicted performance, interface requirements and construction features of all Contractor's furnished equipment. The accuracy of such information and its compatibility with overall performance requirements specified by NPC are the sole responsibility of the Contractor.

EW-12.1 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 Contractor together with Manufacturer's brochure/drawings during the Implementation stage.

1.0 POWER, CONTROL & INSTRUMENTATION CABLE

Item	Description	NPC Requirements	Contractor's Data
15kV F	ower Cable		<u></u>
E-1.1	Manufacturer	By Contractor	
E-1.2	Continuous current carrying capacity of conductor at 90°C Operating Temperature	Manufacturer's Data	
E-1.3	Conductor Cross- Section, mm ²	Refer to Single Line Diagram	
E-1.4	Type of cable	Single Core	
E-1.5	Conductor Material	Annealed Copper	
E-1.6	Max. Outside	Manufacturer's Data	



		NDO	0441-
Item	Description	NPC Requirements	Contractor's Data
	Diameter, mm		
E-1.7	Conductor Shape	Circular Stranded Wire	
E-1.8	Conductor Material	Annealed Copper	
E-1.9	Insulation		
	a. Material	Cross-linked polyethylene (XLPE)	
	b. Thickness, mm	<u>≥</u> 4.0	
E-1.10	Outer covering/Jacket		
	a. Material	PVC Sheath Jacketing	
	b. Thickness, mm	Manufacturer's Data	
	c. Termite Protection Required	Yes	
E-1.11	Shielded (yes, no)	Yes	
	a. Type of Shielding	Copper Tape Screen	
E-1.12	Provided with Filler and Binder Tape	Yes	
600V P	ower, Instrumentation ar	d Control Cable	
E-1.13	Manufacturer	By Contractor	
E-1.14	Туре		· · · · · · · · · · · · · · · · · · ·
	a. Power	THHN/THWN-2	
	b. Control & Instrumentation	Royal Cord	
E-1.15	Continuous current carrying capacity of conductor at 75°C Operating Temperature		
	a. THHN/THWN-2	Refer to Single Line Diagram	
	b. Royal Cord	By Contractor	
E-1.16	Conductor Material	Annealed Copper	
E-1.17	Conductor Shape	Circular Stranded Conductors	
E-1.18	Type of Insulation	Lead Free, UL-listed PVC	
E-1.19	Outer covering/Jacket	Oil, Chemical and Abrasion Resistant Tough Polyamide (Nylon)	

item	Description	NPC Requirements	Contractor's Data
E-1.20	Meets ASTM, UL 83 & 1063, and PNS 35 Specifications and		
	requirements of PEC	Yes	:

2.0 BUS CONDUCTOR AND HARDWARE

Item	Description	NPC	Contractor's
	20001111111	Requirements	Data
Strand	Stranded Conductor Requirements		
E-2.1	Manufacturer	By Contractor	
E-2.2	Type designation	Aluminum Conductor Steel Reinforced (ACSR)	
E-2.3	Code Name	By Contractor	
E-2.4	Conductor size	Refer to Single Line Diagram	
E-2.5	Voltage Rating, kV	15	
E-2.6	Ampacity, A	270	
E-2.7	Outer Layers		
	a. Material	Aluminum	
	b. Stranding No.	6	
	c. Calculated Cross- sectional Area, mm²	Manufacturer's Data	
	d. Coefficient of Elongation (/°C)	Manufacturer's Data	
E-2.8	Core		
	a. Material	Galvanized Steet	_
	b. Stranding No.	1	
	c. Calculated Cross- sectional Area, mm²	Manufacturer's Data	
	d. Coefficient of Elongation (/°C)	Manufacturer's Data	
E-2.9	Conductor Coefficient of Linear Expansion (/°C)	Manufacturer's Data	
Conductor Hardware			
E-2.10	Tension Clamp		
	a. Type	Bolted, U-Bolt	
	b. Material of Body	Aluminum Alloy	

Item	Description	NPC Requirements	Contractor's Data
E-2.11	Connectors		
	а. Туре	Wedge pressure clamp for stranded conductor connection	
	b. Angle and T- connectors type	Wedge pressure clamp for stranded conductor connection	

3.0 GROUNDING SYSTEM

Item	Description	NPC Requirements	Contractor's Data
Groun	nding Grid Design Criteria		
E-3.1	Fault duration, sec.	3	
E-3.2	Total fault level (line to ground), kA	. 8	
E-3.3	Ground mat design resistance	5 Ohms (max.)	
E-3.4	Grounding connection	Exothermic	
E-3.5	Permissible temperature rise of grid copper conductor, ^o C	300	
E-3.6	Grid conductor		
	a. Manufacturer	By Contractor	
	b. Minimum Size, mm²	100	
	c. Material	tin-annealed copper stranded conductor (bare)	
E-3.7	Burial depth of grid conductor below finished grade, m	0.6	
Equip	ment Grounding		<u>. </u>
E-3.8	Bonding Conductor (riser)		
	a. Manufacturer	By Contractor	
	b. Size, mm²	100, 50 & 22	
	c. Material	Tin-annealed copper stranded conductor with 1.2kV PVC insulation	

Item	Description	NPC Requirements	Contractor's Data
E-3.9	Ground Rod		
i	a. Manufacturer	By Contractor	
	b. Type	Copper Rod	
	c. Diameter, mm	≥ 19 mm	
	d. Length/section, m	≥ 3 m	

4.0 LIGHTNING PROTECTION SYSTEM

Item	Description	NPC Requirements	Contractor's Data	
Lightn	ing Protection	·	· · · · · · · · · · · · · · · · · · ·	
E-4.1	Manufacturer	By Contractor]	
Lightn	ing Rod	-		
E-4.2	Material	Copper		
E-4.3	Length, mm	2000		
E-4.4	Minimum Diameter, mm	19		
Down	Conductor		•	
E-4.5	Type	Insulated Copper Conductor		
E-4.6	Minimum Cross-Section Area	55 mm²		
E-4.7	Overall Diameter, mm	Manufacturer's Data		
E-4.8	Insulation Material	PVC		
E-4.9	Weight (kg/meter)	Manufacturer's Data		
Access	Accessories			
E-4.10	Support Pipe, Download Clamp, Terminal Lug, Guy Wire, PVC conduit, etc.	Yes		

5.0 AUTOMATIC CIRCUIT RECLOSER

item	Description	NPC Requirements	Contractor's Data
E-5.1	Manufacturer	By Contractor	
E-5.2	Place of Manufacture	By Contractor	
E-5.3	Туре	Solid Dielectric Vacuum Interrupter	
E-5.4	Phase	3	



item	Description	NPC Requirements	Contractor's Data
E-5.5	Rated Frequency, Hz	60	
E-5.6	Nominal Rated Voltage, kV	13.8	
E-5.7	Maximum Rated Voltage, kV	By Contractor	
E-5.8	Rated Normal Current (Min.)	800	
E-5.9	CT Ratio	Multi-Ratio	. <u>-</u>
E-5.10	Rated Symmetrical Interrupting Current at rated Voltage	12 kA	
E-5.11	Rated Short Time Current for 3 secs.	12 kA	
E-5.12	Rated Making Current (RMS)	12 kA	
E-5.13	Rated 1 min. power frequency withstand between phase and earth (min.)	50 kV	
E-5.14	Interrupting Medium	Vacuum	
E-5.15	Insulation Medium	Cycloaliphatic epoxy or equivalent	
E-5.16	Rated Operating Sequence (total number of trips/counts to lock out)	4	
E-5.17	Current Sensing	By Contractor	
E-5.18	Voltage Sensing	By Contractor	
E-5.19	Mechanical Life – minimum number of close/open operations – without inspection	20000	
E-5.20	HV Bushing Creepage Distance (min.)	500 mm	
E-5.21	Spare Control Cabinet/Panel to be provided	At least 3	
E-5.22	Min. length of umbilical (multi-core) cable to be provided	At least 20 m	
E-5.23	AC Supply	240 Volts	
E-5.24	DC Supply		
	a. Voltage	By Contractor	

item	Description	NPC Requirements	Contractor's Data
	b. Make of Batteries	By Contractor	
	с. Туре	Re-chargeable sealed lead-acid battery	
	d. Capacity	By Contractor	<u> </u>
	e. Battery Operating Time after Loss of AC supply	72 hours	
	f. No. of reclose sequences possible within 36 hours after the loss of ac supply	By Contractor	
E-5.25	Manual "Open-Close" Functionality with Operator Hook Stick	Required	
E-5.26	Controller		
E-5.27	a. Type	Electronic type equipped with advance protection, metering, control and communication in an individual module arranged within the compartment	
	Protection Features		
	Directional Overcurrent and Earth Fault Protection	Yes	
	b. Instantaneous/Time Overcurrent	Yes	
	c. Under and Over Voltage	Yes	
	d. Under and Over Frequency (pick-up setting range of 45 – 65 Hz)	Yes	
	e. Cold Load Pick-up Element	Yes	
	f. Inrush Restraint Element	Yes	
	g. Auto Reclosing Element	Yes	
E-5.28	Monitoring/Metering Functions	Yes	

Item	Description	NPC	Contractor's
E-5.29	ļ	Requirements	Data
E-3.25	a. Sequence of Event (Up to 5000 events can be stored)	Yes	
	b. Fault and Disturbance Records	Yes	
	c. Load Profile	Yes	
E-5.30	Communication Interface	RS 232/ RS 485	
E-5.31	No. of trips to lock-out	Up to 4	
E-5.32	Rated Duty Cycle	0-0.1s CO-1s-CO-1s-CO	
E-5.33	Controller Cubicle Degree of protection	IP 65	
E-5.34	Fault Indicator Type FLA3.1 for overhead lines to be integrated with the control cubicle	To be provided	
E-5.35	Buzzer Alarm Trip, Open/Close Alarm Indications	To be provided	
E-5.36	Bird Guard for insulation protection between the load side and line side, Units	6	
E-5.37	Total Weight, kg	By Contractor	
Other 1	Technical Requirements		
E-5.38	Programming (Configuration) and Maintenance Human- Machine Interface equipped w/ Operating and Configuration Editor Software Program to be provided	Yes	
	а. Туре	PC Compatible Notebook Computer/ Laptop	
	No. of Units to be supplied	1 per unit	
	b. Hardware		
	1. Processor	Ryzen 7 or Higher	
	2. Clock Frequency, MHz	3200	
	3. RAM Capacity, GB	32	

Item	Description	NPC Requirements	Contractor's Data
	Hard Disk Capacity, TB	2 or Higher	
	5. Video Card Capacity	GTX 1660 Super or Higher	
	6. Optical Drive	DVD ± RW	
	7. Display	15" LCD Color Monitor	
	8. Audio System	Built-in Stereo Speakers	
	c. Software		
	Operating System	Licensed Windows 10 Pro with back-up CDROM bundled with latest version of MS Office and reference manuals	
	2. Communication Stack	OSI-TCP / IP	
	3. Configuration Tools	Provided with back- up copy	
	Testing, Maintenance and Diagnostic Software	Provided with back- up copy	
	d. Peripheral Connectivity		
	Communication Interface (I/O)	1x9-pin RS232 & 1x25-pin ECP/EPP parallel ports, 1xUSB 3.0 ports, keyboard& Mouse port, VGA port, DP interface, phone line-in, microphone-in ports and DC jack for power adapter	
	e. Keyboard	Built-in	
	f. Mouse	Wired Optical Mouse	
	g. Power Adaptor	100 - 240V full range 50 – 60Hz	
	h. Battery	Li-ion Battery Pack, At least 4-5hrs rundown battery life with APM	
E-5.39	Operating and		

Item	Description	NPC Requirements	Contractor's Data
	Configuration Editor Software Program		
	a. All system software and configuration editor software program including licenses and instruction manuals	To be provided	
E-5.40	Test Requirement		
	Design and Routine Tests Reports required	Yes	

6.0 FUSE DISCONNECT SWITCH WITH LIGHTNING ARRESTER COMBINATION

Item	Description	NPC Requirements	Contractor's Data
E-6.1	Manufacturer	By Contractor	
E-6.2	Class (indoor, outdoor)	Outdoor	
E-6.3	Rated voltage, kV	15	
E-6.4	Nominal system voltage, kV	13.8	
E-6.5	Frequency, Hz	60	
E-6.6	BIL, kV	110	
E-6.7	Ampere Frame	100	
E-6.8	Interrupting Capacity, kA	10	
E-6.9	Fuse Link		
	а. Туре	Universal button head design	
	b. Current Rating, A	Refer to Single Line Diagram	
E-6.10	Lightning Arrester		
	а. Туре	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	10.2	

Item	Description	NPC Requirements	Contractor's Data
·	(MCOV), for the arresters having the following duty cycle voltage, kVrms		
	f. Nominal discharge current, kA	10	
	g. Creepage distance, mm	465	
	h. Supporting brackets, bolts, nuts, etc.	Yes	

7.0 KILOWATT-HOUR DEMAND METER

Item	Description	NPC Requirements	Contractor's Data	
240V Single Phase Kilowatt-Hour Demand Meter				
E-7.1	Manufacturer	By Contractor		
E-7.2	Accuracy Class	Class 0.3 or Better		
E-7.3	Number of Phase	1		
E-7.4	Wire	2		
E-7.5	Voltage, V	240		
E-7.6	Current Range	Class 200		
E-7.7	Frequency, Hz	60		
E-7.8	Register Type	LCD		
E-7.9	TOU (Time of Use)	Programmable Ready		
E-7.10	Soft Switches	Available		
E-7.11	LCD Display	Programmable		
E-7.12	Power Consumption	By Contractor		
E-7.13	The Kilowatt-hour meter to be provided is certified and approved by ERC	Yes		
13.8kV 1	hree Phase Kilowatt-Hour	Demand Meter		
E-7.14	Manufacturer	By Contractor		
E-7.15	Accuracy Class	Class 0.3 or Better		
E-7.16	Number of Phase	3		
E-7.17	Wire	4		
E-7.18	Voltage, V	120 - 480		

Item	Description	NPC Requirements	Contractor's Data
E-7.19	Current Range	Class 20	
E-7.20	Frequency, Hz	60	
E-7.21	Register Type	LCD	
E-7.22	TOU (Time of Use)	Programmable Ready	
E-7.23	Soft Switches	Available	
E-7.24	LCD Display	Programmable	
E-7.25	Power Consumption	Manufacturer's Data	
E-7.26	The Kilowatt-hour meter to be provided is certified and approved by ERC	Yes	
E-7.27	Metering Current Transformer		
	a. Class (indoor, outdoor)	Outdoor	
	b. Insulation type	Full cast epoxy resin	
	c. Secondary rated current for all windings, A	5	
	d. CT ratio	To be based on protection and metering requirements	
	e. Accuracy class	Class 0.3 or better	
	f. Burden	Manufacturer's Data	
	g. BIL, kV	110	
E-7.28	Metering Voltage Transformer		
	a. Class (indoor, indoor)	Outdoor	
	b. Highest continuous operating voltage of VTs, kV	15	
	c. Nominal voltage of VT, kV	13.8	
	d. Rated secondary voltage, V	120	
	e. Insulation type	Full cast epoxy resin	
	f. Accuracy class	Class 0.3 or Better	
	g. Burden	Manufacturer's Data	<u> </u>

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Item	Description	NPC Requirements	Contractor's Data
	h. BIL, kV	110	

8.0 JOB SITE CAMERAS

Item	Description	NPC Requirements	Contractor's Data
E-8.1	Manufacturer	By Contractor	
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	

9.0 SPARE PARTS AND TOOLS

Item	Description ³	Qty. ¹	Unit Price	Total Price ²
E-9.1	Generator Circuit Breaker for Generator Control & Protection Panel	1 set per D/G set rating		
E-9.2	Telescopic Hot Stick with Tip Lock Features, Material: Epoxy glass Minimum Length: 35 ft.	1 set		

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Item	Description ³	Qty. 1	Unit Price	Total Price ²
	No. of Sections: 8			
E-9.3	Lineman's Rubber Gloves Size: 14" Maximum Usage: 17,000 Volts	2 pairs		
E-9.4	Lineman's Belt Maximum Length:42" Minimum Length: 34" D-to-D distance: 56 cm Center Hole: 38"	1 set		
E-9.5	Positioning Strap, Nylon Maximum Length: 2.0m Minimum Length: 1.3m Adjustable Range: 0.7m	1 set		
E-9.6	Heavy Duty Hard Hat with strap & NPC (Passed Safety Standard)	3 pcs		

Note:

- Minimum requirements but the Contractor 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 Contractor at no cost to NPC.
- 2. Indicated Price shall be used for reference in future purchase orders.
- 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).

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 Bill of Quantities — 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.



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PART II – TECHNICAL DATA SHEETS EW- ELECTRICAL WORKS TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
E-1.0	Power, Control and Instrumentation Cables	VI-TDS(EW)-2
E-2.0	Bus Conductor	VI-TDS(EW)-2
E-3.0	Grounding System	VI-TDS(EW)-3
E-4.0	Lightning Protection System	VI-TDS(EW)-3
E-5.0	Automatic Circuit Recloser	VI-TDS(EW)-4
E-6.0	Fuse Disconnect Switch with Lightning Arrester Combination	VI-TDS(EW)-4
E-7.0	Kilowatt-Hour Demand Meter	VI-TDS(EW)-5
E-8.0	Spare Parts and Tools	VI-TDS(EW)-6

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PART II

TECHNICAL DATA SHEETS

EW - Electrical Works

Technical Requirements

- The Bidder is required to provide all the information required under the column "Contractor's Data". Although not given by NPC, The Contractor's Data shall be based on the International Standard.
- 2. NPC's requirements are indicated below. The Contractor shall indicate their data corresponding to the said NPC requirements to facilitate evaluation of Contractor's compliance to the specifications.
- 3. Non-compliance with the requirements shall be ground for disqualification.

Name of Firm Name & Signature of Representative Designation



POWER, CONTROL & INSTRUMENTATION CABLE

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
15kV Pov	wer Cable		
E-1.1	Manufacturer	By Contractor	
E-1.2	Continuous current carrying capacity of conductor at 90°C Operating Temperature	Manufacturer's Data	
E-1.3	Conductor Cross-Section, mm ²	Refer to Single Line Diagram	
E-1.4	Conductor Material	Annealed Copper	
E-1.5	Insulation Material	Cross-linked polyethylene (XLPE)	
600V Pov	ver, Instrumentation and Co	ntrol Cable	
E-1.6	Manufacturer	By Contractor	
E-1.7	Туре		
	a. Power	THHN/THWN-2	
	b. Control & Instrumentation	Royal Cord	
E-1.8	Continuous current carrying capacity of conductor at 75°C Operating Temperature		
	a. THHN/THWN-2	Refer to Single Line Diagram	
	b. Royal Cord	By Contractor	
E-1.9	Conductor Material	Annealed Copper	

E-2.0 BUS CONDUCTOR

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-2.1	Manufacturer	By Contractor	· · · · · · · · · · · · · · · · · · ·
E-2.2	Type designation	Aluminum Conductor Steel Reinforced (ACSR)	

Name of Firm	Name & Signature of Representative	Designation
(144110-01-1-1111	riamo a oignature of representative	Designation



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ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-2.3	Conductor size	Refer to Single Line Diagram	
E-2.4	Ampacity, A	230 / 270	

E-3.0 GROUNDING SYSTEM

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-3.1	Grounding connection	Exothermic	
E-3.2	Permissible temperature rise of grid copper conductor, ^o C	300	
E-3.3	Grid conductor		
	a. Manufacturer	By Contractor	
	b. Minimum Size, mm²	100	
	c. Material	tin-annealed copper stranded conductor (bare)	
E-3.4	Bonding Conductor		
	a. Manufacturer	By Contractor	
	b. Size, mm ²	100, 50 & 22	-
	c. Material	tin-annealed copper stranded conductor with 1.2 kV PVC Insulation	
E-3.5	Copper Ground Rod		
	a. Manufacturer	By Contractor	
	b. Diameter, mm	≥ 19 mm	
	c. Length/section, m	≥ 3 m	

E-4.0 LIGHTNING PROTECTION SYSTEM

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA		
Lightning Protection					
E-4.1	Manufacturer	By Contractor			
Lightning	Lightning Rod				

Name of Firm

Name & Signature of Representative

Designation



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ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-4.2	Material	Copper	
E-4.3	Length, mm	2000	
E-4.4	Minimum Diameter, mm	19	
Down Co	onductor	<u> </u>	
E-4.5	Туре	Insulated Copper Conductor	
E-4.6	Minimum Cross-Section Area	55 mm²	-
E-4.7	Insulation Material	PVC	

E-5.0 AUTOMATIC CIRCUIT RECLOSER

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-5,1	Manufacturer	By Contractor	
E-5.2	Place of Manufacture	By Contractor	
E-5.3	Туре	Solid Dielectric Vacuum Interrupter	
E-5.4	Phase	3	
E-5.5	Rated Frequency, Hz	60	
E-5.6	Nominal Rated Voltage, kV	13.8	
E-5.7	Mainly Active Breaking Capacity	800 A	

E-6.0 FUSE DISCONNECT SWITCH WITH LIGHTNING ARRESTER COMBINATION

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
E-6.1	Manufacturer	By Contractor	
E-6.2	Rated voltage, kV	15	
E-6.3	Frequency, Hz	60	
E-6.4	BIL, kV	110	
E-6.5	Ampere Frame	100	
E-6.6	Interrupting Capacity, kA	10	
E-6.7	Fuse Link		
	a. Type	Universal button head	

Name of Firm	Name & Signature of Representative	Designation



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ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
		design	
	b. Current Rating, A	Refer to Single Line Diagram	
E-6.8	Lightning Arrester		
	а. Туре	Metal Oxide Varistor (MOV), gapless	

E-7.0 KILOWATT-HOUR DEMAND METER

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
240V Sin	gle Phase, Digital Kilowatt-I	lour Demand Meter	
E-7.1	Manufacturer	By Contractor	
E-7.2	Accuracy Class	Class 0.3 or Better	
E-7.3	Wire	2	
E-7.4	Current Range	Class 200	
E-7.5	Frequency, Hz	60	
E-7.6	The Kilowatt-hour meter to be provided is certified and approved by ERC	Yes	
13.8kV T	hree Phase, Digital Kilowatt-	Hour Demand Meter	·
E-7.7	Manufacturer	By Contractor	
E-7.8	Accuracy Class	Class 0.3 or Better	
E-7.9	Wire	4	
E-7.10	Voltage, V	120 - 480	
E-7.11	Current Range	Class 20	-
E-7.12	Frequency, Hz	60	
E-7.13	The Kilowatt-hour meter to be provided is certified and approved by ERC	Yes	
E-7.14	Metering Current Transformer		
	a. Insulation type	Full cast epoxy resin	
_	b. Secondary rated current for all windings,	5	

Name of Firm	Name & Signature of Representative	Designation



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI - TECHNICAL SPECIFICATIONS

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ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
		design	
	b. Current Rating, A	Refer to Single Line Diagram	
E-6.8	Lightning Arrester		
	a. Type	Metal Oxide Varistor (MOV), gapless	

E-7.0 KILOWATT-HOUR DEMAND METER

ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
240V Sin			
E-7.1	Manufacturer	By Contractor	
E-7.2	Accuracy Class	Class 0.3 or Better	
E-7.3	Wire	2	
E-7.4	Current Range	Class 200	
E-7.5	Frequency, Hz	60	
E-7.6	The Kilowatt-hour meter to be provided is certified and approved by ERC	Yes	
13.8kV Th	ree Phase, Digital Kilowatt-	Hour Demand Meter	
E-7.7	Manufacturer	By Contractor	
E-7.8	Accuracy Class	Class 0.3 or Better	
E-7.9	Wire	4	
E-7.10	Voltage, V	120 - 480	
E-7.11	Current Range	Class 20	
E-7.12	Frequency, Hz	60	
E-7.13	The Kilowatt-hour meter to be provided is certified and approved by ERC	Yes	
E-7.14	Metering Current Transformer		
	a. Insulation type	Full cast epoxy resin	
	b. Secondary rated current for all windings,	5	

Name	of	FI	m
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Name & Signature of Representative

Designation



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ITEM	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S DATA
- 1	Α		
	c. Accuracy class	Class 0.3 or Better	
-	d. BIL, kV	110	
E-7.15	Metering . Voltage Transformer		
	a. Nominal voltage of VT, kV	13.8	
	b. Rated secondary voltage, V	120	
	c. Insulation type	Full cast epoxy resin	
	d. Accuracy class	Class 0.3 or Better	
	e. BIL, kV	110	

E-8.0 SPARE PARTS AND TOOLS

ITEM	DESCRIPTION 3	QTY. 1	UNIT PRICE	TOTAL PRICE ²
E-8.1	Generator Circuit Breaker for Generator Control & Protection Panel	1 set		
E-8.2	Telescopic Hot Stick with Tip Lock Features, Material: Epoxy glass Minimum Length: 35 ft. No. of Sections: 8	1 Set		
E-8.3	Lineman's Rubber Gloves Size: 14* Maximum Usage: 17,000 Volts	2 Pairs		
E-8.4	Lineman's Beit Maximum Length:42" Minimum Length: 34" D-to-D distance: 56 cm Center Hole: 38"	1 Set		
E-8.5	Positioning Strap, Nylon Maximum Length: 2.0m Minimum Length: 1.3m Adjustable Range: 0.7m	1Set		
E-8.6	Heavy Duty Hard Hat with strap & NPC	3 Pcs		

Name of Firm	Name & Signature of Representative	

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI - TECHNICAL SPECIFICATIONS

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ITEM	DESCRIPTION 3	QTY. ¹	UNIT PRICE	TOTAL PRICE 2
	(Passed Safety Standard)			
E-8.7				<u> </u>
E-8.8				
E-8.9				
E-8.10				

Note:

- Minimum requirements but the Contractor 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 Contractor at no cost to NPC.
- 2. Indicated Price shall be used for reference in future purchase orders.
- 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	Name & Signature of Representative	Designation



CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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SECTION VI

TECHNICAL SPECIFICATIONS (MECHANICAL WORKS)



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PARTI

TECHNICAL SPECIFICATIONS

MW - MECHANICAL WORKS



PART I - TECHNICAL SPECIFICATIONS

MW - MECHANICAL WORKS

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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 shown on the accompanying drawings and installation manuals or as otherwise directed by NPC for the CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR.

EQUIPMENT	DESTINATION
Four (4) complete sets of Prime Powe	
Output Modular Diesel Gensets and thei systems' auxiliaries; spare parts; specia tools; balance of plant, consumables (lube oil, lubricants and coolants).	2 Rutawanan NPP+1 Y 50 kW/ & 1 v

The Contractor/Supplier shall accept full responsibility for its work as required, performance qualifications, specifications, documentation, reports, fabrication, corrosion protection, cleaning, shop testing, preparation for transport, reinforcement of roads and bridges as maybe deemed necessary, field testing and compliance with the applicable codes and standards and the requirements of this specification

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

Correction of all deviations from the requirement of this specification or drawings and all errors in or resulting from the workmanship of the Contractor/Supplier including all costs, expenses and other damages resulting from any such deviations or errors, as well as freight charges, taxes and duties, will be solely for the account of the Contractor/Supplier.

All equipment and materials including its associated structures and necessary accessories which the Contractor/Supplier shall supply and install and which thereafter will be incorporated in the plant shall be new and unused. They shall be suitable for their intended purpose and appropriately matched to other items complying with all applicable regulations, quality and dimension standards. The Contractor/Supplier shall strictly observe the general requirements of this specification in conjunction with the specific requirements specified in the relevant specifications (Civil, Architectural and Electrical Works).



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MW-2.0 SCOPE OF WORK

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. However, the Contractor/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 Contractor/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 Contractor/Supplier shall conduct actual inspection at both sites and thoroughly investigate and familiarize himself with all the conditions at site, make assessment on the physical conditions and configurations of the existing building equipment and auxiliaries to be transferred, determine the required quantity of materials and equipment to be supplied/utilized during the project execution, determine possible sources of materials and equipment to be supplied/utilized, and verify the actual scope of works and relative costs. 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 Contractor/Supplier and no additional payment thereof shall be made by NPC.

The Contractor/Supplier shall furnish all supervision, labor, materials, supplies, tools and equipment to complete all the Mechanical Works.

The Contractor/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 smooth execution of the project. Relative costs of any additional works or materials which the Contractor/Supplier deemed required or necessary to complete the works shall be included in the bid proposal.

The scope of works under this project shall generally consist of the following:

- Packing/crating, Transportation, Hauling, Assembling, Installation, and Assistance to Testing of all Mechanical Equipment and Systems' Auxiliaries and other accessories to be transferred including but not limited to:
 - a.1 Two (2) sets of 50 kW Modular Diesel Gensets and its systems' auxiliaries FOR CALUTCOT DPP

Make

SAONON

Model

S100EPS6(S)

Alternator

UC1224D (Stamford)

Engine

1104A-44TG2 (Perkins)

Rating

480 V. 3Ø

Enclosure Dimension (m)

2.3 x 1.133 x 1.376

Weight

: 1,597 kg.

a.2 One (1) set of 50 kW and one (1) set of 30 kW Modular Diesel Gensets and its systems' auxiliaries – FOR BUTAWANAN DPP

	50 KW GENSET	30 KW GENSET
Make	: SAONON	Make : SAONON
Model	: S100EPS6(S)	Model : S60EP6 (S)
Engine	: 1104A-44TG2 (Perkins)	Engine: 1104A-44TG1 (Perkins)
	ator : UC1224D (Stamford)	Alternator : PI144G (Stamford)
Rating	: 480 V, 3Ø	Rating : 480 V, 3Ø
. □ men	sion (m): 2.3 x 1.133 x 1.376	Dimension (m): 2.3 x 1.133 x 1.376
	t : 1,597 kg.	Weight: 1,484 kg.

a.3 Spare Parts for Four (4) Genset

ITEM	EQUIPMENT !	QTY
1	Air Filter – 26510342	24 pcs.
2	Lube Oil Filter – 2654407	120 pcs.
3	Fuel oil Filter Element - 4816636	60 pcs.
4	Water Filter Element – 4415122	24 pcs.
5	Fan Belt - 2614B655	14 pcs.
6	Fuel Injector Assembly - 2645K022	8 pcs
7	Top Overhauling Kit - U5LT0357	4 pcs
8	Jacket Water Pump Repair Kit - U5MW0206	4 sets
9	Lube Oil Pump Repair Kit - T414941	4 sets
10	Fan Adaptor and Accessories - 2485C546	8 sets
11	Exhaust Manifold Bellow - 3778E401	4 sets
12	Magnetic Pickup - 2868A006	4 sets

- Supply, delivery, install and test including painting of all materials and equipment but not limited to the following:
 - b.1 Supply, installation and test of Fuel Oil System consisting of two (2) 1000 Liters fuel day tank complete with manhole, inlet and outlet nozzle, nozzles for vent, overflow, drain and level gauge/switch and structural supports; including two (2) 50 l/min double acting rotary type hand pumps complete with fittings connections including flexible hoses Per Site:
 - b.2 One (1) lot of Well Drilling Works consisting of casing installation, well development, pumping test and disinfection including supply and installation of hand pumps complete with accessories Per Site;
 - b.3 One (1) lot of Domestic Water Supply System consisting of 0.6 m3 Elevated Water Tank, pipes, valves, pipe fittings, gaskets, flanges, pipe supports, excavation and backfilling of embedded pipes and other pipe accessories including disinfection of the system- Per Site;



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- b.4 One (1) unit Window Type Air Conditioner (Inverter), 7,000 kJ/hr minimum cooling capacity for control house and One (1) unit of Wall mounted Exhaust Fan for toilet, 100 m³/h minimum capacity, propeller type, direct motor driven, 220V, 60 hz, 1-phase power supply for all air conditioning and ventilation units, all complete with mounting accessories and controls- Per Site;
- b.5 Two (2) units Portable Type Fire Extinguishers, Clean Agent (HCFC or Halotron I Type), 7.1 kg. (15.5 lbs), non-expiry, multi shots, wall-hung and UL/FM approved Per Site
- b.6 One (1) lot Fuel Oil Piping System complete with valves, strainers, pipe and fittings, gaskets, flanges, bolts and nuts, pipe supports and other required accessories to complete the piping systems for the fuel oil unloading, transfer of fuel oil from fuel source to day tanks including double acting rotary type hand pumps, day tanks to and from diesel gensets, waste water/oil from container drain pit to oil water separator including necessary excavation, backfilling and asphalt jute application to embedded pipes Per Site;
- b.7 Supply of the following engine/gensets' spare parts/items

Per Unit of 50 KW and 30 KW -Calutcot and Butawanan								
		ITEM		•		•	- QU	ANTITY
- Alt	emator	Belt					3	pcs/size
• Co	olant						4	gallons

For 2 x 50 KW Gensets - Calutcot		<u></u>
ITEM	QUA	NTITY
 Actuator 	1	set
 Rocker Gear Cover Gasket 	12	set
 Thermostat 	1	set
 Lubrication Oil Pump Switch 	1	set
 Hot Water Temperature Switch 	1	set
 Turbocharger Repair Kit 	1	set

Per Unit 50 KW and 30 kW Gensets in Buta	wanan	
ITEM ITEM	QUA	NTITY
Actuator	1	set
 Rocker Gear Cover Gasket 	12	set
 Thermostat 	1	set
 Lubrication Oil Pump Switch 	1	set
 Hot Water Temperature Switch 	1	set
 Turbocharger Repair Kit 	1	set

- b.8 Assistance to test and commissioning;
- b.9 Painting Materials to be applied to all equipment, pipes, steel structures, tanks, pipe supports and other incidentals;
- b.10 Labels or Standard Plant Identification Number (SPIN) for all equipment, valves, piping and instruments supplied; and



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b.11 All other works and services including those are not specifically detailed herein but are required to fully complete the project.

The Contractor/Supplier shall carefully store and maintain all equipment and materials transported to designated sites, if not immediately assembled/installed, including Balance of Plant to be supplied by Contractor/Supplier until such time as they are required/installed at their designated locations. The Contractor/Supplier shall provide temporary shelter/cover such as tarpaulin or equivalent type of cover for protection of the equipment during the storage.

The Contractor/Supplier shall secure insurance against loss or damage incidental to hauling/transportation, reassembly, and erection/installation of all plant equipment to be relocated.

MW-3.0 GENERAL TECHNICAL REQUIREMENTS

MW-3.1 General

The requirements specified herein shall apply to all equipment and materials to be transferred from SPUG-LOD Minuyan-Warehouse, San Jose Del Monte, Bulacan to Calutcot, Burdeos, Quezon and Butawanan, Siruma, Camarines Sur and those to be supplied by the Contractor/Supplier.

The Contractor/Supplier shall provide the services of qualified engineers who shall be responsible for the transfer; assembly; erection/installation; final alignment; and assistance to start-up, testing, and commissioning of all relocated/transferred equipment including those to be supplied by the Contractor/Supplier.

The work shall be performed and completed in a high quality workmanship, in accordance with generally modern accepted practice in the fabrication, assembly, installation and test of all equipment and materials supplied by the Contractor/Supplier, notwithstanding any omission from these Specifications or drawings.

Defect and damages to the equipment resulting from faulty installation works shall be repaired and/or replaced by the Contractor/Supplier at no cost to the NPC.



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MW-3.2 Materials and Equipment

MW-3.2.1 General

All materials and equipment to be supplied by the Contractor/Supplier under this Contract shall be new and unused, free from defects and imperfections and best suited for the purpose intended. All materials shall comply with the latest revisions or editions of the specified standards for each equipment specification unless otherwise specified or permitted by NPC. 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 installed or used without such approval shall be at the Contractor/Supplier's risk of subsequent rejections.

All materials or parts used in the equipment to be supplied shall be tested in conformance with applicable specifications and shall be purchased with certified mechanical and chemical properties.

The materials and components to be supplied shall essentially be the standard products of the manufacturer as best meets the conditions of sound engineering economy of manufacture and procurement.

Brochures, catalogs and other related technical data of materials and equipment to be supplied by the Contractor/Supplier under this contract shall be submitted by the Contractor/Supplier for NPC's review and approval prior to fabrication.

From the commencement of the works until the date of Final Completion, the Contractor/Supplier will be fully responsible for the care of the works and all materials and equipment, whether supplied by the Contractor/Supplier or Corporation, and for all temporary works. Should any damage, loss or injury happen to the works, materials or equipment or to any part thereof from any cause attributable to the fault of the Contractor/Supplier. Contractor/Supplier shall at his own expense, repair, replace and make good the damage, loss or injury so that at completion, the works shall be in good order and condition and in conformity in every respect with the requirements of the Contract.

MW-3.2.2 Inventory

Immediately upon effectivity of the Contract, NPC and the Contractor/Supplier or their authorized representatives, shall jointly take a physical inventory of all equipment and materials including its associated structures, consumable goods, spare parts, tools and other inventory items to be repacked, transported and installed to the new locations.

The Contractor/Supplier shall prepare a checklist to record the physical inventory of the equipment and materials which shall be signed by authorized NPC and Contractor/Supplier representatives present during the inventory.



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The weight and physical characteristics of the equipment to be transferred are based on the available data taken from the corresponding nameplates. It shall be the responsibility of the Contractor/Supplier to verify the specified data and make actual assessment of the equipment at the sites particularly on the quantity, physical conditions or appearance and, weight and dimensional requirements.

Completeness of the equipment's controls and accessories including sizes and dimensions and rating shall be verified during the site inspection. Any missing and/or lacking in measure or quantity of items/equipment shall be supplied by the Contractor/Supplier.

MW-3.2.3 Mechanical Equipment and Auxiliaries/Accessories

All mechanical equipment/components and its associated structures which shall be hauled, transported, re-assembled, installed, assistance to testing and commissioning by the Contractor/Supplier are enumerated and described in this section.

The Contractor/Supplier shall supply all equipment and materials which are damaged, missing or lacking in required quantity.

Prior to submission of Bids, the Contractor/Supplier shall make a visual inspection of the all equipment and materials to be transferred in coordination with NPC. It shall be the responsibility of the Contractor/Supplier to verify the specified physical characteristics, make actual assessment particularly on the quantity, physical conditions or appearance and dimensional requirements.

All necessary equipment, materials, and devices, although not listed and/or described herein but are parts of the plant and required for the safe and reliable operation of the plant, shall be included in the scope of works.

The physical, dimensional characteristics and specifications of equipment to be transferred are based on the available data taken from the corresponding nameplates and actual measurements. It shall be the responsibility of the Contractor/Supplier to verify the specified data and make actual assessment of the equipment at the sites particularly on the quantity, physical conditions or appearance and dimensional requirements.

MW-3.2.3 Applicable Codes and Standards

The design, materials, equipment, manufacturing, construction, installation, and testing of all works under this contract shall be in strict accordance with the latest edition of all applicable codes and standards, national and local laws, codes and regulations, statutes and ordinances.

The latest edition of each standard shall mean the latest edition available at the date of contract signing.

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



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MW-3.4 Equipment Foundation

All equipment shall be installed in accordance with the manufacturer's recommendations and applicable codes and standards. Requirements for concrete foundations where the equipment are to be mounted shall be referred to the relevant Civil Works Specifications.

The Contractor/Supplier shall be responsible for the correct positioning and leveling of the equipment and auxiliaries, and any checking made by the NPC during the course of the work shall not relieve the Contractor/Supplier from his responsibility. During installation works, electro-mechanical equipment 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 Contractor/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 Contractor/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 clust.

MW-3.4 Piping System

MW-3.4.1 General

The Contractor/Supplier shall supply and install all the piping system as required a: d specified to provide a complete and acceptable installation necessary for the safe and efficient operation of each plant 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 pipe supports.

The piping systems for the transferred generating sets and its auxiliaries shall be installed as shown on the drawings.



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The Contractor/Supplier shall submit, if required to suit actual site conditions, 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 Contractor 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.

The Contractor/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 Contractor/Supplier in a manner satisfactory to NPC or shall be replaced by and at the expense of the Contractor/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.

A minimum of 2.0 m headroom shall be maintained to the bottom of all piping components or insulation in walking areas.

Instrument and sampling nozzle connections and valves shall be of 15 mm Ø.

A minimum of 50 mm clearance shall be provided between piping including insulation and any point of adjacent equipment or piping.

A 200 mm minimum clear space shall be provided from the bottom surface of pipe to trench bottom or finished grade. Metric flanges shall be used throughout. Welded flanges shall be weld-neck or slip-on flanges. The raised face shall be machined.

Joints between stainless and steel flanges shall be of the insulated type.

Piping installation shall be sloped to prevent trapping of air bubbies. Where required, suitable venting system with valve shall be provided.



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Pressurized pipes shall generally not be embedded in concrete. When embedding such pipes is necessary, approval by NPC is required.

Unless otherwise stated, all piping shall be designed for a Nominal Pressure of 10kg/cm².

Where pipeline are laid, the trench shall be provided with a cushion pad of at least 100 mm sand and sandy soil bedding materials prior to pipe laying, unless otherwise 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 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 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.

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.

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.



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For oil pipes, after installation, pipe 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 Contractor/Supplier at its own expense.

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

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.

MW-3.4.2 Pipe and fittings

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. Only specified pipes shall be used for interconnection piping between the diesel engines and its auxiliary equipment including fuel oil transfer piping system. Pipes used for Domestic water supply and distribution systems shall be as specified in the relevant sections of this specification.

All steel piping, 65 mm and above, shall be butt-weided or flanged. All piping, 50 mm and under shall be joined by socket welded or screwed where specified.

Steel 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 pipe 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.

Malleable iron, galvanized screwed fittings conforming to ANSI B16.3 (Malleable iron threaded fittings, Class 150) may be used for Potable Water System.

Flanges for steel piping shall be forged, weld neck for 65mm and larger or socket weld for 50mm and smaller, 150 lb raised face and conforming to ASTM A181 Class 60. Galvanized flanges shall be used for fire protection and potable water supply systems.

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.



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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, n:arked and handed over to NPC.

MW-3.4.3 Drains and Vents

Not all piping system vents and drains may be shown on the piping drawings. The Contractor/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 20 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-3.4.4 Pipe Supports

Pipe supports shall be fabricated and installed as shown on the drawings. If pipe supports required are not shown on the accompanying drawings the Contractor/Supplier shall provide detailed drawings and submit to NPC for review and approval.



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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 be not 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.

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 Contractor/Supplier.



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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-3.4.5 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 below shall be socket weld or other method as 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 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.



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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 Contractor/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 semiautomatic 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-3.5 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 Contractor/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 Contractor/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.



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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 above 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 above shall be of OS & Y or 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 below 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 or as specified in relevant sections of this specification.

Garden hose connection valves or hose bibbs shall be of bronze material, 20mm size and outfitted with male thread hose connections.

MW-3.6 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.



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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-3.7 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 EQUIPMENT MARKING, LABELING AND MISCELLANEOUS REQUIREMENTS

MW-4.1 Identification System

All members comprising multi-part assemblies are to be marked with distinguishing numbers and/or letters corresponding to those of the drawings or material lists. These identification marks shall be clearly readable.

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.

Plate material used for nameplates and labels shall be of stainless steel, 1mm minimum thickness or approved equivalent.

Nameplates, labels and warning plates shall be in English.



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MW-4.1.1 Equipment for Relocation

Prior to relocation, the Contractor/Supplier shall ensure and verify that all equipment, valves, piping, panels, cables, instruments and its associated structures and components still contain the original tagging or identification number that will be used as reference to facilitate re-assembly, wiring termination and erection/installation at the new site. As an alternative, proper marking shall be provided to conform with those shown on the drawings or material lists or other marking recommended by the Contractor/Supplier and approved by the NPC.

MW-4.1.2 Equipment to be Supplied by the Contractor/Supplier

All electro-mechanical equipment, valves, instruments, piping, panels and all component parts including cables, control wiring and terminals which shall be supplied and installed by the Contractor/Supplier under this contract shall be designated with an alphanumeric code allowing clear identification of the equipment and components during design, installation and operation of the plant. Each equipment and components shall be systematically marked, both on the drawings and documents and on the equipment, valves, instruments, piping, cables, wires and terminals themselves.

Equipment designation codes and brief technical data shall be indicated on all drawings and documents including bills of materials, lists of spare parts, etc. The codes will later be used for easy identification of stored equipment parts and materials and shall be suitable for use with a computer supported registration system.

Attached drawings are in most cases already marked with designated codes, the system shall be expanded to include detailed diagrams, cable lists, spare parts list, etc., as approved by NPC.

MW-4.2 Nameplates

All equipment and auxiliaries to be supplied by the Contractor/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) and other relevant information in compliance with applicable standards. 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.



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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.

If it is not practical to include the SPIN or tag number on the equipment, valve, & instruments nameplate, a separate durable stainless steel tag or approved non-corrosive material with the identification number shall be securely attached to the equipment as specified in this specification.

Each equipment 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.

MW-4.3 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.



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MW-4.4 Tag Numbers/Standard Plant Identification Number (SPIN)

Tag Numbers or SPIN for all supplied equipment and materials shall be provided by the Contractor/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 Contractor/Supplier shall assign a number subject to the approval of NPC.

MW-4.5 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.

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.

MW-4.6 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.

MW-4.7 Guards

Guards shall be provided for coupling, drive shafts, fans, etc. These shall comply with ANSI Standard B15.1, Safety Code for Mechanical Power Transmission Apparatus.



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MW-4.8 Lifting Lugs

Lifting lugs or points where lifting lugs supplied can be attached to each item of equipment or component which requires to be removed for servicing and which weighs more than 20 kg shall be adequately provided.

MW-5.0 PACKING, CRATING, HAULING AND INSTALLATION

MW-5.1 General

Generally, the equipment, materials and associated steel structures to be transported/hauled, re-assembly and installation shall come from the NPC SPUG-LOD Warehouse, Minuyan, San Jose Del Monte, Bulacan. The Contractor/Supplier shall furnish all necessary plant, equipment, tools and labor to execute the relocation works.

NPC shall make available and provide access to the site for the repacking/orating activities of the Contractor/Supplier. After contract award and prior, the Contractor/Supplier shall submit relocation schedule and methodology or work program for review and approval of the NPC. Preparation of the schedule shall be closely coordinate with NPC Plant Management in consideration to priority generating units to be relocated. The work program shall include detailed procedure for all plant equipment and its associated steel structures such as Diesel Generating Sets, tanks, piping, electrical equipment, cables, panels, transformers, etc. The dismantling procedures shall comply with safety standards, existing environmental laws, rules, and regulations.

The Contractor/Supplier shall submit after the award of contract the general procedure or overall work program covering the crating, hauling, transporting and temporary storage of all equipment and materials to be transferred including disposal works within the new locations.

All works shall be properly coordinated with other fields and with existing installations, structures, piping, and equipment so that interference shall be avoided.

Any discrepancy between the unit quantity of material inventory conducted and actual unit quantity certified received by NPC representative/s for purposes of payment under the Contract shall be considered losses and therefore charged as Materials Accountability of the Contractor/Supplier where the cost of materials damaged or lost shall be based on the current price of the latest contract award of NPC.

Defects and damages to the equipment resulting from faulty re-assembly and installation works by the Contractor/Supplier shall be repaired and corrected at no cost to NPC.

Final adjustments in the location of any other equipment, if necessary, shall be done in the field by the Contractor/Supplier during installation with prior approval of the NPC.



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Special tools, devices and instruments specifically designed and manufactured for the components of transferred equipment shall be made available to the Contractor/Supplier by NPC. The Contractor/Supplier shall return the same in good condition after use who shall be responsible for their safekeeping. In case of failure to return the tools, instruments or devices and equipment, their value shall be debited to the Contractor/Supplier's account.

The Contractor/Supplier shall submit for NPC's review and approval the installation schedule and program showing all the details prior to the erection/installations in accordance with the manufacturer's procedures and standards.

MW-5.2 Scope of Work

The Contractor/Supplier's scope of work shall cover the hauling/transporting, re-assembly, installation/erection, assistance to test and commissioning of all transferred mechanical equipment, materials and associated auxiliaries as specified in Clause MW-2.0 of this specification.

The Contractor/Supplier shall furnish all equipment, materials, labor, tools, scaffoldings and other necessary appurtenances whether or not specifically mentioned in this specification or shown on the accompanying drawings but are deemed necessary to complete the work.

The layout/arrangement of transferred mechanical equipment and associated auxiliaries shall be as shown on the bid drawings. The Contractor/Supplier shall supply all the required piping materials pipe fittings, pipe supports/racks, etc. to complete the works.

The Contractor/Supplier shall supply all materials/parts that will be damaged during transfer works including those that are lacking in measure or quantity. It shall include, but not limited to replacement bolts, including anchor bolts for Diesel Gen-Sets and Auxiliary Equipment; nuts; screws; piping materials; instruments and gauges; and other necessary appurtenances to complete the work called for and to provide a safe, efficient, and reliable operation of each equipment and system.

All replacement and additional materials/parts to be supplied by the Contractor/Supplier shall match the specifications of the original ones. In case of difficulty in procuring such materials/parts, the Contractor/Supplier may supply a different specification provided that such will guarantee a quality not inferior to the original and with prior approval of the NPC.

All transferred equipment and materials shall be painted by the Contractor/Supplier.

The Contractor/Supplier shall assist NPC in conducting all the tests required for the transferred equipment during the pre-commissioning/site commissioning tests. The Contractor/Supplier shall perform any repair or adjustment resulting from faulty re-assembly and re-installation works at no cost to NPC.



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The Contractor/Supplier shall provide temporary shelter/cover for all transferred equipment and materials shall be stored by the Contractor/Supplier at the temporary storage yard to be designated by NPC within the new plant site by the Contractor/Supplier.

The Contractor/Supplier shall maintain a well-guarded and secured area, as designated by the NPC, for all dismantled equipment and materials to avoid pilferage.

MW-5.3 Preparation

The Contractor/Supplier shall prepare materials and equipment for shipment to protect it from damage during shipment/transport and subsequent storage.

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

All equipment, accessories and associated structures shall be properly and carefully packed/crated, as applicable, including any equipment and materials to be supplied by the Contractor/Supplier.

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 (15 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 and 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 or transported equipment/materials may be left in open temporary storage at the designated place, the Contractor/Supplier shall ensure that the delivered items have appropriate protection from water and other elements such as temporary shelter/cover/tarpauline or equivalent type of cover for protection.



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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 will be left in the inside of the equipment.

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

Valves including its bolts, nuts, gaskets 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
GROSS WEIGHT
DIMENSION
CRATE NO.

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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.

Prior to shipment/transport, the Contractor/Supplier shall furnish advance copies of all non-negotiable shipping documents, invoices, packing lists and other pertinent documents.

The Contractor/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.

MW-5.4 Shipment/Transport

The Contractor/Supplier shall be responsible for the sea and land transportation of the plant equipment, materials and supplies required under this Specification and shall ensure that they are safely and timely delivered to the specified site. Contractor/Supplier shall be deemed to have visited the sites and other areas on the route of delivery, including port facilities, inter-island shipping facilities, island transport, access roads, bridges, 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 if any, etc. arising out of neglect of Contractor/Supplier shall be the responsibility of the Contractor/Supplier. Likewise, any additional claim attributable to Contractor/Supplier's lack of knowledge or understanding on existing conditions of the site shall not be given due credence.

Upon arrival of equipment and materials at site, NPC and the Contractor/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.



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A record shall be prepared carefully noting all eventual shortage, defects or damages, signed by the Contractor/Supplier and concurred by NPC. All shortages and damages noted shall be immediately replaced by the Contractor/Supplier at his own cost and shall ensure the timely delivery of replacement without affecting the agreed overall project implementation schedule. The Contractor/Supplier shall be responsible for the care and custody of the equipment from storage until erection.

The Contractor/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 Contractor/Supplier on site at all times.

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

MW-5.5 Storage

If the dismantled equipment and materials including those to be supplied by the Contractor/Supplier will not be immediately required for installation at the site, 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. The Contractor/Supplier shall provide temporary shelter/cover such as tarpauline or equivalent type of cover for protection of the equipment during the storage.

The Contractor/Supplier shall be responsible for securing all his supplied and transferred equipment at a place designated by NPC until the completion of the erection/installation, testing and commissioning of the Plant.

Any loss and/or damage of said equipment at said storage area shall be the responsibility of the Contractor/Supplier.

If the Contractor/Supplier desires to use any storage area outside property at the respective sites, he may do so at his own expense and subject to the approval of NPC.

MW-5.6 Erection and Installation Requirements

All dismantled materials, electro-mechanical equipment and associated structures which are transported to the new site of Guintarcan DPP shall be reassembled, re-erected, installed, tested and commissioned in accordance with the manufacturer's drawings, instruction manuals, and drawings provided thereto including all equipment and materials to be supplied by the Contractor/Supplier under this Contract. In the event of conflict within these documents, the Contractor/Supplier shall inform NPC of the conflict in writing for written resolution prior to the execution of the Work.



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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/re-assembly, erection/re-erection and any such damage and defects shall be repaired, replaced or otherwise make good by the Contractor/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 Contractor/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 Contractor/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 Contractor/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 before final grouting. Foundation bolts/bed plates of the number and sizes required shall be supplied and installed by the Contractor/Supplier. The cost of which shall be included in the cost for the installation of respective equipment. Transferred equipment whose foundation/anchor bolts were no longer retrieved shall be supplied and shall be installed by the Contractor/Supplier.

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 and dimensional requirements of the foundation. Should incorrect positioning be ascertained after the concrete pouring, the Contractor/Supplier shall make the correction at his own expense.

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 Contractor/Supplier of his responsibility for correct welding, electrodes and for minimizing distortion in the finished structure and piping systems.

Re-assembly, re-erection and re-installation of all transferred materials, equipment and its associated structures shall be carried out by skilled and qualified personnel and in accordance with the manufacturer's recommended instructions and standard engineering practice.

The layout/arrangement of all transferred and relocated mechanical equipment and associated auxiliaries shall be as shown on the bid drawings.



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Any transferred equipment which are not indicated in the drawings shall be installed by the Contractor/Supplier as directed by NPC.

The Contractor/Supplier shall submit for NPC's review and approval the erection schedule and program showing all the details prior to the erection/installations in accordance with the manufacturer's procedures and standards.

Final adjustments in the location of any other equipment, if necessary, shall be done in the field by the Contractor/Supplier during installation with prior approval of the NPC.

Special tools, devices and instruments specifically designed and manufactured for the components of transferred equipment shall be made available to the Contractor/Supplier by NPC. The Contractor/Supplier shall return the same in good condition after use who shall be responsible for their safekeeping. In case of failure to return the tools, instruments or devices and equipment, their value shall be debited to the Contractor/Supplier's account.

MW-5.7 Inspection and Field Tests

The installation/erection works shall be inspected by NPC field inspectors and will keep a strict compliance with the specification and approved drawings. The Contractor/Supplier shall keep a daily record of the activities done and see that the position, level, limits and other reference data are kept in proper order during the implementation works. The Contractor/Supplier shall give due notice to the NPO field inspectors in advance whenever such foundations are available for placement of equipment.

After installation of all the transferred equipment and its associated auxiliaries and accessories, NPC shall conduct test and commissioning with the assistance of the Contractor/Supplier.

MW-5.8 Defects and Damages

Defects and damages to the equipment including existing equipment and structures resulting from re-assembly, transport/shipment and installation works by the Contractor/Supplier shall be repaired/corrected and/or replaced at no cost to NPC.

MW-5.9 Technical Description of Transferred Equipment

The mechanical equipment/materials and its associated structures which shall be repacked, hauled, transported, assembled, installed, assistance to testing and commissioning by the Contractor/Supplier are enumerated and described in this section.

The Contractor/Supplier shall supply all equipment and materials which are damaged, missing or lacking in required quantity and those which are not suitable for use on the new site to make the system complete upon its installation in the new sites.

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Prior to submission of Bids, the Contractor/Supplier shall make a visual inspection of the plant and all equipment and materials to be transferred in coordination with NPC. It shall be the responsibility of the Contractor/Supplier to verify the specified weight and physical characteristics, make actual assessmers particularly on the quantity, physical conditions or appearance and dimensional requirements.

All necessary equipment, materials, and devices, although not listed and/or described herein but are parts of the plant and required for the safe and reliable operation of the plant, shall be included in the scope of works

MW-6.0 FUEL OIL SUPPLY AND TRANSFER SYSTEM

MW-6.1 General

This section provides the essential information for the Fuel Oil Storage and Transfer System Equipment and Accessories to be supplied, installed and tested by the Contractor/Supplier under the Balance-of-Plant (BOP). The system shall comprise of fuel oil unloading and transfer facilities including its associated equipment and accessories to complete the system requirements of the new plant site.

The work shall include the supply, installation and test of all the equipment specified below and other accessories even though not specifically mentioned in this specification or shown on the drawing but are necessary to obtain a complete set for the safe and reliable operation of the system as a whole.

- Four (4) sets of Fuel Oil Day Tanks with a capacity of 1.0 m³ each complete with manhole, inlet and outlet nozzles, nozzles for vent, overflow, drain and level gauge/switch, and structural supports;
- b) One (1) lot Fuel Oil Piping System complete with valves, strainers, pipe and fittings, gaskets, flanges, bolts and nuts, pipe supports and other required accessories to complete the piping systems for the fuel oil unloading, transfer of fuel oil from drums to day tanks, including four (4) double acting rotary hand pumps rated at 50 l/m and 10 m discharge head, day tanks to and from diesel gensets including fuel oil storage tank's overflow and drain to oil water separator, waste water/oil from powerhouse drain pit to oil water separator including necessary excavation, backfilling and asphalt jute application to embedded pipes.
- MW-6.2 Fuel Oil Storage Tank (Not Included)
- MW-6.3 Fuel Oil Unloading Pump (Not Included)



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MW-6.4 Fuel Day Tank

The fuel oil day tank shall have a minimum capacity of 1,000 liters and shall be shop-fabricated, all welded construction, rectangular shape and shall be designed and constructed in accordance with the requirements of applicable standards complete with manholes, inlet and outlet nozzles, nozzles for vent, overflow, drain and level gauge/switches. Included in the supply of fuel oil day tank are its structural steel supports with sufficient height as required by the diesel engine fuel system or as recommended by the engine manufacturer. 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 supply shall include all the necessary materials for fixing and installation.

The tank shall be provided with an interior and exterior coating. For internal surfaces, 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 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 DFT of intermediate chlorinated rubber shall be applied and 80 microns DFT chlorinated rubber topcoat as final coat. Refer to relevant Civil Works specifications and drawings for details of concrete foundation and supporting steel structures.

Inspection of welds shall be made by visual examination. Where visual inspection by the NPC inspector indicates unsatisfactory welds, acceptance or rejection shall be based on sectioning such areas by chipping with a mechanical round-nosed chipping tool.

Tank tightness shall be tested by filling the tank with water and inspected frequently during the filling operation. Filling of water shall be up to the point above the overflow nozzle. Traces of leakages shall be determined for at least one (1) day while the tank is filled with water.

Inspection of welds shall be made by visual examination. Where visual inspection by the NPC inspector indicates unsatisfactory welds, acceptance or rejection shall be based on sectioning such areas by chipping with a mechanical round-nosed chipping tool.

Tank tightness shall be tested by filling the tank with water and inspected frequently during the filling operation. Filling of water shall be up to the point above the overflow nozzle. Traces of leakages shall be determined for at least one (1) day while the tank is filled with water.

MW-6.5 Double Acting Rotary Hand Pump

The Supplier shall supply, deliver, install and test four (4) sets of double acting rotary hand (1 set to be installed per fuel day tank). The pump shall have a capacity of not less than 50 liters per minute @ 10 m discharge head and shall be used for the transfer of fuel oil to the fuel oil day tank from a fuel storage drum as necessary.



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The pump shall be heavy duty cast iron construction with brass internals fitted with easy clean wire screen, easy dispensing through anti-static neoprene rubber hose, with telescopic suction tube, adjusted to fit 50 mm diameter to 210 liters drum. Necessary fitting connections including flexible hose shall be provided. Flexible hose shall be oil resistant and made of synthetic rubber tube reinforced spiral-plied synthetic fabric with wire helix.

MW-6.6 Piping, Valves, Fittings and Accessories

MW-6.6.1 Scope of Work

The Supplier shall supply, install and test a complete Fuel Oil Transfer and Waste Oil/Water Piping System including pipe supports, fittings, necessary accessories, all required excavation and backfill of pipe trenches, painting and other necessary accessories as required and shown on the attached drawings.

The F. O. Transfer piping system shall consist of piping interconnections for a flexible hose at fuel rotary hand pump inlet, and from fuel oil day tanks to respective diesel engines.

Waste Oil/Water shall consist of piping interconnections from drain pits in the Generating sets' area to the oil-water separator as shown on the relevant works drawings.

MW-6.6.2 Piping

Fuel oil piping shall be constructed from ASTM A53 Gr. B, seamless pipe, schedule 40. All piping 65mm and larger shall be constructed with flanged joints or butt-welded joints and fittings. Piping 50mm and below shall be constructed with flanged joints or socket welded joints and fittings or otherwise permitted or approved by NPC.

Fuel oil piping in the fuel oil day tanks' area shall generally be installed above ground. All other fuel oil piping shall be installed either above ground or underground or as directed by NPC. Fuel piping installed underground shall generally 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 other corrosion protection method as approved by NPC. 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.

Waste oil/water piping shall be constructed of Unplasticized Polyvinyl Chloride (uPVC) pipe, schedule 80 or class 150, conforming to ASTM D-1784 or approved equivalent.

Unplasticized PVC pipe connection joints 80 mm (3") Ø and above shall be joined by rubber ring or solvent cement type connection in conformance with manufacturer's recommendation. Smaller sizes shall be of solvent cement type connection. Flanged connections shall be used for connecting to flanged surfaces or to flanged-ends valve and shall be of the same material with the connected pipe with a rating of class 150 or ANSI 150.



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The waste oil/water piping system shall generally be laid underground. All trenches shall be provided with a cushion pad of at least 100mm sand and sandy soil bedding materials. All pipeline excavations shall be backfilled up to the level of the finished grade surface in layers of 150 and each layer shall be thoroughly compacted. Backfill materials shall be compatible soil taken from trench excavation and approved by NPC.

All pipes that crosses roadways shall be provided with pipe sleeve made of steel material or RCP pipe to protect the pipe from various loads imposed by vehicles and shall extend 600mm beyond shoulder of each pavement side. Embedded pipes in open areas shall be laid not less than 300mm from the ground surface to the bottom of pipe.

PVC pipe installed aboveground or with associated isolation valve shall be properly supported to avoid pipe sagging. Pipe covering made of steel or metal shall be provided in case there is high risk of damaging the pipe during normal operation and maintenance.

All trench excavation and backfill works shall be done in accordance with pertinent provisions specified in the Civil Works Specifications.

MW-6.6.3 Valves

All gate or globe valves to be supplied shall be of the outside screw and yoke design or with rising stems. Valves body material shall be of cast iron for sizes more than 50mm diameter and cast bronze or stainless steel for 50mm and below. All valves shall have flanged ends with a rating of not less than Class 150. The use of screwed ends may be applied to 50 mm diameter subject to the approval of NPC. Check valves shall be of swing type.

MW-6.6.4 Strainers

Strainers shall be of basket type with cast iron body and flanged ends or as specified in the relevant specifications. Body drain and vent connections shall be included. Drain plugs shall be threaded. Screen elements shall be of stainless steel construction with minimum 32-mesh size or as shown on the drawings. Magnets shall be included to trap small iron and steel particles for use in fuel oil lines.

MW-6.6.5 Pressure Gauges

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.



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MW-6.6.7 Testing

The assembled piping and valves shall be hydrostatically tested at 1.5 times the design pressure for a minimum of 30 minutes. During the test, valves shall be opened and closed. Any leakage or any defect disclosed by the tests shall be corrected and repaired by the Supplier at his own expense to the satisfaction of NPC.

The assembled fuel oil piping system may be tested using a compressed air at a pressure of 1.25 times the operating pressure of the system and maintaining it for a minimum of 10 minutes, subject to the approval of NPC. Examination for leakage detected by soap bubble or equivalent method shall be made of all joints and connections. The piping system shall show no evidence of leaking. During initial pipe filling and trial operation of the fuel oil piping system, piping fittings and joints shall be visually inspected against leak.

There shall be no leakage whatsoever from the pipes, fittings and connections for each section tested while the system is under test pressure for the period of not less than thirty (30) minutes or the total time to inspect all portions of the waterline under test, whichever is longer. During the test, valves shall be opened and closed. Any leakage or any defect disclosed by the tests prior to the acceptance shall be corrected and repaired by the Supplier at his own expense to the satisfaction of NPC.

Before any test is made, the Supplier shall notify NPC in advance so that such test may be witnessed. All expenses that may be incurred during the tests shall be borne by the Supplier.

MW-6.6.8 Painting

All steel piping installed outdoors and indoors shall be primed coated with 80 microns DFT zinc rich epoxy paint and 80 microns DFT of chlorinated rubber for each intermediate and topcoat.

All steel pipes laid underground shall be applied with two (2) coats of coal tar epoxy polyamide of 170 microns DFT each coat and finally wrapped with 6mm thickness asphalt jute.

Painting for waste oil/water uPVC piping is not required unless otherwise directed by NPC.

Final color for Fuel Oil piping and associated valves installed above ground shall conform to Munsell No. 7.5R 3/12.



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MW-7.0 DOMESTIC WATER SUPPLY SYSTEM

MW-7.1 General

This section provides the essential information for the design, supply, installation, construction, test and commissioning of the complete Domestic Water Supply System to provide the water requirement including the required excavation and backfilling of pipe trenches.

The work shall include, but not limited to the following:

- a) One (1) lot of Drilling, Casing Installation, Well Development, Well Disinfection;
- b) One (1) set of Shallow Well Hand Pump complete with controls, instrumentation and necessary accessories;
- c) One (1) lot of Elevated Water Storage Tank complete with accessories;
 and
- d) One (1) lot of Piping, Valves, and Fittings including the required executation and backfill.

MW-7.2 Drilling, Developing and Testing of Deep Well

MW-7.2.1 General

The Contractor/Supplier shall furnish labor, materials, and equipment and perform all operations in connection with the drilling, placing of casing, development and disinfection of the deep well which shall be drilled to an appropriate size and depth.

Depth of well shall be approximately 15m or at a water level suitable for drinking purposes. The Contractor/Supplier shall be responsible for the geological/ground water study as to where the well will be drilled taking into consideration the location of the Elevated Water Storage Tank shown on the drawing.

MW-7.2.2 Drilling

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Drilling of the deep well shall be done by an appropriate method most suited to the conditions of the deep well site to be drilled. When necessary, temporary casing shall be used in sections in the hole through over burden or unstable materials to prevent casing-in of the well.

MW-7.2.3 Well Completion and Development

The Supplier shall develop the well by an appropriate method most suited for the conditions of the well site and placing ready for installation of the Jetmatic Hand Pump.



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The Supplier shall undertake all operations pertaining to completion and development of the well which shall consist of installation of casing, installing well screen in a sand and gravel formation, developing toe water bearing, surging and back washing.

All permanent casing materials shall be new. The well casing to be installed shall be 50mm Ø GI steel pipe, while the pump's suction pipe is 32mm Ø steel pipe conforming to ASTM A 53 seamless hot dip galvanized, schedule 40 pipe. Opening of the well screens shall have dimension to avoid the sediments to pass into the well and shall be designated to prevent clogging and shall be free from jogged edges, irregularities, etc. that will accelerate clogging or corrosion.

After the completion of well construction, the well shall be thoroughly cleaned of all foreign substances including tools, timbers, rope, debris of any kind, cement, oil, grease and scum. The casing pipe shall be thoroughly sabbed using alkalis, if necessary, to remove oil and grease.

Sterilization of the well is done by pouring a solution of 0.46 kg (1 pound) of calcium hypochlorite in 38 liters (10 gals) of water.

MW-7.2.4 Submittal

The Contractor/Supplier shall submit to NPC the complete installation details prior to start of works and the complete well-drawdown test results upon completion of the drilling.

MW-7.3 Pump

The scope of work shall cover the supply, delivery, installation at the well platform and test of two (2) units of shallow well hand pump complete with brass foot valve, stainless steel screen with 5mm Ø slots, associated valves, flanges, bolts, nuts and other accessories necessary for the safe and reliable operation of the domestic water supply system.

The shallow well hand pump shall have a minimum discharge capacity of $0.455\,$ m³/h (2 gpm) and capable of lifting water at a minimum depth of 7.6 m. The hand pump shall be reciprocating type and made of cast iron.

The pump shall be complete with necessary fittings and accessories to provide the safe and reliable operation of the pumping system.

The following documents shall be submitted by the Supplier for NPC's review and approval.

- Technical data, specifications and catalogues;
- Outline, assembly and installation drawings showing all the dimensions;
 and
- Operation and maintenance manuals



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MW-7.5 Water Storage Tank

The Supplier shall supply, deliver, install and test two (2) sets of water storage tank. The water storage tank shall have a minimum capacity of 600 liters and shall be of triple layer polyethylene type. The water storage tank shall be complete with manhole, inlet and outlet nozzles with valves, overflow pipe, strainer, drain nozzle with valve, level switch nozzle with plug (for future use), pipe supports, access ladder and supporting steel structures.

Tank foundation and supporting steel structures shall be in accordance with requirements of relevant Civil Works specifications and drawings.

MW-7.5 Piping, Valves and Fittings

Domestic water supply and distribution piping shall be constructed from Unplasticized Polyvinyl Chloride (*uPVC*) pipe, schedule 80 or class 150, conforming to ASTM D-1784 or approved equivalent.

Gate valves, 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. Check valves shall be of swing type, cast bronze and with screwed ends. Valves of all sizes shall have a rating of not less Class 150.

Garden hose connection valves or hose bibbs shall be of bronze material, 20mm size and outfitted with male thread hose connections.

MW-7.6 Testing

After installation of the equipment, the Supplier shall perform necessary tests at site to determine its compliance with the requirements of the specifications. All costs for testing shall be borne by the Supplier.

MW-7.6.1 Pumps

The pump shall be subjected to site tests to determine its conformance with the design and operating characteristics and shall be performed in accordance with the approved test procedures and applicable codes and standards.

MW-7.6.2 Water Storage Tank

Upon completion of the tank, it shall be filled with water at a proper pressure to fill the tank to the maximum water level. The water shall remain in the tank for at least twenty-four (24) hours after which observations for leaks and other defects shall be made.

All defects shall be corrected by the Supplier to the satisfaction of NPC before final acceptance of the work is made. Any leakage that is disclosed in the test shall be repaired by the Supplier.

All equipment and appurtenances necessary to carry out the tests and any repair, if required, shall be borne by the Supplier.



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MW-7.6.3 Domestic Water Supply Piping System

The piping system shall be hydrostatically tested at a pressure of 1.5 times the operating pressure of the system.

Tests may be applied to sections or the entire system. The test shall be made between valves and sections of not more than 305m (1000 ft) in accordance with the American Water Works Association (AWWA). There shall be no leakage whatsoever from the pipes, fittings and connections for each section tested while the system is under the test pressure for the period of not less than thirty (30) minutes of the total time to inspect all portions of the waterline under test, whichever is longer. During the test, valves shall be opened and closed. Any leakage or any defect disclosed by the tests prior to the acceptance shall be corrected and repaired by the Supplier at his own expense to the satisfaction of NPC.

Before any test is made, the Supplier shall notify NPC in advance so that such test may be witnessed. All expenses that may be incurred during the tests shall be borne by the Supplier.

MW-7.7 Disinfecting of Water Storage Tank and Domestic Water Piping System

The water corage tank and domestic water piping system shall be disinfected after testing and before being put into use. Before disinfections, the tank and piping should be drained, flushed, re-drained and refilled. In refilling, care must be taken to avoid entraining or entrapping air in the tank. The Supplier may use any of the methods of disinfections as recommended by the American Water Works Association (AWWA) or any of the following kinds of treatment:

- a) Chlorine Gas-Water Mixture:
- b) Calcium-Hypochlorite or equal; or
- c) Dry Calcium Hypochlorite or Chlorinated Lime and Water Mixture.

Retention period shall be at least 24 hours and shall produce not less than 10 ppm at extreme end of the lines at the end of the retention period. After flushing, residual chlorine must be reduced to less than 1 ppm.

MW-8.0 AIR CONDITIONING & VENTILATION SYSTEM

MW-8.1 General

The Contractor/Supplier shall furnish, deliver, install and test the ventilation and air conditioning system complete with all the necessary appurtenances for its efficient operation. The scope of supply shall include all mounting supports and fixing materials required to complete the installation and ready for operation.



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The unit shall be properly sized to conform to the required air changes per hour at free air for this particular application but in no case be less than those specified eisewhere in this specification. It shall be designed to continuously or intermittently operate on a 240 V, single phase, 60 Hz power supply, otherwise specified.

Refrigerant to be used shall be environment-friendly.

All necessary transformers and electrical materials shall be included in the Contractor/Supplier's supply if power ratings provided are other than the one's specified above.

MW-8.2 Design Conditions

a) Outdoor Conditions:

Dry Bulb Temperature : 35°C
Wet Bulb Temperature : 27°C
Relative Humidity : 80% to 100%.

b) Indoc: Conditions (for air-conditioned areas):

Dry Bulb Temperature : $24^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Relative Humidity : $50\% \pm 5\%$

- c) Areas to be air-conditioned shall be:
 - c.1 Control Rooms
- d) Areas to be ventilated shall be:

d.1 Comfort Rooms

10 air changes per hour

MW-8.3 Schedule of Equipment

a) Air-Conditioning Units

Location	Quantity	Cooling Load/Unit	Туре
Control Room	Two (2) units	7,000 kJ/hr	Inverter Window Type

b) Ventilation Units

Location	Quantity	Rating/Unit	Type
Comfort Room	Two (2) units	100 m³/hr	Wall Mounted Exhaust Fan



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MW-8.4 Air-conditioning System

MW-8.4.1 Scope of Work

The Work called for in this specification includes the design, furnishing, delivering, installing and testing of window type air conditioners (inverter type) to provide a fully ventilated and air conditioned rooms. The work shall include other accessories even though not specifically mentioned in this specification but are necessary to obtain a complete set for the safe and reliable operation of the system as a whole.

All electrical materials such as circuit breakers, automatic controls, including all power and control wires, supervision and electrical outlets shall be included and provided by the Contractor/Supplier including complete system of automatic temperature controls.

All air conditioning units to be supplied and installed shall have the following features/accessories but not limited to:

- With Remote Controller and Holder
- With automatic and manual swing louver control
- · With control switch
- Cool Mode
- Fan Mode
- Automatic Mode
- Gold or blue fin condenser

The type and quantity of air conditioning equipment to be supplied shall be as specified in Clause 7.3 (Schedule of Equipment) or shown on the drawings.

MW-8.5 Ventilation Units

MW-8.5.1 General

The Contractor/Supplier shall furnish, deliver, install and test the ventilation system equipment complete with all the necessary appurtenances for its efficient operation. The scope of supply shall include all mounting supports and fixing materials required to complete the installation and ready for operation.

The unit shall be properly sized to conform to the required air changes per hour at free air for this particular application but in no case be less than those specified elsewhere in this specification. It shall be designed to continuously or intermittently operate on a 230 V, single phase, 60 Hz power supply, otherwise specified.

MW-8.5.2 Wall Mounted Exhaust Fans

Thru-the-wall propeller exhaust fans shall be provided at the area as specified in the schedule of equipment.



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Each unit shall be properly sized to conform with the required air changes per hour at free air for this particular application but in no case be less than those specified elsewhere in this specification. Unit installed/mounted on the wall and directly discharges exhaust outside the building shall be provided with automatic shutter. It shall be of the direct driven type and corrosion resistant to operate on a 230 V, single phase, 60 Hz.

MW-8.6 Installation and Painting

The Wall Mounted Supply & Exhaust Fan and Air Conditioning Unit shall be installed as indicated in the drawings or as directed by NPC. After installation, all exposed and unfinished surfaces shall be thoroughly cleaned and washed possibly by chemical of all rust, oil and other foreign matters and shall be repainted in accordance with the manufacturer's standard or as approved by NPC.

Likewise, all surfaces and supports shall be thoroughly cleaned of rust, oil and other foreign matters and shall be painted with epoxy primer and two (2) coats of finish paint.

Painted surfaces of all equipment which are damaged during transport and installation shall be repaired or touched-up as necessary to prevent rusting, corrosion, etc. until the final finish painting application is made.

MW-8.7 Spare Parts

The Contractor/Supplier shall supply the standard spare parts for one (1) year operation or as recommended by the manufacturer. Spare parts required during the warranty period shall be supplied by the Contractor/Supplier at no Cost to NPC.

Special tools for normal operation and maintenance and are not usually available in a standard machine shop or retailing store shall also be provided as recommended by the manufacturer.

MW-8.8 Acceptance Test

Prior to acceptance of the Works, the equipment shall be tested in the presence of NPC to determine whether the requirements of the specifications have been met. Any defects found that are inherent in the equipment shall be remedied at the expense of the Contractor/Supplier.

MW-8.9 Submittals

Prior to purchase and implementation of the works, the Contractor/Supplier shall prepare and submit five (5) copies of the following drawings/documents for review/approval of NPC:

a) Dimensional layout drawings of mechanical equipment and associated devices.



SECTION VI - TECHNICAL SPECIFICATIONS

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- Manufacturer's catalog sheets, marked as necessary, to indicate materials or equipment being furnished including instruments for control system;
- Complete control schematic and wiring diagrams for all equipment to be furnished:
- d) List of recommended Spare Parts and Special Tools; and

MW-9.0 FIRE FIGHTING SYSTEM

MW-9.1 Scope of Work

The Supplier shall supply the specified number of Underwriter Laboratories/Factory Mutual approved Portable Type Fire Extinguishers complete and ready for operation and shall be installed at their corresponding place of use as specified in the particular specifications and as shown on the drawings.

a) Two (2) units of Portable Type Fire Extinguisher, Clean Agent (HCFC or Halotron I Type), 7.1 kg. (15.5 lbs), wall-hung type and UL/FM approved; and

MW-9.2 Fire Extinguisher

Fire extinguishers shall be Underwriter Laboratories and/or Factory Mutual approved and of rechargeable cylinder with five (5) years guarantee against leak. Each fire extinguisher cylinder shall be complete with release valve, dial gauge indicator, appropriate length of hose with nozzle and locking pin.

The 7.1 kg (15.5 lbs.) capacity wall-hung type fire extinguishers shall be complete with carrying handle and wall-mounting bracket.

Portable fire extinguishers shall be suitable for the protection against class ABC fires using Clean Agent (HydroChloroFluoroCarbon or Halotron I Type) that is environmentally safe and leaves no residue.

The fire extinguishers shall be check-weighed at interval of six (6) months from the date of delivery for a period of one (1) year and if found to be undercharged (unless used by an NPC personnel) shall be filled and recharged by the Supplier at no expense to NPC.

MW-9.3 Submittal

The Supplier shall submit the technical specifications/data and brochures/catalogs of the fire extinguishers for the approval of NPC prior to purchase.



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MW-10.0 MISCELLANEOUS TOOLS, EQUIPMENT AND MATERIALS TO BE SUPPLIED AND DELIVERED PER PLANT

The Contractor/Supplier shall supply, deliver and install the following equipment, materials and appurtenances which are necessary for the safe and reliable operation of the plant. All equipment and materials to be supplied shall be new and unused. The Contractor/Supplier/Supplier shall submit brochures/technical data prior to supply for approval of NPC. The equipment and materials shall be submitted with the Bid in a form specified in the Bid Form.

The materials listed below will be allocated and delivered to the plant site:

MW-10.1 Miscellaneous Tools (Per Plant)

	Tools	Q	ity.
<u> </u>	Hoist, hand chain, 2 tons capacity, 3 meters lift	1	Unit
•	Wrench, combination, 13 pcs/set	1	Set
-	Wrench, open, 8 pcs/set	1	Set
•	Wrench box, 7 pcs/set	1	Set
•	Wrench, socket, 17 pcs/set	1	Set
•	Wrench, adjustable, chrome vanadium steel, drop forged, fine polished, heavy duty, sizes: 8, 10 & 12"	1	Set
•	Wrench, pipe, forge steel, heavy duty, sizes: 12 & 14"	1	Set
•	Wrench, torque, 0-500 Nm	1	Pc
-	Plier, combination, sizes: 6, 7 & 8"	1	Set
•	Plier, long nose, sizes: 6 & 8"	1	Set
<u> </u>	Screw driver, 6 pcs/set	1	Set
•	Vise, size 6" swivel type, pre drilled holes for mounting	1	Pc
•	Caliper, digimatic, measuring range: 0-150mm, accuracy: +/- 0.02mm	1	Pc
•	Micrometer, outside deviation within: +/- 0.01 mm, heavy duty	1	Рс
•	Drill, Electric, 13mm hammer drill, 220 V, 60 Hz, 710 W, 3.2a, reversible, with hammer, lock-on button and kit box	1	Pc
•	Bit, drill, 70 pcs/set, includes 3 position ratcheting hand drive, brad point bits-wood, twist drill bits - motal/wood/plastic/masonry	1	Set
•	Grinder, angle, heavy duty, 220 V, 60 Hz, 750 W, 1200 rpm, single phase, variable speed	1	Set
•	Tester, Multi, Digital	1	Pc
•	Meter, Clamp, Digital	1	Pc
<u> </u>	Tester, Megger (0-1000)	1	Pc
_ •	Allen Wrench	1	Set
	Hammer - ball & claw (2 pcs each type)	1	Set

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	Tools	Qty.
. 1	Filter Wrench	1 Pc
•	Tongue & Grove Pliers (10")	1 Pc
-	Precision Screwdrivers (long type)	1 Set
•	Grease gun	1 Pc.
•	Locker Cabinet with 6 compartment with lock keys and ball rollers	1 Set
•	Tool box, heavy duty, 535mm x 250mm x 238 mm (or as required to contain all the standard/special and miscellaneous Tools)	1 Set
•	Other tools recommended by the Manufacturer	1 Lot

MW-10.2 Miscellaneous Equipment and Materials

Equipment/Material	Quantity		
a. Four Wheel Drum Truck (210 liter capacity)	1 pc		
b. Clock (10" diameter)			
c. Steel Cabinet locker, 90 x 45 x 140 cm galvalum materials	1 set		
d. Office Table and Chairs (Standard size table, 3 drawers with lock keys and 2 chairs with roller balls)	1 set		
e. Ear muff, fluid filled high attenuation	10 pcs.		
f. Lube Oil requirement (for the next lube oil change)	80 liters		
 g. Flash Light and head light with rechargeable AA battery, halogen bulb, 	1 set		
h. LED light Automatic Rechargeable Ernergency Light	1 set		
 i. Electricians First Aid Kit (Plastic case filled specifically to meet the needs of the electricians most common injuries – burns, eye irritations, cuts and insect hites) consists of the ff: 	1 set		
 Adhesive bandages, plastic 1 x 3 	16 pcs		
Burn Ointment 1/8 oz	6 pcs.		
Cold Pack, Instant	4 packs		
 Eye wash Solution, Eye pads & Strips 	7 pcs.		
Tweezers	4 pcs.		
Latex Gloves, Pair	1 box		
PVP lodine Wipes	10 pcs.		
Scissors, 4" blunt	1 pcs.		
Sting Kill Swabs	4 pack		
Triangular Bandage	4 pcs.		
First Aide Guide	1 set		
j. Diesel Fuel including plastic drum	800 liters		

SECTION VI - TECHNICAL SPECIFICATIONS

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Equipment/Material	Quantity
k. Hard Hat with NPC logo, white color	5 sets
Plastic table and 4-chair (monoblock)	1 set

MW-11.0 GUARANTEE

The Contractor/Supplier shall guarantee that he will repair, and/or replace, at his own expense, equipment and materials against defect in design, materials and workmanship for a period of twelve (12) months after the issuance of the Certificate of Completion. The Contractor/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.

MW-12.0 MEASUREMENT OF PAYMENT

Measurement of payment for all works shall be based on the bid price of each item as shown in the Bill of Quantities. The cost shall cover all works required and described in the pertinent provisions of the specifications.

Measurement of payment for pipes shall be based on the bid price of actual length of pipe installed as shown in the Bill of Quantities. The cost shall cover all works required including excavation, sand bedding, backfilling, testing, painting and other works and services described in the pertinent provisions of the specifications.



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SECTION VI

(PART II - TECHNICAL DATA SHEETS)

MW – MECHNICAL WORKS



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PART II – TECHNICAL DATA SHEETS MW – MECHANICAL WORKS

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M-2.2	Fuel Oil Day tank	VI-TDS(MW)-3
M-2.3	Exhaust Fan	VI-TDS(MW)-3
M-2.4	Airconditioning Unit	VI-TDS(MW)-3
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SECTION VI - TECHNICAL SPECIFICATIONS

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PART II - TECHNICAL DATA SHEETS

MW - MECHANICAL WORKS

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. NPC reserves the right to reject Bids without proper and/or specific data and information as required herein.
- 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.

Name & Signature	of Representa	tive	Designation
•	Name & Signature	Name & Signature of Represental	Name & Signature of Representative



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M-1.0 EQUIPMENT/GENSETS TO BE TRANSFERRED

ITEM NO.	DESCRIPTION	NPC REQUIREMENTS	CONTRACTOR'S VERIFIED DATA
M-1.1	FOR CALUTCOT DPP		
M-1.1a	SAONON Modular GenSet and its Accessories	50 kW GENSET (2 UNITS) Model : \$100EP\$6(\$) Engine : 1104A-44TG2 (Perkins) Alternator : UC1224D (Stamford) Rating : 480 V, 3Ø Dimension (m): 2.3 x 1.133 x 1.376 Weight : 1,597 kg.	
M-1.1b	One (1) lot of Spare Parts and Tools	500 kg	
M-1.2	FOR BUTAWANAN DPP		
	SAONON Modular GenSet and its Accessories	50 kW GENSET (1 UNIT) Model : \$100EP\$6(\$) Engine : 1104A-44TG2 (Perkins) Alternator : UC1224D (Stamford) Rating : 480 V, 3Ø Dim (m): 2.3 x 1.133 x 1.376 Weight : 1,597 kg.	
		30 kW GENSET (1 UNIT) Model: S60EP6 (S) Engine: 1104A-44TG1 (Perkins) Alternator: Pl144G (Stamford) Rating: 480 V, 3Ø Dim (m): 2.3 x 1.133 x 1.376 m Weight: 1,484 kg.	
M-1.2b	One (1) lot of Spare Parts and Tools	500 kg	

Name of Firm	Name & Signature of Representative	Designation
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M-2.0 EQUIPMENT TO BE SUPPLIED, INSTALLED AND TESTED BY THE CONTRACTOR

ITEM	DESCRIPTION	UNIT	NPC REQUIREMENT	CONTRACTOR'S DATA
MW-2.2	DOMESTIC WATER SUPP	LY		
MW-2.2.1	WATER STORAGE TANK			
MW-2.2.1a	Manufacturer/Fabricator		By Contractor	
MW-2.2.1b	Capacity (Nominal)	liters	600	
MW-2.2.1c	Design Code		By Contractor	
MW-2.2.1d	Quantity	Sets	Two (2)	·
MW-2.2.1e	Empty Weight	kg	By Contractor	
MW-2.2.1f	Operating Weight	kg	By Contractor	
MW-2:2.1g	Size (diameter x height x thickness)	m x m x m	By Contractor	
MW-2.2.1h	Materials of Construction		Triple Layer Polyethylene	
MW-2.2.1i	Paint Specifications (if applicable:		Per Specifications	
MW-2.2.1j	Structurals Supports		By Contractor	
MW-2.2,2	JETMATIC HAND PUMP			
MW-2.2.2a	Manufacturer		By Contractor	
MW-2.2.2b	Place of Manufacture	-	By Contractor	
MW-2.2.2c	Quantity	Sets	Two (2)	
MW-2.2.2d	Туре		Reciprocating	
MW-2.2.2e	Pump Capacity	GPM	2	
MW-2:2.2g	Materials:			
	Body	1	By Contractor	
Į	Foot Valve		Brass	
	Suction Screen/Strainer	<u> </u>	Stainless Steel	

Name of Firm	Name & Signature of Representative	Designation
		-



M-2.0 EQUIPMENT TO BE SUPPLIED, INSTALLED AND TESTED BY THE CONTRACTOR (Cont'd...)

ITEM	DESCRIPTION	UNIT	NPC REQUIREMENT	CONTRACTOR'S DATA
2.3	FUEL OIL DAY TANK			
2.3,1	Manufacturer		By Contractor	
2.3.2	Model		By Contractor	
2.3.3	Fuel Day Tank Capacity	m ³	1	
2.3.4	Fuel Day Tank Type (Elevated)		Rectangular or Approved Shape	
2.3.5	Fuel Tank Dimensions (W x L x H)	m	By Supplier	
2.3.6	Fuel Tank Plate Material	ASTM	A 36	
2.3.7	Fuel Tank Shell Thickness	mm	5	
2.3.8	Structural Steel Supports		Included	
2.4	EXHAUST FAN			
2.4.1	Manufacturer		By Contractor	
2.4.2	Model		By Contractor	
•	a.1) Air Flow	m³/hr	100 (minimum)	
	a.2) Quantity	set	2	
	a.3) Type		Wall Mounted	·
	a.4) Dimensions (W x D x H)	mm	By Contractor	
	a.5) Power Consumption	kW	By Contractor	,,,,
	a.6) Electrical Ratings	V/Ph/Hz	220/1/60	
2.5	AIRCONDITIONING UNIT			
2.5,1	Manufacturer	"	By Contractor	
2.5.1	Model		By Contractor	· ·
_	a.1) Cooling Capacity	kJ/hr	7,000 minimum	· · · · · · · · · · · · · · · · · · ·
	a.2) Quantity	sets	2	
'. ·	а.3) Туре		Window Type (Inverter)	
	a.4) Dimensions (W x D x H)	mm	By Contractor	
	a.5) Power Consumption	kW	By Contractor	
	a.6) Refrigerant type		By Contractor	
<u> </u>	a.7) Weight	kg	By Contractor	
2.6	PORTABLE FIRE EXTINGUISH	ER		
2.6.1	Manufacturer		By Contractor	,
2.6.2	Туре		HCFC or Halotron I, Wall Hung	
2.6.3	Quantity	sets	4	
2.6.4	Capacity	kg	7.1	
2.6.5	Approving Authority		UL/FM	

Name of Firm	Name & Signature	of Representative	Designation
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SECTION VII

BILL OF QUANTITIES

SECTION VII

BILL OF QUANTITIES (CIVIL WORKS)

SECTION VII - BILL OF QUANTITIES

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ARCHITECTURAL WORKS (2x50kW CALUTCOT DPP)

Item	Description of Work	Work to	ALGIGGI DITT		T-2 :: . T	11 1. K. T. T. T.	
No.	or Materials	Be Done	Reference	Unit	Estimate d	Unit Price in Pesos (Words and Figures)	Total Amount (In Figures)
-AW-1.0	Prefabricated Container House						
	Prefabricated Container House including Installation Works:						
	Dimensions: 6m length x 2.4m width x 2.6m height	install &	Refer to NPC	lot	1.00		
	Flooring: Magnesium board with linoleum finish	construct	TS & Drawing			(P)	(P
	Walls: 50mm polystyrene insulation with double sided 0.45mm						
	pre-painted GI sheet						
	Roofing: Glasswool insulation with pre-painted GI sheet roof and						
	interior ceiling						
	Windows: 3 pcs aluminum frame sliding windows, 1 pc aluminum awning window						
	Door: 2 pcs. Steel door and 1 pc. aluminum frame door with						
	double sided insulated G.I. sheet with 50mm polystyrene						
	insulation (2.10m x 0.60m)						
	Additional: toilet (1.2x1.2) including fixtures & plumbing						
	what oo a plantag						
	SUB-TOTAL AMOUNT OF BID (ARCHITECTURAL WORKS)						
						(P)	(P

Name of Firm

Name and Signature of Authorized Representative



BID DOCUMENTS

SECTION VII - BILL OF QUANTITIES

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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ARCHITECTURAL WORKS (1x50 & 1x30kW BUTAWANAN DPP)

Itam No.	Description of Work or Materials	Work to Be Done	Reference	Unit	Estimate	Unit Price in Pesos (Words and Figures)	Total Amount (In Figures)
AW-1.0	Prefabricated Container House Prefabricated Container House including Installation Works: Dimensions: 6m length x 2.4m width x 2.6m height Flooring: Magnesium board with linoleum finish Walls: 50mm polystyrene insulation with double sided 0.45mm pre-painted GI sheet Roofing: Glasswool insulation with pre-painted GI sheet roof and interior ceiling Windows: 3 pcs aluminum frame sliding windows, 1 pc aluminum awning window Door: 2 pcs. Steel door and 1 pc. aluminum frame door with double sided insulated G.I. sheet with 50mm polystyrene insulation (2.10m x 0.60m) Additional: toilet (1.2x1.2) including fixtures & plumbing	instatl & construct	Refer to NPC TS & Drawing	lot	1.00	(P)	(P
	SUB-TOTAL AMOUNT OF BID (ARCHITECTURAL WORKS)					(P)	(P

Name and Signature of Authorized Representative



SECTION VII - BILL OF QUANTITIES

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CIVIL WORKS
(2x50kW CALUTCOT DPP)

No.	Description of Work or Materials	Work to Be Done	Reference	Unit	Estimate	Unit Price In Pesos (Words and Figures)	Total Amount (In Figures)
CW-1.1	SITE DEVELOPMENT Clearing and Grubbing Drainage System and Appurtenant Structures	clear, cut & dispose	Refer to NPC	lot	1.00	(P)	(P)
	a. Open RC Canal	furnish & construct	Refer to NPC TS & Drawing	H.m.	220.00	(P)	(P)
	b. Septic Tank (ST)	furnish & construct	Refer to NPC TS & Drawing	pc.	1.00	(P)	(P)
	c. Oil-Water Separator	furnish & construct	Refer to NPC TS & Drawing	pc.	1.00	(P)	(P)
	d. Drain Pit (DP)	furnish & construct	Refer to NPC TS & Drawing	pcs.	2.00	(P)	(P)
	e. Catch Basin (CB)	furnish & construct	Refer to NPC TS & Drawing	pcs.	1.00		,
	f. 100 mm dla, uPVC	furnish & install	Refer to NPC TS & Drawing	II.m.	14.00	(P)	(P)
	Perimeter Fence (including vehicular & pedestrian gates, wall footing, barbed wires, pedestal painting & other accessories)	furnish & construct	Refer to NPC TS & Drawing	li.m.	225.00	(P)	(P)
	Concrete Walk (including excavation & bedding)	furnish & place	Refer to NPC TS & Drawing	cu.m	6.00	(P)	(P)

Name	- 2	-	
Nama	n,	ы	***

Name and Signature of Authorized Representative



SECTION VII - BILL, OF QUANTITIES

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CIVIL WORKS (2x50kW CALUTCOT DPP)

ltem	Description of Work		OICOI DEF				_
No.	or Materials	Work to Be Done	Reference	Unit	Estimate d	Unit Price in Pesos (Words and Figures)	Total Amount (in Figures)
CW-1.5	Other Appurtenances						(
	Flag Pole (FP) (including GI Pipe, cleats, painting, foundation & accessories)	furnish & construct	Refer to NPC TS & Drawing	iot	1.00	(P)	(P)
	b. Perimeter Lighting Pole Foundation (PL) (inc. excavation, bedding & backfill)	furnish & construct	Refer to NPC TS & Drawing	pcs.	5.00	(P)	(P)
CW-2.0	OTHER STRUCTURES AND FACILITIES						
CW-2.1	Prefab Container House Foundation						
	a. Structural Excavation	excavate & reuse	Refer to NPC TS & Drawing	cu.m.	5.00	(P)	(P)
	b. Structural Backfill	spread, level & compact	Refer to NPC TS & Drawing	cu.m.	2.00	(P)	(P)
	c. Sand and Gravel Bedding	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m.	0.50	(P)	(P)
	d. Concrete (20.7 Mpa)	furnish & place	Refer to NPC TS & Drawing	cu.m.	2.00	(P)	(P)
	e. Reinforcing Steel Bars (Grade 275)	furnish, cut, bend schedule & install	Refer to NPC TS & Drawing	kgs.	80.00	(P)	(P)
	f. Structural Steel (A36) (Including base plate & anchor botts)	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	kgs.	35.00	(P)	(P)
CW-2.3	2x50kW Genset Foundation Pad	design and construct	Refer to NPC TS & Drawing	units	2.00		(P)

Name of Firm

Name and Signature of Authorized Representative





SECTION VII - BILL OF QUANTITIES

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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CIVIL WORKS

Item	Description of Work		LUTCOT DPP)		_		
No.	or Materials	Work to Be Done	Reference	Unit	Estimate	Unit Price in Pesos (Words and Figures)	Total Amount (In Figures)
CW-2,4	Water Tank Steel Support				<u> </u>	(visite vigate)	(m.c.i8mas)
	a. Structural Excavation	excavate,stockpile & reuse	Refer to NPC TS & Drawing	cu.m,	0.50	(P)	(P
	b. Structural Backfill	spread, level & compact	Refer to NPC TS & Drawing	cu.m.	0.03		(P
	c. Sand and Gravel Bedding	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m.	0.07		(P
	d. Concrete (20.7 Mpa)	furnish & place	Refer to NPC TS & Drawing	cu.m.	0.20	(P)	(P
	e. Reinforcing Steel Bars (Grade 275)	furnish, cut, bend schedule & install	Refer to NPC TS & Drawing	kgs.	24.00	(P)	(P
	f. Structural Steel (A36) (Including base plate)	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	kgs.	115.00	(P)	(P
	g.12 dia. x 75mm Dynabolt Stainless Steel	furnish & install	Refer to NPC TS & Drawing	pcs	16.00	(P)	(P_
CW-2.5	Day Tank Steel Support (2pc)						
	a. Structural Excavation	excavate,stockpile & reuse	Refer to NPC TS & Drawing	cu.m.	0.60	(P)	(P
	b. Structural Backfill	spread, level & compact	Refer to NPC TS & Drawing	cu.m.	0.20		(P
	c. Sand and Gravel Bedding	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m.	0.20	(P)	(P
	d. Concrete (20.7 Mpa)	furnish & place	Refer to NPC TS & Drawing	cu.m.	0.40	(P)	(P_

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SECTION VII - BILL OF QUANTITIES

LuzP21Z1311Sc

CIVIL WORKS
(2x50kW CALUTCOT DPP)

item	Description of Work	Work to	LUTCOT DPP)		I Callmate 1	11-14 0-1	
No.	or Materials	Be Done	Reference	Unit	Estimate d	Unit Price in Pesos (Words and Figures)	Total Amount (in Figures)
	e. Reinforcing Steel Bars (Grade 275)	furnish, cut, bend schedule & install	Refer to NPC TS & Drawing	kgs.	46.00	(P)	(III FIGS165)
	f. Structural Steel (A36) (Including base plate)	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	kgs.	144.00	(P)	(P
	g. 12 dia. x 75mm Dynabolt Stainless Steel	furnish & install	Refer to NPC TS & Drawing	pcs	32.00	(P)	(P
V-2.7	Switchyard Appurtenances:						
	Seclusion Fence including gate, concrete post, CHB wall, excavation, fill & 50mm dia. uPVC Pipe Weep Holes.	furnish & construct	Refer to NPC TS & Drawing	l.m	45.00	(P)	(P_
	b. Gravel Surfacing (150mm thick)	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m	13.00	(P)	(P
	c. 50mm dia. uPVC Pipe Weep Holes;	furnish & Install	Refer to NPC TS & Drawing	l.m	13.00	(P) _	(P
	d. Transformer pad foundation for 1x75kVA (including excavation, bedding, gravel surfacing, and anchor bolts)	design and construct	Refer to NPC TS & Drawing	บกits	2.00	(P)	(P
V-2.B	Take-off Structures						
	a. 4 - 30 Ft Steel Pole (including excavation & backfill)	fumish & erect	Refer to NPC TS & Drawing	p¢.	4.00)	(P
	b. 2 - 25 Ft Steel Pole (including excavation & backfill)	furnish & erect	Refer to NPC TS & Drawing	pc.	2.00	(P)	(P
	c. Steel Crossarms, Braces etc.	furnish & install	Refer to NPC TS & Drawing	lot	1.00	(P)	(P
	SUB-TOTAL AMOUNT OF BID (CIVIL WORKS)					(P)	(P
ame	of Firm						,,
		Name and Signature of A	uthorized Represe	ntative			Designa

SECTION VII - BILL OF QUANTITIES

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

LuzP21Z1311Sc

CIVIL WORKS

Item No.	Description of Work or Materials	(1x50 & 1x30kW B Work to Be Done	Reference	Unit	Estimate	Unit Price in Pesos	Total Amount
CW-1.0	SITE DEVELOPMENT			-		(Words and Figures)	(in Figures)
CW-1.1	Clearing and Grubbing	clear, cut & dispose	Refer to NPC	lot	1.00		
CW-1.2	Drainage System and Appurtenant Structures					(P)	(P
	a. Open RC Canal	furnish & construct	Refer to NPC TS & Drawing	li.m.	235.00	(P)	(P
	b. Septic Tank (ST)	furnish & construct	Refer to NPC TS & Drawing	pc.	1.00	(P)	(P
	c. Oil-Water Separator	furnish & construct	Refer to NPC TS & Drawing	pc.	1.00	(P)	(P
	d. Drain Pit (DP)	furnish & construct	Refer to NPC TS & Drawing	pcs.	2.00	(P)	(P
	e. Catch Basin (CB)	furnish & construct	Refer to NPC TS & Drawing	pcs.	1.00		
	f. 100 mm dia. uPVC	furnish & install	Refer to NPC TS & Drawing	li.m.	14.00	(P)	(P)
	Perimeter Fence (Including vehicular & pedestrian gates, wall footing, barbed wires, pedestal painting & other accessories)	furnish & construct	Refer to NPC TS & Drawing	li.m.	240.00		(P)
	Concrete Walk (including excavation & bedding)	furnish & place	Refer to NPC TS & Drawing	CU.M	7.00	(P)	(P)

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SECTION VII - BILL OF QUANTITIES

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CIVIL WORKS
(1x50 & 1x30kW BUTAWANAN DPP)

		- (INDO OF INDOVER D	A IVIIVIIVII AL	r,			
item No.	Description of Work or Materials	Work to Be Done	Reference	Unit	Estimate	Unit Price in Pesos (Words and Figures)	Total Amount (in Figures)
CW-1.5	Other Appurtenances	<u> </u>					111111111111111111111111111111111111111
	Plag Pole (FP) (including GI Pipe, cleats, painting, foundation & accessories)	furnish & construct	Refer to NPC TS & Drawing	lot	1.00	(P)	(P)
	b. Perimeter Lighting Pole Foundation (PL) (Inc. excavation, bedding & backfill)	furnish & construct	Refer to NPC TS & Drawing	pcs.	4.00	(P)	(P)
CW-2.0	OTHER STRUCTURES AND FACILITIES						
CW-2.1	Prefab Container House Foundation						
	a. Structural Excavation	excavate & reuse	Refer to NPC TS & Drawing	cu.m.	5.00	(P)	(P)
	b. Structural Backfill	spread, level & compact	Refer to NPC TS & Drawing	cu.m.	2.00	(P)	(P)
	c. Sand and Gravel Bedding	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m.	0.50	(P)	(P)
	d. Concrete (20.7 Mpa)	furnish & place	Refer to NPC TS & Drawing	cu.m.	2.00	(P)	(P)
	e. Reinforcing Steel Bars (Grade 275)	furnish, cut, bend schedule & install	Refer to NPC TS & Drawing	kgs.	80.00	(P)	(P)
	f. Structural Steel (A36) (Including base plate & anchor bolts)	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	kgs.	35.00	(P)	(P)
CW-2.2	1x50 and 1x30kW Genset Foundation Pad	design and construct	Refer to NPC TS & Drawing	បរាit\$	2.00	(P)	(P)

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SECTION VII - BILL OF QUANTITIES

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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CIVIL WORKS (1x50 & 1x30kW BUTAWANAN DPP)

No.	Description of Work or Materials	Work to Be Done	Reference	Unit	Estimate d	Unit Price in Pesos (Words and Figures)	Total Amount (in Figures)
CW-2.3	Water Tank Steel Support		· _ ·	•			<u> </u>
	a. Structural Excavation	excavate,stockpile & reuse	Refer to NPC TS & Drawing	cu.m.	0.50	(P)	(P
	b. Structural Backfill	spread, level & compact	Refer to NPC TS & Drawing	cu.m.	0.03	(P)	(P
	c. Sand and Gravel Bedding	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m.	0.07	(P)	(P
	d. Concrete (20.7 Mpa)	furnish & place	Refer to NPC TS & Drawing	cu.m.	0.20	(P)	(P
	e. Reinforcing Steel Bars (Grade 275)	furnish, cut, bend schedule & install	Refer to NPC TS & Drawing	kgs.	24.00	(P)	(P
	f. Structural Steel (A36) (Including base plate)	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	kgs.	115.00	(P)	(P
	g.12 dia. x 75mm Dynabolt Stainless Steel	furnish & install	Refer to NPC TS & Drawing	pcs	16.00	(P)	(P
CW-2.4	Day Tank Steel Support (2pc)						
	a. Structural Excavation	excavate,stockpile & reuse	Refer to NPC TS & Drawing	cu.m.	0.60	(P)	(P
	b. Structural Backfill	spread, level & compact	Refer to NPC TS & Drawing	cu.m.	0.20	(P)	(P
	c. Sand and Gravel Bedding	furnish, place level & compact	Refer to NPC TS & Drawing	cu.m.	0.20	(P)	(P
	d. Concrete (20.7 Mpa)	furnish & place	Refer to NPC TS & Drawing	cu.m.	0.40	(P)	(P

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SECTION VII - BILL OF QUANTITIES

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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CIVIL WORKS
(1x50 & 1x30kW BUTAWANAN DPP)

No.	Description of Work or Materials	Work to Be Done	Reference	Unit	Estimate d	Unit Price in Pasos (Words and Figures)	Total Amount (In Figures)
	e. Reinforcing Steel Bars (Grade 275)	furnish, cut, bend schedule & install	Refer to NPC TS & Drawing	kgs.	46.00	(P)	(nr rigures)
	f. Structural Steel (A36) (Including base plate)	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	kgs.	144.00	(P)	(P
	g. 12 dia. x 75mm Expansionbolt Stainless Steel	furnish & install	Refer to NPC TS & Drawing	pcs	32.00	(P)	(P
W-2.5	Switchyard Appurtenances:						
	a. Seclusion Fence including gate, concrete post, CHB wall, excavation, fill & 50mm dia, uPVC Pipe Weep Holes.	furnish, fabricate assemble & install	Refer to NPC TS & Drawing	l.m	45.00	(P)	(P
	b. Gravel Surfacing (150mm thick)	spread, level & compact	Refer to NPC TS & Drawing	cu.m	13.00	(P)	(P
	c. 50mm dia. uPVC Pipe Weep Holes;	furnish & install	Refer to NPC TS & Drawing	l.m	13.00	(P)	(P
	d. Transformer pad foundation for 1x75kVA & 1x50kVA (including anchor bolts)	design and construct	Refer to NPC TS & Drawing	units	2.00	(P)	(P
V-2.6	Take-off Structures						-
	a. 4-30 Ft Steel Pole (including excavation & backfill)	fumish & erect	Refer to NPC TS & Drawing	pc.	4.00	(P)	(P
	b. 2 - 25 Ft Steel Pole (including excavation & backfill)	furnish & erect	Refer to NPC TS & Drawing	pc.	2.00	(P)	(P
	c. Steel Crossarms, Braces etc.	furnish & install	Refer to NPC TS & Drawing	lot	1.00	(P)	(P
	SUB-TOTAL AMOUNT OF BID (CIVIL WORKS)						
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SECTION VII

BILL OF QUANTITIES (ELECTRICAL WORKS)



SECTION VII - BILL OF QUANTITIES

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ltem No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pasos (Words and Figures)	Total Amount
A.	EQUIPMENT & MATERIALS TO BE FURNISHED BY THE CONTRACTOR						1 Patrount
1.0	 a. 2/0 AWG, 15kV, ACSR b. 1/0 AWG, 15kV, ACSR c. 7/16"Ø High strength grade steel galvanized guy wire d. 3/8"Ø High grade steel galvanized OHGW e. Lightning rod f. Line Hardwares such as tee-connectors, turnbuckle, insulators, termination kit, including sealant, ground clamp, cable/conduit support, etc. 	Furnish, Lay, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
2.0	Power Control and Instrumentation Cables including Terminal Lugs, Connectors, Cable Ties, Identification Tags, Etc	Furnish, Lay and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P	
	 a. 30 mm², 15kV, Crosslink-Polyethylene (XLPE) Power Cable Copper Conductor b. 30 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor c. 4- 4c x 2.0 mm2, 600 V, (Royal Chord) Copper Conductor 						
Nan	ne of Firm Name and	Signature of Authoriz	ed Representativ	ve			Designation '

SECTION VII - BILL OF QUANTITIES

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No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
3.0	Grounding System						
3.1	Grounding Grid Copper Conductor 100 mm ² , soft drawn bare copper conductor	Furnish, Lay, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
3.2	 Bonding Copper Conductor a. 100 mm², copper conductor b. 50 mm², copper conductor c. 22 mm², copper conductor 	Furnish, Lay, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
3.3	Weld Metal Powder for Powder Connection including Molder and Holder, Etc.	Furnish and Install	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
3.4	Grounding Rod (3m x 19mm dia.) Copper Bonded	Furnish and Install	EW-TS, TDS & Bid Dwg.	pcs	16	(P)P
3.5	Grounding Test Pit	Furnish and Install	EW-TS, TDS & Bid Dwg.	set	1	(P	.)P
3.6	Grounding Accessories such as Cable Terminals, Lugs, Etc.	Furnish and Install	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
Nar	me of Firm Name an	nd Signature of Authoriz	zed Representati	ve			esignation

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item No.		Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total
4.0	Ele	ectrical Services and Accessories				doanuty	(storing and Lighter)	Amount
4.1	Lig	hting Fixtures						
	a,	Fixture Type A (1 x 9 W Compact LED Lamp Lighting Fixture)	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	3	(P)	٩
	b.	Fixture Type B 2 x 9 Watts cool white high output ballast-bypass LED Lamp Tube Luminaires	Furnish, Instali Typı and Test	EW-TS, TDS & Bid Dwg.	set(s)	1 -	(P)	P
		Fixture Type C (Portable Emergency Light, 2 x 2 W LED with built battery and Battery Charger)	Furnish, Install in and Test	EW-TS, TDS & Bid Dwg.	set(s)	1 _	(P)	P
		Fixture Type D (50W LED Flood Light with clear Tempered Glass Cooling Fins)	Furnish, Install anc and Test	EW-TS, TDS & Bid Dwg.	sel(s)	3 _	(P)	P
	е.	Fixture Type E (30W LED Perimeter Lighting Fixture)	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	5 _ -	(P)I	·
		of Firm Name	and Signature of Authoriz					

BIO DOCUMENTS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VII - BILL OF QUANTITIES

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item No,		Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total
	f.	Fixture Type F 1 x 30 W LED Flood Light with Clear Tempered Glass and Cooling Fins	Fumish, Install and Test	EW-TS, TDS & Bid Dwg.	sel(s)	5		Amount P
4.2	Ot Flu	utlets and Switches Including Plate Cover, ush-mounted, Grounding Type						
	a.	Convenience Outlet, Duplex with Cover, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	sets	1	(P)	P
	b.	Convenience Outlet, Duplex, Weatherproof type with Cover, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	sets	3	(P)	P
	C.	Outlet for Emergency Lighting Fixture, Single Receptacle, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	sets	1	(P)	P
	d.	Outlet for Exhaust Fan, Single Receptacle, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW•TS, TDS & Bid Dwg.	sets	1	(P)	P
	a.	50AF/20AT, 2 Pole, Enclosed Circuit Breaker with built-in universal outlet	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	1	(P)	P

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SECTION VII - BILL OF QUANTITIES

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Item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price In Pesos (Words and Figures)	Total Amount
	e. Single Pole Wall Switch, 10 A, 230 V	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	sets	1	(P	
	f. Duplex Wall Switch, 10 A, 230 V	Furnish, Install and Test	EW-TS, TDS & Bid Dwg,	sets	2	(P)P
	g. Triplex Wall Switch, 10 A, 230 V	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set	2	(P)P
	h. Boxes, Fittings, and Accessories	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P	
4.3	Panelboard and Breakers						
	 a. 240V, 1-Phase, Main Distribution Panelboard 250AF/100AT, 2-Pole Main MCCB with branch circuits 1 - 50AF/50AT, 2-Pole, MCB 6 - 50AF/20AT, 2-Pole, MCB 3 - 50AF/15AT, 2-Pole, MCB 	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	1	(P	_)P
4.4	600V, Lighting and Power Cables	Furnish, Lay and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
Nai	me of Firm Name and	Signature of Authori	zed Representat				Designation

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item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	 a. 30 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor b. 8.0 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor c. 3.5 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor 						- Amount
5.0	Conduit System						
5.1	Electrical Conduit including Locknuts, Washer, Elbows and Other Fittings a. 110 mmØ uPVC b. 40 mm dia. uPVC c. 32 mm dia. uPVC d. 25 mm dia. uPVC e. 20 mm dia. uPVC f. Boxes, Locknuts, Elbows, and other Fittings	Furnish and Install	EW-TS, TDS & Bid Dwg.	lot	1	(P)	P
6.0	Tools and Spare Parts						
	 a. 90AT, 600V Rated Molded Case Circuit Breaker, 3-Ph, 60Hz 	Furnish	EW-TS & TDS	set(s)	1 .	(P)	P
Nam	e of Firm Name and	d Signature of Authoriz	ed Representati	v e	•	De:	signation

SECTION VII - BILL OF QUANTITIES

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Item No.		Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
		Telescopic Hot Stick with Tip Lock Features, 35 ft., 8 Sections, Epoxyglass	Furnish	EW-TS & TDS	set	1	(P)P
		Lineman's Rubber Gloves, maximum usage: 17,000 Volts Size 14"	Furnish	EW-TS & TDS	pairs	2	(P)P
		Lineman's Belt, Max. Length:42", Minimum Length: 34", D-to-D distance:56 cm, Center Hole:38"	Furnish	EW-TS & TDS	set	1	(P)P
		Positioning Strap, Nylon, Maximum Length:2.0m Minimum Length: 1.3m, Adjustable Range: 0.7m	Furnish	EW-TS & TDS	set	1	(P)P
		Heavy Duty Hard Hat with NPC Logo & strap (Safety Standard Compliant)	Furnish	EW-TS & TDS	sets	3	(P)P
7.0	Job	Site Cameras						
		Construction Cameras (2 Sets), complete with the required accessories and peripherals	Furnish, Install and Test	EW-TS & TDS	set(s)	2	(P)P
	b.	32Gb SDHC Memory Cards	Furnish, Install and Test	EW-TS & TDS	set(s)	2	(P)P

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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VII - BILL OF QUANTITIES

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item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	c. 2850mAh, 1.5V, AA Size Alkaline Batteries	Furnish, Install and Test	EW-TS & TDS	set(s)	4	(P)P
	d. Spare 32GB SDHC Memory Cards	Furnish, Install and Test	EW-TS & TDS	set(s)	2	(P)P
	e. Spare 2850mAh, 1.5V, AA Size Alkaline Batteries	Furnish, Install and Test	EW-TS & TDS	set(s)	16	(P)P
8.0	13.8 kV Switchyard and Appurtenances						
8.1	Automatic Circuit Recloser, 800 A, 60 Hz, 15 kV 12 kA Symmetrical Fault Current	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)P
8.2	15 kV, 100 A, 10 kA, Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link (10A), brackets and accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	3	(P	ĴΡ
8.3	15 kV, 100 A, 10 kA, Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link (3A), brackets and accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	6	(P)P

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SECTION VII - BILL OF QUANTITIES

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ELECTRICAL WORKS CALUTCOT DIESEL POWER PLANT (2x50kW)

Item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
8.4	15 kV, 100 A, 10 kA, Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link (2A), brackets and accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)P
8.5	Kilowatt-Hour Demand Meter						
	13.8 kV, Three-Phase Kilowatt-hour meter and associated Instrument Transformer and Accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)P
	b. 240V, Single-phase Kilowatt-hour Demand Meter	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P	ĵР
В.	EXISTING EQUIPMENT TO BE HAUL/TRANSPORT, INSTALL AND TEST BY THE CONTRACTOR						
1.0	Generator Control and Protection Panel (GCPP) for 50 kW AC Generator Set complete with the required Control, Metering, Protection, Synchronization (auto/manual), Annunciation and Alarm, Grounding Materials and all other appurtenances	Haul, Install & Test	EW-TS & Bid Dwg.	sel(s)	2	(P	ĪР

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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZONAND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VII - BILL OF QUANTITIES

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ELECTRICAL WORKS CALUTCOT DIESEL POWER PLANT (2x50kW)

				-,			
Item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
2.0	13.8 kV Switchyard and Appurtenances						
2.1	75 kVA, 13.8 kV/480 V, 3-phase, 60 Hz, Generator Transformer	Haul, install & Test	EW-TS & Bid Dwg.	set(s)	2 _	(P)P
2.3	15 kVA, 7.97 kV/240 V, 1-phase, 60 Hz, Station Service Transformer	Haul, Instail & Test	EW-TS & Bid Dwg.	set(s)	1 <u>-</u>	(P	<u>)</u> P
	SUB-TOTAL AMOUNT OF BID (ELECTRICA	L WORKS)			_		
					-	(P) P

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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VII - BILL OF QUANTITIES

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Item No.	Description of Work or Materials	Work to	Ref.	Unit	Estimated	Unit Price in Pesos	Total
		Be Done	Koi.	Onit	Quantity	(Words and Figures)	Amount
A.	EQUIPMENT & MATERIALS TO BE FURNISHED BY THE CONTRACTOR						
1.0	 a. 2/0 AWG, 15kV, ACSR b. 1/0 AWG, 15kV, ACSR c. 7/16"Ø High strength grade steel galvanized guy wire d. 3/8"Ø High grade steel galvanized OHGW e. Lightning rod f. Line Hardwares such as tee-connectors, turnbuckle, insulators, termination kit, including sealant, ground clamp, cable/conduit support, etc. 	Furnish, Lay, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P)	P
	Power Control and Instrumentation Cables including Terminal Lugs, Connectors, Cable Ties, Identification Tags, Etc a. 30 mm², 15kV, Crosslink-Polyethylene (XLPE) Power Cable Copper Conductor	Furnish, Lay and Test	EW-TS, TDS & Bid Dwg.	lot	1	(P)F	·
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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	 b. 30 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor c. 14 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor d. 4- 4c x 2.0 mm2, 600 V, (Royal Chord) Copper Conductor 				- Goding	(storas alia trigulas)	Amount
3.0	Grounding System						
3.1	Grounding Grid Copper Conductor 100 mm ² , soft drawn bare copper conductor	Fumish, Lay, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1 _	(P)।	P
3.2	 Bonding Copper Conductor a. 100 mm², copper conductor b. 50 mm², copper conductor c. 22 mm², copper conductor 	Furnish, Lay, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1 -	(P)i	Ρ
3.3	Weld Metal Powder for Powder Connection including Molder and Holder, Etc.	Furnish and Install	EW-TS, TDS & Bid Dwg.	lot	1 -	(P)F	
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Item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
3.4	Grounding Rod (3m x 19mm dia.) Copper Bonded	Furnish and Install	EW-TS, TDS & Bid Dwg.	pcs	16	(P	_)P
3.5	Grounding Test Pit	Furnish and Install	EW-TS, TDS & Bid Dwg.	set	1	(P	_)P
3.6	Grounding Accessories such as Cable Terminals, Lugs, Etc.	Furnish and Install	EW-TS, TDS & Bid Dwg.	lot	1	(P	
4.0	Electrical Services and Accessories						
4,1	Lighting Fixtures						
	 a. Fixture Type A (1 x 9 W Compact LED Lamp Lighting Fixture) 	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	3	(P	_)P
	 Fixture Type B 2 x 9 Watts cool white high output ballast-bypass Type LED Lamp Tube Luminaires 	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	1	(P	
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ELECTRICAL WORKS BUTAWANAN DIESEL POWER PLANT (1X30 kW & 1x50kW)

ltem No.		Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos Total (Words and Figures) Amount
	C.	Fixture Type C (Portable Emergency Light, 2 x 2 W LED with built in battery and Battery Charger)	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	1	(P)P
	d.	Fixture Type D (50W LED Flood Light with clear Tempered Glass and Cooling Fins)	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	3	(P)P
	e.	Fixture Type E (30W LED Perimeter Lighting Fixture)	Fumish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	4	(P)P
	f.	Fixture Type F 1 x 30 W LED Flood Light with Clear Tempered Glass and Cooling Fins	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	8	(P)P
4.2	Ou Flu	tlets and Switches Including Plate Cover, sh-mounted, Grounding Type					
	a.	Convenience Outlet, Duplex with Cover, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Owg.	sets	1	(P)P

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No.		Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	b.	Convenience Outlet, Duplex, Weatherproof type with Cover, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set s	3	(P	_)P
	C.	Outlet for Emergency Lighting Fixture, Single Receptacle, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	sets	1 .	(P)P
	ď.	Outlet for Exhaust Fan, Single Receptacle, 16 A, 230 V, 1-phase	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set s	1 .	(P	_)P
1	e.	50AF/20AT, 2 Pole, Enclosed Circuit Breaker with built-in universal outlet	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	1 .	(P)P
1	f.	Single Pole Wall Switch, 10 A, 230 V	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set s	1 .	(P)P
!	g.	Duplex Wall Switch, 10 A, 230 V	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	sets	2	(P)P
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Item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	h. Triplex Wall Switch, 10 A, 230 V	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set	2	(P)P
	i. Boxes, Fittings, and Accessories	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	lot	1 .	(P	
4.3	Panelboard and Breakers						
	 a. 240V, 1-Phase, Main Distribution Panelboard 250AF/100AT, 2-Pole Main MCCB with branch circuits 1 - 50AF/50AT, 2-Pole, MCB 6 - 50AF/20AT, 2-Pole, MCB 3 - 50AF/15AT, 2-Pole, MCB 	Furnish, Install and Test	EW-TS, TDS & Bid Dwg.	set(s)	1 .	(P)P
4.4	600V, Lighting and Power Cables	Furnish, Lay and Test	EW-TS, TDS & Bid Dwg.	lot	1 .	(P	_)P
	 a. 30 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor b. 8.0 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor 						
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ltem No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	c. 3.5 mm², 600 V, Heat Resistant Thermoplastic, (THHN/THWN-2), Copper Conductor		-				,
5.0	Conduit System						
5.1	Electrical Conduit including Locknuts, Washer, Elbows and Other Fittings	Furnish and Install	EW-TS, TDS & Bid Dwg.	lot	1	(P)P
	 a. 110 mmØ uPVC b. 40 mm dia. uPVC c. 32 mm dia. uPVC d. 25 mm dia. uPVC e. 20 mm dia. uPVC f. Boxes, Locknuts, Elbows, and other Fittings 						
6.0	Tools and Spare Parts						
	a. 90AT, 600V Rated Molded Case Circuit Breaker,3-Ph, 60Hz	Furnish	EW-TS & TDS	set(s)	1	(P)P
	50AT, 600V Rated Molded Case Circuit Breaker,3-Ph, 60Hz	Furnish	EW-TS & TDS	set(s)	1	(P))P
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Item No.		Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	c.	Telescopic Hot Stick with Tip Lock Features, 35 ft., 8 Sections, Epoxyglass	Furnish	EW-TS & TDS	set	1	(P)P
	d.	Lineman's Rubber Gloves, maximum usage: 17,000 Volts Size 14"	Furnish	EW-TS & TDS	pairs	2	(P)P
	e.	Lineman's Belt, Max. Length:42", Minimum Length: 34", D-to-D distance:56 cm, Center Hole:38"	Furnish	EW-TS & TDS	set	1	(P)P
	f.	Positioning Strap, Nylon, Maximum Length:2.0m Minimum Length: 1.3m, Adjustable Range: 0.7m	Furnish	EW-TS & TDS	set	1	(P)P
	g.	Heavy Duty Hard Hat with NPC Logo & strap (Safety Standard Compliant)	Furnish	EW-TS & TDS	sets	3	(P)P
7.0	Jo	b Site Cameras						
	a.	Construction Cameras (2 Sets), complete with the required accessories and peripherals	Furnish, Install and Test	EW-TS & TDS	set(s)	2	(P)P
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item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
	b. 32Gb SDHC Memory Cards	Furnish, Install and Test	EW-TS & TDS	set(s)	2	(P	_)P
	c. 2850mAh, 1.5V, AA Size Alkaline Batteries	Furnish, Install and Test	EW-TS & TDS	set(s)	4	(P	_)P
	d. Spare 32GB SDHC Memory Cards	Furnish, Install and Test	EW-TS & TDS	set(s)	2	(P)P
	e. Spare 2850mAh, 1.5V, AA Size Alkaline Batteries	Furnish, Install and Test	EW-TS & TDS	set(s)	16 _	(P)P
8.0	13.8 kV Switchyard and Appurtenances						
8.1	Automatic Circuit Recloser, 800 A, 60 Hz, 15 kV 12 kA Symmetrical Fault Current	Furnish Instail & Test	EW-TS & Bid Dwg.	set(s)	1 _	(P	
8.2	15 kV, 100 A, 10 kA, Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link (10A), brackets and accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	3 _	(P	_)P

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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ELECTRICAL WORKS BUTAWANAN DIESEL POWER PLANT (1X30 kW & 1x50kW)

Item No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
8.3	15 kV, 100 A, 10 kA, Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link (3A), brackets and accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	6 _	(P)	P
8.4	15 kV, 100 A, 10 kA, Fuse Disconnect Switch with Lightning Arrester Combination complete with the required fuse link (2A), brackets and accessories	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	1 _	(P)	P
8.5	Kilowatt-Hour Demand Meter						
	a. 13.8 kV, Three-Phase Kilowatt-hour meter and associated Instrument Transformer and Accessories	Fumish Install & Test	EW-TS & Bid Dwg.	set(s)	1 _	(P)	P
	b. 240V, Single-phase Kilowatt-hour Demand Meter	Furnish Install & Test	EW-TS & Bid Dwg.	set(s)	1 _	(P)	P
В.	EXISTING EQUIPMENT TO BE HAUL/TRANSPORT,					_	

INSTALL AND TEST BY THE CONTRACTOR

Designation `
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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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No.	or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
1.0	Generator Control and Protection Panel (GCPP) for AC Generator Set complete with the required Control, Metering, Protection, Synchronization (auto/manual), Annunciation and Alarm, Grounding Materials and all other appurtenances						
1.1	GCPP for 50 kW AC Generator Set	Haul, Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)	P
1.2	GCPP for 30 kW AC Generator Set	Haul, Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)	P
2.0	13.8 kV Switchyard and Appurtenances						
2.1	75 kVA, 13.8 kV/480 V, 3-phase, 60 Hz, Generator Transformer	Haul, Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)	P
2.2	37.5 kVA, 13.8 kV/480 V, 3-phase, 60 Hz, Generator Transformer	Haul, Install & Test	EW-TS & Bid Dwg.	set(s)	1	(P)	P
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		AN DIESEE PONER PEA		, addition			
ltem No.	Description of Work or Materials	Work to Be Done	Ref.	Unit	Estimated Quantity	Unit Price In Pesos (Words and Figures)	Total Amount
2.3	15 kVA, 7.97 kV/240 V, 1-phase, 60 Hz, Station Service Transformer	Haul, Install & Test	EW-TS & Bid Dwg.	set(s)	1 _	(9	7p
	Clausii Ceivice Italisiolillei	mstan & 16st	Dwg.		-	(P)P
	SUB-TOTAL AMOUNT OF BID (ELECTR	ICAL WORKS)			_		_
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SECTION VII

BILL OF QUANTITIES (MECHANICAL WORKS)



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SECTION VII - BILL OF QUANTITIES

MECHANICAL WORKS

BUTAWANAN DIESEL POWER PLANT

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
A	EQUIPMENT TO BE HAULED/TRANSPORTED FROM NPC- SPUG MINUYAN WAREHOUSE, SAN JOSE DELMONTE, BULACAN TO PLANT TITE		MW-2.0				
MW-1.0	MECHANICAL EQUIPMENT AND ACCESSORIES						
MW-1.1	50 kW Modular Diesel Generating sets and its Accessories (approx. 2.0 tons per set)	Hauling/Transport and Installation	MW-2.0	set	1 1	(p	P
MW-1.2	30 kW Modular Diesel Generating sets and its Accessories (approx. 1.8 tons per set)	Hauling/Transport and Installation	MW-2.0	set	1	(P)	ρ
MW-1.3	Spare Parts	Hauling/Transport and Installation	MW-2.0	lot	1	(F 4)	p
MW-1,4	Miscellaneous Materials	Hauling/Transport and Installation	MW-2.0	lot	1	(P)	P

Name and Signature of Author

SECTION VII - BILL OF QUANTITIES

MECHANICAL WORKS

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BUTAWANAN DIESEL POWER PLANT

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
8,	BALANCE OF PLANT AND MISCELLANEOUS TOOLS, EQUIPMENT AND MATERIALS TO BE SUPPLIED BY THE CONTRACTOR						
MW-2.1	FUEL OIL SUPPLY AND TRANSFER SYSTEM		MW 6.0				
MW-2.1,1	Rectangular Fuel Oil Day Tank, 1,000 liters capacity, 5mm thick, ASTM A 36 steel plate, complete with rotary hand pump (50 l/min., aluminum body), strainer, nozzles/manhole, level gauge glass with protector guard, level switch for high & low alarm, structural steel supports with anchor bolts on foundation, relative pipeworks and other accessories required	Supply, Installation and Test		sels	2	(P)	P
	PIPING SYSTEM Pipe, filtings, 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; 3a) Fuel supply/filling to the separate/elevated fuel day tanks through the rotary hand pump (50 l/min., aluminum hody) complete with flexible hose, accessories, etc. and interconnection piping to/from the generating sets including strainers, etc.; 3b) Interconnection of water supply to radiators from the domestic water source; and 3c) Waste oil discharge to the oil-water separator.	Supply, Excavate, Install, Backfill and Test	MW-6.0 & Drawings	lot	1	(P)	Ρ

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MECHANICAL WORKS

BUTAWANAN DIESEL POWER PLANT

item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-4.0	DOMESTIC WATER SYSTEM		MW-7.0				
	Well Drilling, Well Development, Pumping Test and Disinfection. complete with 50 mm Ø (min.) casing and 32mm Ø suction pipes conforming to ASTM A53, Gr.A, welded or seamless, Sch. 40, hot dip galvanized, fitted with 32mm Ø stainless steel Screen with 5mm slots and (1) set of Brass Foot Valve, and other accessories as described in the technical specifications	Oniling, Well Development, Test and Disinfection		lm	15	(P)	P
·	Hand pump jetmatic, 2 gpm min. flow, reciprocating type, cast iron body complete with foot valves, fittings, supports, concrete pad and other accessories as described in the technical specifications.	Supply, Installation and Test		set _.	1	(R)	P
<u>.</u>	Water Tank, 600 liters capacity, triple layer polyethylene, complete with nozzles/manhole, inlet and outlet nozzles, supports, down spout strainer, overflow and drain nozzles with pipes, pipe structural steel supports with anchor bolts on foundation and access tadder, and other accessories as required in the technical specifications.	Supply, Installation Test and Disinfection		set	1	(P)	ρ
MW-4.4	Gate Valve, 25 mm Ø, cast bronze, screwed ends, rising stem, Class 150	Supply, Installation and Test		sets	1	(P	P
MW-4.5	Gate Valve, 20 mm Ø, cast bronze, screwed ends, rising stem, Class 150	Supply, Installation and Test		sets	3	(R	P
MW-4.6,	Gate Valve, 15 mm Ø, cast bronze, screwed ends, rising stem, Class 150	Supply, installation and Test	İ	sets	2	(P	ρ

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MECHANICAL WORKS

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-4.0	DOMESTIC WATER SYSTEM (Cont'd)		MW-7.0		,	(***)	22. **
MW-4.7	Ball Valve, 80mmØ, cast iron, flanged ends, Class 150	Supply, Installation and Tast		set	1		P
MW-4.8	Hose Bibb, 20 mm Ø, bronze body, screwed ends, Class 150.	Supply, Installation and Test		sets	3	(β)	P
MW-4.9	Water Pipe, 90 mm O.D. (80 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection		lm	6	(B)	P
MW-4.10	Water Pipe, 40 mm O.D. (32 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection		lm	6	(8	P
MW-4.11	Water Pipe, 32 mm O.D. (25 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection		lm	12	(P	μ
MW-4.12	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.	Supply, Excavation, Installation, Test, Backfill & Disinfection		lm ,	. 78	(P	P
MW-4.13	Water Pipe, 20mm O.D. (15 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection		, lm ,	6	(P	р
WW-5.0	FIRE FIGHTING SYSTEM	i i	MW 9.0				
MW-5.1	Portable Fire Extinguishers, HCFC or Halotron I, 7.1 kg (15 lbs), non-expiry, multi shots, wall hung type with bracket and mounting accessories	Supply and Installation	,	sets	. 2	(P)	P

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Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-6.0	AIR CONDITIONING & VENTILATION SYSTEM		MW 8.0				
MW-8.1	Air Conditioning System						
MW-6.1,1	Air conditioning unit for Control Room, 7,000 kJ/h minimum cooling capacity, window type, inverter-type, complete with necessary mounting accessories and controls (infrared remote) and other necessary accessories as described in the technical specifications.	and Test		sets	1	(P)	P
MW-6.2 MW-6.2.1	Ventilation System Exhaust fan for CR, 100 m³/h wall mounted, propeller type, direct driven, complete with automatic shutter, mounting accessories and controls	Supply, Installation and Test		set	1 1	(P)	₽

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MECHANICAL WORKS

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Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-7.0	MISCELLANEOUS TOOLS, EQUIPMENT AND MATERIALS		MW-10.0				
MW-7.1	MISCELLANEOUS EQUIPMENT AND MATERIALS				!		
MW-7.1.1	Four Wheel Drum Truck (210 Liter Capacity)	Supply and Delivery		рс	1		p
MW-7.1.2	Clock, 10* diameter	Supply and Delivery		set	1	(P)	P
MW-7.1.3	Steel Cabinet Locker, 90 x 45 x 140 cm, galvalum materials	Supply and Delivery		set	1	(P)	P
MW-7.1.4	Office Tables and Chairs (Standard size table, 3 drawers with lock keys and 2 chairs with roller balls)	Supply and Delivery		set	1	(µ	φ
MW-7.1.5	Ear Muff, fluid filled high attenuation	Supply and Delivery		pcs	10	(P)	e
MW-7.1.6	Lube Oil requirement for next oil change	Supply and Delivery		liter	80	(P)	P
MW-7.1.7	Flash Light and Head Light with rechargeable AA battery, halogen bulb, LED light	Supply and Delivery		set	1	(P)	۹
WW-7.1.8	Automatic rechargable emergency light (LED)	Supply and Delivery		set	1		P
						(P)	

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SECTION VII - BILL OF QUANTITIES

MECHANICAL WORKS

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Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-7.1	MISCELLANEOUS EQUIPMENT AND MATERIALS (Cont'd)		MW-10.0			(110100011101)	<u> </u>
MW-7.1.9	Diesel Fuel in a sealed plastic drum	Supply and Delivery		liter .	800		P
MW-7.1.10	Hard hat with NPC logo, white color	Supply and Delivery		sets	5	(P)	p
MW-7.1.11	Plastic table and 4-chair (monoblock)	Supply and Delivery		set	1		₽
MW-7.1.12	Electricians First Aid Kit (Refer to Item "I" Clause MW-10.2 for details of contents)	Supply and Delivery		set	1	(B)	p
MW-7.2	MISCELLANEOUS TOOLS & SPARE PARTS		MW-10.1		<u> </u>		
MW-7.2.1	Manufacturer's Special/Standard and Specified Tools as listed in Sections "MW-10.1" Part I - Technical Specifications (Mechanical Works).	Supply and Delivery		lot	1	(P)	ρ
	Manufacturer's Standard and Recommended Spare Parts as listed in Sections "MW-2.0, Item "b.7" of Part I - Technical Specifications (Mechanical Works).	Supply and Delivery	÷	lot	1	(P)	ρ

Name of Firm : Name and Signature of Authorized	Representative Designation
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SECTION VII - BILL OF QUANTITIES

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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MECHANICAL WORKS

BUTAWANAN DIESEL POWER PLANT

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-8.0	MISCELLANEOUS WORKS					-	
WW-8.1	Tayging anti/or Labels for Equipment, Valves, Piping, instruments and its fixing accessories as described in the bid documents or shown on the drawings.	Supply & Instail	₩W-4.0	iot	1	(R)	p
MW-8.2	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	Supply & Apply	MW-7.0 TO MW-9.0	lot	1	(P)	ρ
/W-8.3	Conduct Testing & Commissioning for all Mechanical Works Systems supplied by the Contractor including its associated electrical equipment and other services as described in the technical specifications. The Contractor's scope of work shall include assistance during the test and commissioning of the generating sets supplied by NPC	Conduct/Perform		lot	,	(P)	р

TOTAL MECHANICAL WORKS	p
	(P)

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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MCDULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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MECHANICAL WORKS

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
A	EQUIPMENT TO BE HAULED/TRANSPORTED FROM NPC- SPUG MINUYAN WAREHOUSE,SAN JOSE DELMONTE, BULACAN TO PLANT SITE		MW-2.0				
MW-1.0	MECHANICAL EQUIPMENT AND ACCESSORIES				 		
MW-1.1	50 kW Modular Diesel Generating sets and its Accessories (approx. 2.0 tons per set)	Hauling/Transport and Installation	MW-2.0	sets	2	(P)	P
MW-1.2	Spare Parts	Hauling/Transport and Installation	MW-2.0	lot	1	(P	P
MW-1.3	Miscellaneous Materials	Hauling/Transport and Installation	MW-2.0	lot	1	(P)	P

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MECHANICAL WORKS

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CALUTCOT DIESEL POWER PLANT

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
В.	BALANCE OF PLANT AND MISCELLANEOUS TOOLS, EQUIPMENT AND MATERIALS TO BE SUPPLIED BY THE CONTRACTOR						
MW-2.0	FUEL OIL SUPPLY AND TRANSFER SYSTEM		MW 6.0				
MW-2.1.1	Rectangular Fuel Oil Day Tank, 1,000 liters capacity, 5mm thick, ASTM A 36 steel plate, complete with rotary hand pump (50 l/min., aluminum body), strainer, nozzles/manhole, level gauge glass with protector guard, level switch for high & low alarm, structural steel supports with anchor bolts on foundation, relative pipeworks and other accessories required	Supply, Installation and Test		sets	2	(R)	P
	PiPING SYSTEM 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: 3a) Fuel supply/filling to the separate/elevated fuel day tanks through the rotary hand pump (50 l/min., aluminum body) complete with flexible hose, accessories, etc. and interconnection piping to/from the generating sets including strainers, etc.; 3b) Interconnection of water supply to radiators from the domestic water source; and 3c) Waste oil discharge to the oil-water separator.	Supply, Excavate, Install, Backfill and Test	MW-6.0 & Drawings	lot	1	(P)	₽

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SECTION VII - BILL OF QUANTITIES

MECHANICAL WORKS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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CALUTCOT DIESEL POWER PLANT

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-4.0	DOMESTIC WATER SYSTEM		MW-7.0				
MW-4.1	Well Drilling, Well Development, Pumping Test and Disinfection, complete with 50 mm Ø (min.) casing and 32mm Ø suction pipes conforming to ASTM A53, Gr.A., welded or seamless, Sch. 40, hot dip galvanized, fitted with 32mm Ø stainless steel Screen with 5mm slots and (1) set of Brass Foot Valve, and other accessories as described in the technical specifications	Drilling, Well Development, Test and Disinfection		ţ m	15	(P)	p
MW-4.2	Hand pump jetniatic, 2 gpm mln. flow, reciprocating type, cast iron body complete with foot valves, fittings, supports, concrete pad and other accessories as described in the technical specifications.	Supply, Installation and Test	·	set	1	(P)	P
MW-4.3	Water Tank, 600 liters capacity, triple layer polyethylene, complete with nozzles/manhole, inlet and outlet nozzles, supports, down spout strainer, overflow and drain nozzles with pipes, pipe structural steel supports with anchor bolts on foundation and access ladder, and other accessories as required in the technical specifications.	Test and Disinfection		set	1	(5 ·)	£
MW-4.4	Gate Valve, 25 mm Ø, cast bronze, screwed ends, rising stem, Class 150	Supply, Installation and Test		sets	1	(B	p
MW-4.5	Gate Valve, 20 mm Ø, cast bronze, screwed ends, rising stem, Class 150	Supply, Installation and Test		, sets	3	(P	P
MW-4.6	Gate Valve, 15 mm Ø, cast bronze, screwed ends, rising stem, Class 150	Supply, Installation and Test		sets	2	(P)	ъ

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MECHANICAL WORKS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEDS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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CALUTCOT DIESEL POWER PLANT

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-4.0	DOMESTIC WATER SYSTEM (Cont'd)		MW-7.0				
MW-4.7	Ball Valva, 80mmØ, cast Iron, flanged ends, Class 150 Class 150	Supply, Installation and Test		set	1		· P
MW-4.8	Hose Bibb, 20 mm Ø, bronze body, screwed ends, Class 150.	Supply, Installation and Test		sets	′ 3	(P)	P
MW-4.9	Water Pipe, 90 mm O.D. (80 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection	-	 Im	6	(P)	R
MW-4.10	Water Pipe, 40 mm O.D. (32 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection		lm	6	(B	p
MW-4.11	Water Pipe, 32 mm O.D. (25 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection	· .	lm	12	(P	Ρ
MW-4.12	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.	Supply, Excavation, Installation, Test, Backfill & Disinfection		lm	78	(P	Α
MW-4.13	Water Pipe, 20mm O.D. (15 mm N.D.), uPVC pipe, sch 80 or Class 150, and its associated fittings, pipe supports and other accessories.	Supply, Excavation, Installation, Test, Backfill & Disinfection		. lm	6	(P	ρ
NW-5.0	FIRE FIGHTING SYSTEM	·	MW 9.0				
MW-5.1	Portable Fire Extinguishers, HCFC or Halotron I, 7.1 kg (15 lbs), non-expiry, multi shots, wall hung type with bracket and mounting accessories	Supply and Installation	•	sets	2	(P)	P

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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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MECHANICAL WORKS

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-6.0	AIR CONDITIONING & VENTILATION SYSTEM		MW 8.0				-
MW-6.1	Alt: Conditioning System					•	
MW-6.1.1	Air conditioning unit for Control Room, 7,000 kJ/h minimum cooling capacity, window type, inverter-type, complete with necessary mounting accessories and controls (infrared remote) and other necessary accessories as described in the technical specifications.	and Test		sets	1	(P)	P
MW-6.2 MW-6.2.1	Ventilation System Exhaust fan for CR, 100 m³/h wall mounted, propeller type, direct driven, complete with automatic shutter, mounting accessories and controls	Supply, Installation and Test		set	1	(P)	P

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Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-7.0	MISCELLANEOUS TOOLS, EQUIPMENT AND MATERIALS		MW-10.0				
MW-7.1	MISCELLANEOUS EQUIPMENT AND MATERIALS						
MW-7.1.1	Four Wheel Drum Truck (210 Liter Capacity)	Supply and Delivery		рс	1		P
MW-7.1.2	Clock, 10" diameter	Supply and Delivery		set	1 1	(P)	P
MW-7.1.3	Steel Cabinet Locker, 90 x 45 x 140 cm, galvalum materials	Supply and Delivery		set	1	(P)	P
MW-7.1.4	Office Tables and Chairs (Standard size table, 3 drawers with lock keys and 2 chairs with roller balls)	Supply and Delivery		set	1	(P	ρ
MW-7.1.5	Ear Muff, fluid filled high attenuation	Supply and Delivery		pcs	10	(A	P
MW-7.1,6	Lube Oil requirement for next oil change	Supply and Delivery		liter	80	(P)	۹
MW-7.1.7	Flash Light and Head Light with rechargeable AA battery, halogen builb, LED light	Supply and Delivery		set	1	(P)	P
MW-7.1.8	Automatic rechargable emergency light (LED)	Supply and Delivery		set	1 1	(P)	P
<u> </u>					F	(P)	

	
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MECHANICAL WORKS

Item No.	Description of Work or Materials	Work to be Done	Ref.	Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-7.1	MISCELLANEOUS EQUIPMENT AND MATERIALS (Cont'd)		MW-10.0			(110100 and 1 (Sares)	
MW-7.1.9	Diesel Fuel in a sealed plastic drum	Supply and Delivery	_	liter	800		P
MW-7.1.10	Hard hat with NPC logo, white color	Supply and Delivery		sets	5	(P)	P
MW-7.1.11	Plastic table and 4-chair (monoblock)	Supply and Delivery		set	1	(P)	P
MW-7.1,12	Electricians First Aid Kit (Refer to Item "I" Clause MW-10.2 for details of contents)	Supply and Delivery		set	1	(P)	P
MW-7.2	MISCELLANEOUS TOOLS & SPARE PARTS		MW-10.1			(P)	
MW-7.2.1	Manufacturer's Special/Standard and Specified Tools as listed in Sections "MW-10.1" Part I - Technical Specifications (Mechanical Works).	Supply and Delivery		lot	1	(P)	P
MW-7.2,1	Manufacturer's Standard and Recommended Spare Parts as listed in Sections "MW-2.0, item "b.7" of Part I - Technical Specifications (Mechanical Works).	Supply and Delivory		lot	1	(P)	P

_ Name of Firm		•	٠.	. •	.* •	Name and Signature of Authorized Representative	Designation
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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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item No.	Description of Work or Materials	Work to be Done	Ref.	: -, Unit	Total Quantity	Unit Price in Pesos (Words and Figures)	Total Amount
MW-8.0	MISCELLANEOUS WORKS						
MW-8,1 - ·	Tagging and/or Labels for Equipment, Valves, Plping, Instruments and its fixing accessories as described in the bid documents or shown on the drawings.	Supply & Install	MW-4.0	lot	1	(P)	Р
•	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	Supply & Apply	MW-7.0 TO MW-9.0 :	lot	1 [(P)	p
	Conduct Testing & Commissioning for all Mechanical Works Systems supplied by the Contractor including its associated electrical equipment and other services as described in the technical specifications. The Contractor's scope of work shall include assistance during the test and commissioning of the generating sets supplied by NPC	Conduct/Perform		lọt	1	(P)	ρ

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NATIONAL POWER CORPORATION	Name of Firm	Name and Signature of Authorized Representative	Designation VII-800-Cat-8

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SECTION VIII - BIDDING FORMS

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Standard Form No: NPCSF-INFR-01

Checklist of Technical & Financial Envelope Requirements for Bidders

A. THE 1ST 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;
 - Valid Philippine Contractors Accreditation Board (PCAB) license and registration for the type and cost of the contract for this Project or Special PCAB License in case of Joint Ventures.

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-INFR-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-INFR-03) complete with the following supporting documents:
 - Contract
 - Owner's Certificate of Final Acceptance issued by the project owner other than the contractor or a final rating of at least Satisfactory in the Constructors Performance Evaluation System (CPES). In case of contracts with the private sector, an equivalent document (Ex. Official Receipt or Sales Invoice) shall be submitted

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Standard Form No: NPCSF-INFR-01 Page 2 of 3

(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 due to inaccessibility of the site for whatever reason or fault of the bidder.)

- Special PCAB License in case of Joint Ventures
- Duly signed computation of its Net Financial Contracting Capacity (NFCC) at least equal to the ABC (NPCSF-INFR-04);
- b. (CLASS B)
- ➤ Valid Joint Venture Agreement, if applicable (NPCSF-INFR-05)

2. Technical Documents

- Bid Security, any one of the following:
 - Bid Securing Declaration (NPCSF-INFR-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-INFR-06a) - 2% of ABC;

OR

- Surety Bond callable upon demand issued by a reputable surety or insurance company (NPCSF-INFR-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-INFR-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)
- Organization Chart for the project (NPCSF-INFR-08)
- Duly Signed List of Contractor's Key Personnel (based on the minimum key personnel) with complete supporting documents (NPCSF-INFR-09,10a,10b & 11)
- Duly Signed List of Contractor's Equipment (owned, leased or under purchase agreement (NPCSF-INFR-12), with
 - Proof of ownership and/or certificate of availability issued by Equipment Lessors

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Standard Form No: NPCSF-INFR-01 Page 3 of 3

- Completely Filled out and duly signed Technical Data Sheets Mechanical Works (MW) and Electrical Works (EW) – Part II, Section VI - Technical Specifications
- Complete eligibility documents of proposed sub-contractor, if applicable

B. THE 2ND ENVELOPE (FINANCIAL COMPONENT) SHALL CONTAIN THE FOLLOWING:

- Duly signed Bid Letter indicating the total bid amount in accordance with the prescribed form (NPCSF-INFR-13)
- Duly signed and completely filled-out Bill of Quantities (Section VII) indicating the unit and total prices per item and the total amount in the prescribed Bill of Quantities form.
- Duly Signed Detailed Estimates for each items of work showing the computations in arriving at each item's unit prices used in coming up with the bid (NPCSF-INFR-14)
- Summary sheets indicating the direct unit prices of construction materials, labor rates and equipment rental rates used in coming up with the bid (NPCSF-INFR-15)

CONDITIONS:

- 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.
- 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.

Designation Date CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL, GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VIII - BIDDING FORMS

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Standard Form Number: NPCSF-IN	FR-02					
List of All Ongoing Gover	nment and Private Contra	cts including Contract	Awarded But Not	Yet S	Started	
Business Name :		•				
	- Consideration of		Contractor's Role	<u> </u>	a.Date Awarded	
Name of Contract/Location/ Project Cost	a. Owner's Name b. Address c. Telephone Nos.	Nature of Work	Description %		b. Date Started c. Date of Completion or Estimated Completion Time	Value of Outstanding , Works
Government						
		 -				
						<u> </u>
	<u> </u>					
						 .
Private						<u> </u>
		 		-		
				_	-	
		<u> </u>				
					Total Cost	
The bidder shall declare in this form Joint Venture agreement other than I	all his on-going government and privants current joint venture where he is a	ate contracts including contracts v a partner. Non declaration will be a	where the bidder (either a ground for disqualificat	as indiv tion of b	idual or as a Joint Venture) is id.	a partner in a
Note: This statement shall be supported in Contract/Purchase Order	orted with the following documents for	r all the contract(s) stated above v	which shall be submitted			
Submitted by :	(Printed Name & Signature)	_				

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SECTION VIII - BIDDING FORMS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

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Standard Form Number: NPCSF-INFR-03

iness Name :	ne bidder's Single Larg		ict (SECC) Sillill	ar to tr	ie contract to be bid	
	a. Owner's Name		Contractor's i	Role	A A	
Name of Contract	b. Address c. Telephone Nos.	Nature of Work	Description	%	a.Amount at Award b.Amount at Completion c.Duration	a. Date Awarded b. Contract Effectivit c. Date Completed

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: Owner's Certificate of Final Acceptance issued by the project owner other than the contractor; or A final rating of at least Satisfactory in the Constructors Performance Evaluation System (CPES); 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	:	

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LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-04

NET FINANCIAL CONTRACTING CAPACITY (NFCC)

Summary of the Bidder's/Contractor'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)	

В.	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.

Name of Bidder/Contractor	
Signature of Authorized Representative	
Date :	

Submitted by:

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-05

JOINT VENTURE AGREEMENT

KNOW ALL MEN BY THESE PRESENTS:

That	t this JOINT VENTURE AGR, of legal a and a resi	EEMENT is ge, <i>(civil status</i> dent of	entered into by and between , authorized representative o
		- and –	
_	, of legat age, a resident of	(civil_status)	, authorized representative or
reso the l	That both parties agree to join to ources and efforts to enable the Joint \ hereunder stated Contract of the Nati o	enture to parti	pital, manpower, equipment, and other cipate in the Bidding and Undertaking or rporation.
	NAME OF PROJECT		CONTRACT AMOUNT
	That the capital contribution of each	h member firm	:
	NAME OF FIRM		CAPITAL CONTRIBUTION
1. 2.		B	
۷.	 	P	<u> </u>
Bidd	That both parties agree to be jo ling and Undertaking of the said contra		rally liable for their participation in the
do, d Bidd	execute and perform any and all acts	necessary and ract, as fully an	and/or shall are granted full power and authority to lor to represent the Joint Venture in the defectively and the Joint Venture may and revocation.
Con	That this Joint Venture Agreement tract until terminated by both parties.	ent shall rema	in in effect only for the above stated
•	Name & Signature of Authorized		Name & Signature of
	Representative		Authorized Representative
•	Official Designation		Official Designation
•	Name of Firm		Name of Firm
		Witnesses	
1.		2.	
-			

[Jurat]

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

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-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:
 if the Bidder withdraws his Bid during the period of bid validity specified in the Bidding Documents; or
 if the Bidder does not accept the correction of arithmetical errors of his bid price in accordance with the Instructions to Bidder; or
 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
 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

a)

b)

Employer.

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-06b

FORM OF BID SECURITY (SURETY BOND)

BONE) NO	D.:DATE BOND EXECUTED:			
unto N (amou payme	ict b Natio <i>int in</i> ent o	ond, We (Name of Bidder) (hereinafter called "the Principal") and (Name of (Name of Country of Surely), authorized to usiness in the Philippines (hereinafter called "the Surety") are held and firmly bound anal Power Corporation (hereinafter called "the Employer") as Obligee, in the sum of a words & figures as prescribed in the bidding documents), callable on demand, for the of which sum, well and truly to be made, we, the said Principal and Surety bind our successors and assigns, jointly and severally, firmly by these presents.			
SEALI	ED v	vith our seals and dated this day of 20			
WHEF	REAS	S, the Principal has submitted a written Bid to the Employer dated the day of 20, for the the Bid").			
NOW,	THE	EREFORE, the conditions of this obligation are:			
1)		he Bidder withdraws his Bid during the period of bid validity specified in the Bidding cuments; 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 ti him	he Bidder having been notified of the acceptance of his bid and award of contract to 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 th	is ot	bligation shall remain in full force and effect, otherwise it shall be null and void.			
PROVI	IDE	O HOWEVER, that the Surety shall not be:			

liable for a greater sum than the specified penalty of this bond, nor

liable for a greater sum that the difference between the amount of the said Principal's Bid and the amount of the Bid that is accepted by the

SECTION VIII - BIDDING FORMS

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Standard Form Number: NPCSF-INFR-06b 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)	SIGNATURES(S)
NAME(S) AND TITLE(S)	NAME(S)
SEAL	CEAI

SECTION	VIII -	RIDDING	FORMS
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LuzP21Z1311Sc

Standard Form No: NPCSF-INFR-06	Standa	rd Form	No: I	NPCSF-	INFR-	06c
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REPUBLIC OF THE PHILIPPINES)	
CITY OF) S.S

BID-SECURING DECLARATION

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR LuzP21Z1311Sc

To: National Power Corporation
BIR Road cor. Quezon Ave.
Diliman, Quezon City

I/We¹, 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.
- 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.

Affiant

20	IN WITNESS WHEREOF, I/we have at, Philippines.	ave hereunto set my hand this day of
		[Name and Signature of Bidder's Representative/ Authorized Signatory] , [Signatory's legal capacity]

[Jurat]

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

 $^{^{}m 1}$ Select one and delete the other. Adopt same instruction for similar terms throughout the document.

SECTION VIII - BIDDING FORMS

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Standard Form No: NPCSF-INFR-07b

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;
- 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

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[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;
 - Acknowledging all conditions, local or otherwise, affecting the implementation of the Contract;
 - 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].
- [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,	1	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

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-08

CONTRACTOR'S ORGANIZATIONAL CHART FOR THE CONTRACT

Contract if awarde	he Organizational Charled to him. Indicate in to and other Key Engineer	he chart the names	intends to use to execu of the Project Manager,	ute the Project
Attach the re	equired Proposed Org	anizational Chart f above	or the Contract as state	ed

NOTES:

- This organization chart should represent the "Contractor's Organization" required for the Project, and not the organizational chart of the entire firm.
- 2. Each such nominated engineer/key personnel shall comply with and submit duly accomplished forms NPCSF-INFR-10a, NPCSF-INFR-10b and NPCSF-INFR-11.
- 3. All these are required to be in the Technical Envelope of the Bidder.

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-09

LIST OF KEY PERSONNEL PROPOSED TO BE ASSIGNED TO THE CONTRACT

(Based on the Minimum Key Personnel Required in the Bidding Documents)

Business:	<u> </u>				
			<u> </u>		
		D	DESIGNATION		
1 Name	 				
2 Address	- - - - - - - 				-
3 Date of Birth					
4 Employed Since				·	 -
5 Experience				<u> </u>	
6 Previous Employment					
7 Education				_	
8 PRC License					
Required Attachments:					. I
 Certificate of Employment, Bio Data a Certificate of Employment, Bio Data a Certificate of Employment, Bio Data a 	and valid PRC License of th	ne (professional) perso:	nnel		
			, or io, in a material	s Engineer	
Submitted b	<u> </u>	· · · · · · · · · · · · · · · · · · ·	<u> </u>		
Designatio		inted Name & Signature)			
Dat					
	===				

One of the requirements from the bidder to be included in its Technical Envelope is a list of contractor's key personnel (based on the minimum key personnel required in the bidding documents) to be assigned to the contract to be bid, with their complete qualification and experience data (including the key personnel's signed written commitment to work for the project once awarded the contract).

SECTION VIII - BIDDING FORMS

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Standard Form Number: NPCSF-INFR-10a

KEY PERSONNEL'S CERTIFICATE OF EMPLOYMENT (PROFESSIONAL PERSONNEL)

THE PRESIDENT		Issuance Date	<u>.</u>
National Power Corporation BIR Road cor. Quezon Ave. Diliman, Quezon City			
Dear Sir:			
l am (Name of Nominee)		censed	Engineer with
Professional License No	issued on <i>(dat</i>	e of issuance)	at (place of
I hereby certify that (Name of (Designation) for the	of Bidder) (Name of Project)		ed my services as arded to it.
As (Designation) the contract under bidding:	, I supervised the	following completed	projects similar to
NAME OF PROJECT	OWNER	COST	DATE COMPLETED
At present, I am supervisin	g the following projects	:	
NAME OF PROJECT	OWNER	COST	DATE COMPLETED
In case of my separation Contractor, I shall notify the Nation effective date of my separation. As (Designation)	nal Power Corporation a		1) days before the
time to supervise and manage the authorized to handle only one (1) of	Contract works to the		
I do not allow the use of Contractor to qualify for the Contra of (Designation) that to do so will be a sufficient grany future National Power Corp business with the National Power Corp	nct without any firm com- herefor, if the contract ound for my disqualific poration bidding or en	mitment on my part t is awarded to him : ation as <u>(Designation)</u>	to assume the post since I understand in
		(Name and Signature AFFIANT	<u> </u>

[Jurat]

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

One of the requirements from the bidder to be included in its Technical Envelope is a list of contractor's key personnel (viz. Project Manager, Project Engineer, Construction Safety Officer, Foremen, etc.), to be assigned to the contract to be bid, with their complete qualification and experience data (including the key personnel's signed written commitment to work for the project once awarded the contract).

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-10b

KEY PERSONNEL'S CERTIFICATE OF EMPLOYMENT (CONSTRUCTION SAFETY AND HEALTH OFFICER)

		Issuance Date	
THE PRESIDENT National Power Corporation BIR Road cor. Quezon Ave. Diliman, Quezon City			
Dear Sir:			
I am (Name of Nominee) Certificate No. issuance)		nstruction Safety & H	
I hereby certify that (Name Construction Safety & Health Office		has engage	d my services as , if awarded to it.
I am the Construction Safe to the contract under bidding:	ety & Health Officer of t	he following complete	ed projects similar
NAME OF PROJECT	OWNER	COST	DATE COMPLETED
At present, i am the Constr	ruction Safety & Health OWNER	Officer of the following	projects: DATE COMPLETED
In case of my separation Contractor, I shall notify the Nation effective date of my separation. As Construction Safety & time and aware that I am authorize	nal Power Corporation a Health Officer, I know I	at least twenty one (21 will have to stay in t) days before the
I do not allow the use of Contractor to qualify for the Contra of Construction Safety & Health O to do so will be a sufficient ground in any future National Power Co business with the National Power Co	my name for the purp act without any firm com ifficer, if the contract is a for my disqualification a proporation bidding or e	oose of enabling the mitment on my part to awarded to him since as Construction Safet	assume the post I understand that y & Health Officer
		(Name and Signature))

[Jurat]

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

One of the requirements from the bidder to be included in its Technical Envelope is a list of contractor's key personnel (viz. Project Manager, Project Engineer, Construction Safety Officer, Foremen, etc.), to be assigned to the contract to be bid, with their complete qualification and experience data (including the key personnel's signed written commitment to work for the project once awarded the contract).

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-11

KEY PERSONNEL (FORMAT OF BIO-DATA)

Give the detailed information of the following personnel who are scheduled to be assigned as full-time field staff for the project. Fill up a form for each person.

1.	Name	:				_	<u>_</u>
2.	Date of Birth	:	· · · · · · · · · · · · · · · · · · ·				
3.	Nationality	:					
4.	Education and Degrees	:	··-				
5.	Specialty	:					
6.	Registration	:				_	
7.	Length of Service with the Firm	:	Year from To		(months) (months)		(year) (year)
8.	Years of Experience	:					
9.	If Item 7 is less than ten (10) employers for a ten (10)-year per	years, iod (attac	give name ched additio	and len nal sheet	gth of ser /s), if nece	vice w ssary:	ith previous
	Name and Address of Employer		<u>Len</u>	gth of Se	<u>rvice</u>		
			year year year	(s) from		to to to	
10,	Experience:						

This should cover the past ten (10) years of experience. (Attached as many pages as necessary to show involvement of personnel in projects using the format below).

One of the requirements from the bidder to be included in its Technical Envelope is a list of contractor's key personnel (viz. Project Manager, Project Engineer, Construction Safety Officer, Foremen, etc), to be assigned to the contract to be bid, with their complete qualification and experience data (including the key personnel's signed written commitment to work for the project once awarded the contract).

BID DOCUMENTS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SE	CTION VIII - BIDDING FORMS	<u> </u>	LuzP21Z1311Sc
	ndard Form Number, NPCSF-INFR-11 e 2 of 2		
1.	Name	:	
2.	Name and Address of Owner	:	
3.	Name and Address of the Owner's Engineer (Consultant)	:	
4.	Indicate the Features of Project (particulars of the project components and any other partic interest connected with the project	cular	
5.	Contract Amount Expressed in Philippine Currency	:	
6.	Position	:	
7.	Structures for which the employed was responsible	e :	
8.	Assignment Period	: from (months) : to (months)	(years) (years)
lt is	ne and Signature of Employee hereby certified that the above perded to our company.	ersonnel can be assigned to this project, if t	he contract is
	(Place and Date)	(The Authorized Representati	ve)

One of the requirements from the bidder to be included in its Technical Envelope is a list of contractor's key personnel (viz. Project Manager, Project Engineer, Construction Safety Officer, Foremen, etc), to be assigned to the contract to be bid, with their complete qualification and experience data (including the key personnel's signed written commitment to work for the project once awarded the contract).

BID DOCUMENTS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standard Form Number: NPCSF-INFR-12

LIST OF EQUIPMENT, OWNED OR LEASED AND/OR UNDER PURCHASE AGREEMENTS

(Based on the Minimum Equipment Required in the Bidding Documents)

Description	Model/Year	Capacity / Performance / Size	Plate No.	Motor No. / Body No.	Location	Condition	Proof of Ownership / Lessor or Vendor
. Owned				<u> </u>			
							
				<u> </u>			
Leased			L	<u> </u>	<u></u>		
Leaseu	 	 -	1				
		 			 	 	
	 	·		 			
	 			 			
			 		 -		· · · · · · · · · · · · · · · · · · ·
. Under Purchase Agree	ments		<u> </u>	<u> </u>	 -	<u> </u>	<u> </u>
•		T .	·				
				 			-
						·	
		<u>. </u>		<u></u>	_	<u> </u>	<u> </u>
	Submitted	by:					
			(Delegand Ma	me & Signature)		-	

One of the requirements from the bidder to be included in its Technical Envelope is the list of its equipment units pledged for the contract to be bid, based on minimum equipment required in the bidding docs, which are owned (supported by proof/s of ownership), leased, and/or under purchase agreements (with corresponding engine numbers, chassis numbers and/or serial numbers), supported by certification of availability of equipment from the equipment lessor/vendor for the duration of the project

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Standa	BID LETTER
	Date:
То:	THE PRESIDENT National Power Corporation BIR Road cor. Quezon Ave. Diliman, Quezon City
We, t	he undersigned, declare that:
(a)	We have examined and have no reservation to the Bidding Documents, including Addenda, for the Contract CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR (LuzP21Z1311Sc).
(b)	We offer to execute the Works for this Contract in accordance with the Bid Documents, Technical Specifications, General and Special Conditions of Contract accompanying this Bid;
	The total price of our Bid, excluding any discounts offered below is: [insert information]
	The discounts offered and the methodology for their application are: [Insert Information]
(c)	Our Bid shall be valid for a period of <u>linsert number!</u> days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
(d)	If our Bid is accepted, we commit to obtain a Performance Security in the amount of <u>linsert percentage amount!</u> percent of the Contract Price for the due performance of the Contract;
(e)	Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from the following eligible countries: [insert information]
(f)	We are not participating, as Bidders, in more than one Bid in this bidding process, other than alternative offers in accordance with the Bidding Documents;
(g)	Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the Funding Source;
(h)	We understand that this Bid, together with your written acceptance thereof included

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

formal Contract is prepared and executed; and

in your notification of award, shall constitute a binding contract between us, until a

SECTION VIII - BIDDING FORMS

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- (j) We likewise certify/confirm that the undersigned, is the duly authorized representative of the bidder, and granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for the CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR (LuzP21Z1311Sc) of the National Power Corporation.
- (k) We acknowledge that failure to sign each and every page of this Bid Letter, including the Bill of Quantities, shall be a ground for the rejection of our bid.

Name:	
In the capacity of:	
Signed:	·
Duly authorized to sign the Bid for and on behalf of:	
Date:	

RID	DOCUM	PTMEN

SECTION VIII - BIDDING FORMS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

LuzP21Z1311Sc

Standard Form No.: NPCSF-INFR-14

DETAILED COST ESTIMATE FORM

Name of Bidder :	

Item No.	Item Description	Unit of	· · · · · · · · · · · · · · · · · · ·	Direct Cost		Mar	k-Up	144-		
		Measure	Materials	Labor	Equipment	OCM	Profit	VAT	Unit Cost	Total Price
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Name, Signature of Authorized Representative	Designation
·	Boognation

SECTION VIII - BIDDING FORMS

LuzP21Z1311Sc

Designation

Standard Form No.; NPCSF-INFR-15

Name, Signature of Authorized Representative

SUMMARY SHEETS OF MATERIALS PRICES, LABOR RATES AND EQUIPMENT RENTAL RATES

Name of Bidder:				
Unit	Unit Price			
Poto/Us				
∺ate/Hr.				
Rental Rate	/Hr.			

BID DOCUMENTS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI - TECHNICAL SPECIFICATIONS

LuzP21Z1311Sc

BID DRAWINGS

MECHANICAL DRAWINGS

BID DOCUMENTS

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI - TECHNICAL SPECIFICATIONS

LuzP21Z1311Sc

SECTION IX - BID DRAWINGS

MW - MECHANICAL DRAWINGS

DRAWING NO.	TITLE
CalDPP-BDM-17.001	Plant Layout (2 X 50KW Calutcot DPP)
CalDPP-BDM-17.002	Equipment and Piping Layout (2 X 50KW Calutcot DPP)
ButDPP-BDM-17.001	Plant Layout (2 X 50KW Butawanan DPP)
ButDPP-BDM-17.002	Equipment and Piping Layout (2 X 50KW Butawanan DPP)

TYPICAL DRAWINGS

CBBSDPP-BDM-17.001	Typical Fuel Oil Filling System (P&I Diagram)
CBBSDPP-BDM-17.002	1000 Liters Fuel Oil Day Tank (Typical)
CBBSDPP -BDM-17.003	Typical Domestic Water System And Oil-Water Line
CBBSDPP -BDM-17.004	Domestic Water System (P&I Diagram)
CBBSDPP -BDM-17.005	Shallow Well Details
CBBSDPP -BDM-17.005	Generator Set Weatherproof Enclosure (Typical for all Gensets)

LuzP21Z1311Sc

SECTION VIII

BIDDING FORMS

LuzP21Z1311Sc

SECTION IX

BID DRAWINGS

LuzP21Z1311Sc

SECTION IX

BID DRAWINGS (CIVIL WORKS)

SIRUMA, CAMARINES SUR

SECTION VI - BID/ REFERENCE DRAWINGS

LuzP21Z1311Sc

SECTION VI – BID DRAWINGS CW – CIVIL WORKS

DRAWING NO.	TITLE
ButDPP-BDC-17.001	SITE DEVELOPMENT PLAN (1x50 & 1x30kW BUTAWANAN)
CalDPP-BDC-17.001	SITE DEVELOPMENT PLAN (2x50kW CALUTCOT DPP)
CBBSDPP-BDC-17.001	TYPICAL PREFAB CONTAINER HOUSE (FOUNDATION, FOOTING AND PEDESTAL PLAN DETAILS)
CBBSDPP-BDC-17.002	TYPICAL ENTRANCE GATE AND PERIMETER FENCE (ELEVATION, SECTION AND DETAILS)
CBBSDPP-BDC-17.003	TYPICAL GENSET AND TRANSFORMER PAD (PLAN, SECTION AND DETAILS)
CBBSDPP-BDC-17.004	TYPICAL WATER TANK AND DAY TANK SUPPORT (PLAN, SECTION AND DETAILS)
CBBSDPP-BDC-17.005	TYPICAL SEPTIC TANK, RC CANAL AND OIL WATER SEPARATOR
CBBSDPP-BDC-17.006	TYPICAL FLAGPOLE AND LIGHTING POLE FOUNDATION (PLAN, SECTION AND DETAILS)
CBBSDPP-BDC-17.007	TYPICAL DIRECT BURIED STEEL POLE (DETAILS)
CBBSDPP-BDC-17.008	TYPICAL FENCE AND PEDESTRIAN GATE (PLAN, SECTION AND DETAILS)



TERMS OF REFERENCE

CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

SECTION VI - BID/REFERENCE DRAWINGS

LuzP21Z1311Sc

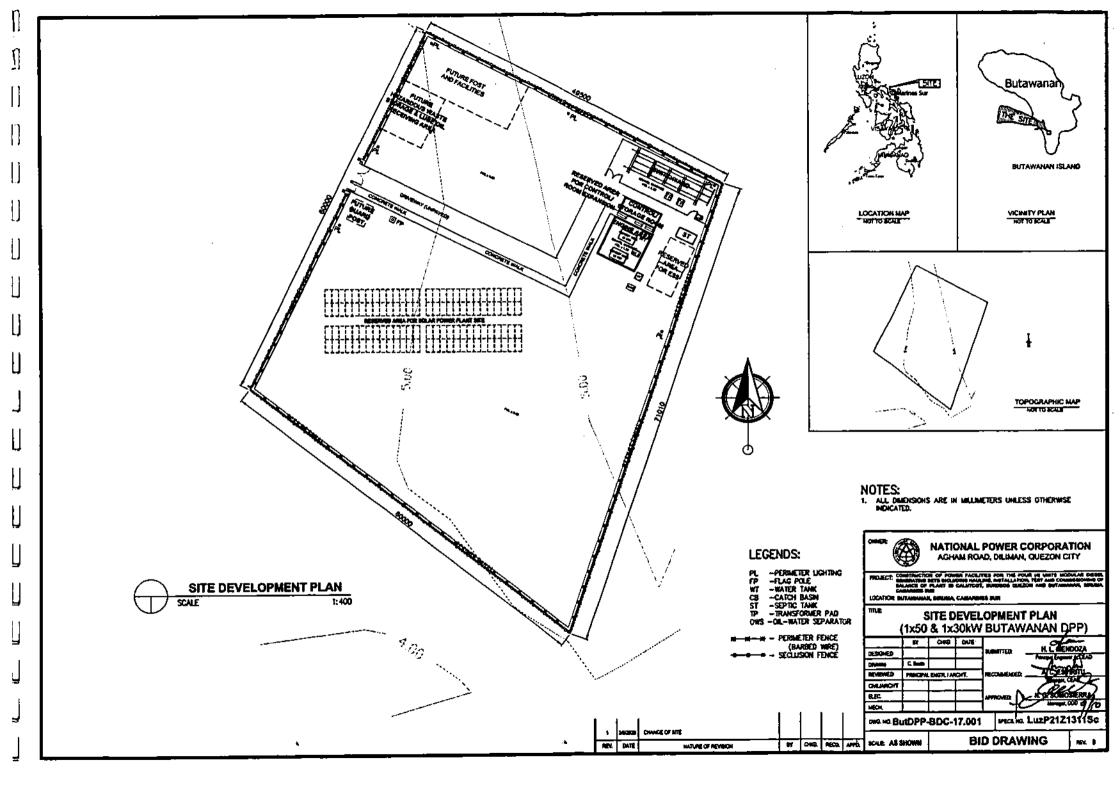
SECTION VI – BID DRAWINGS AW – ARCHITECTURAL WORKS

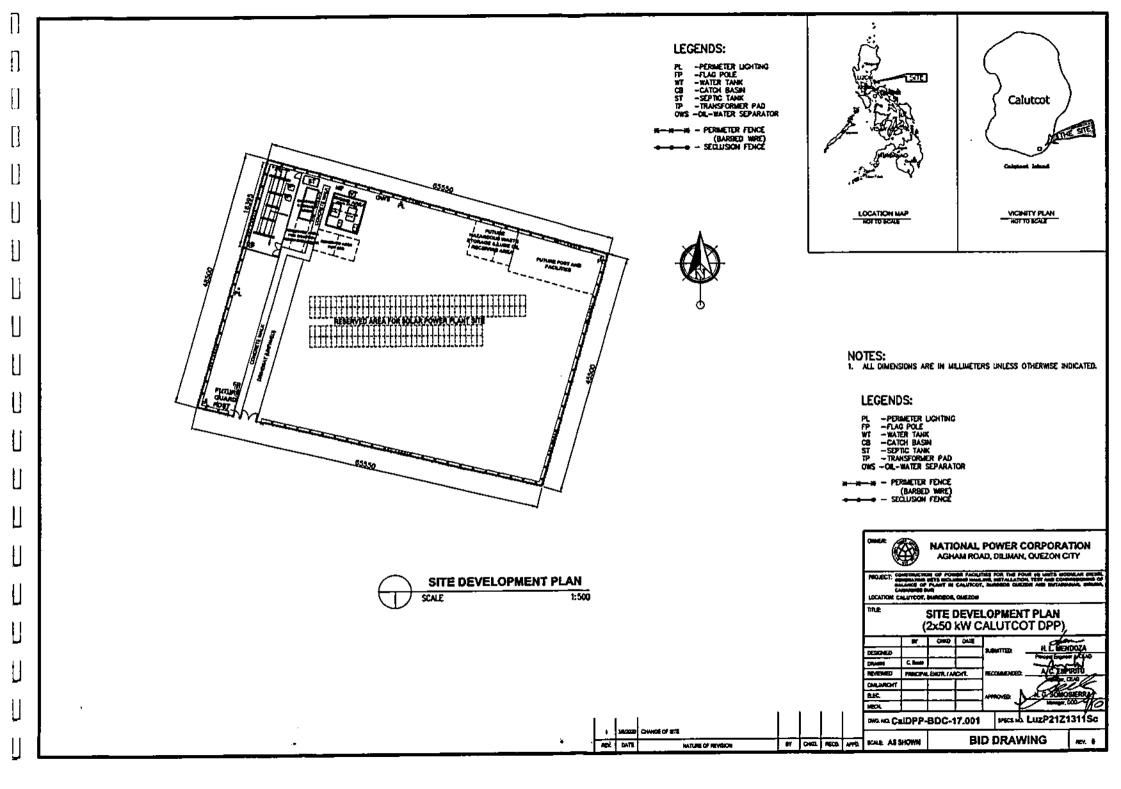
DRAWING NO.

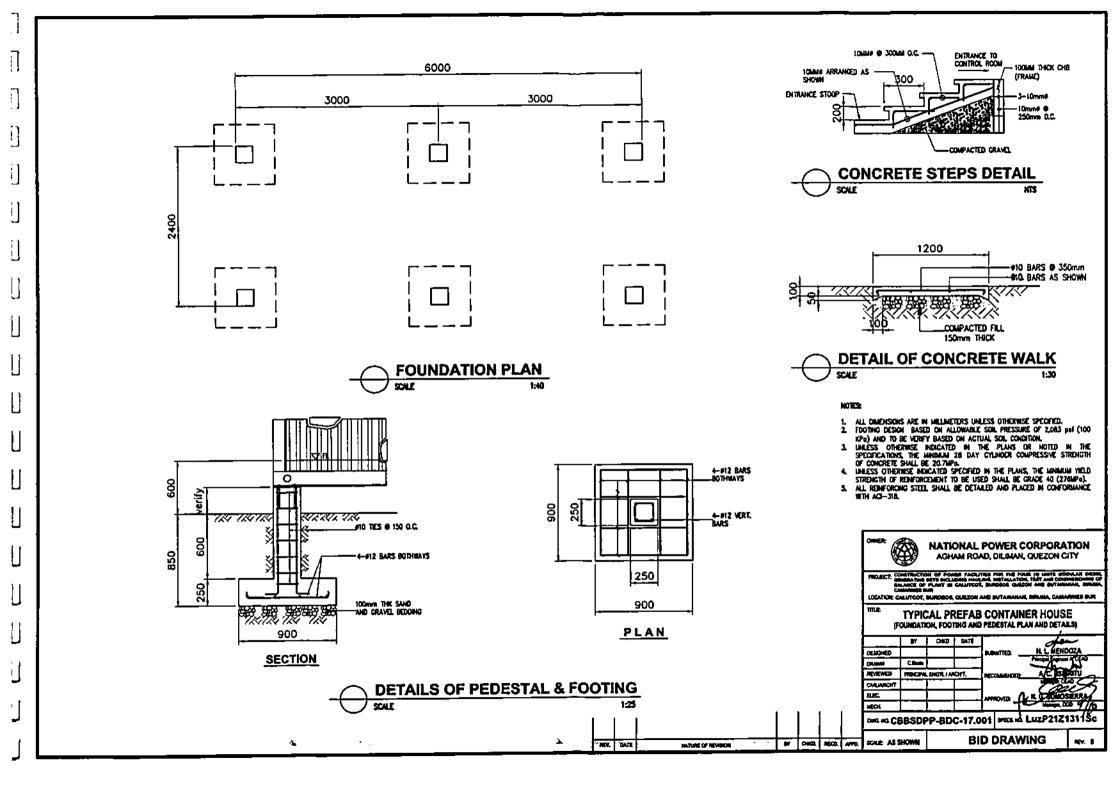
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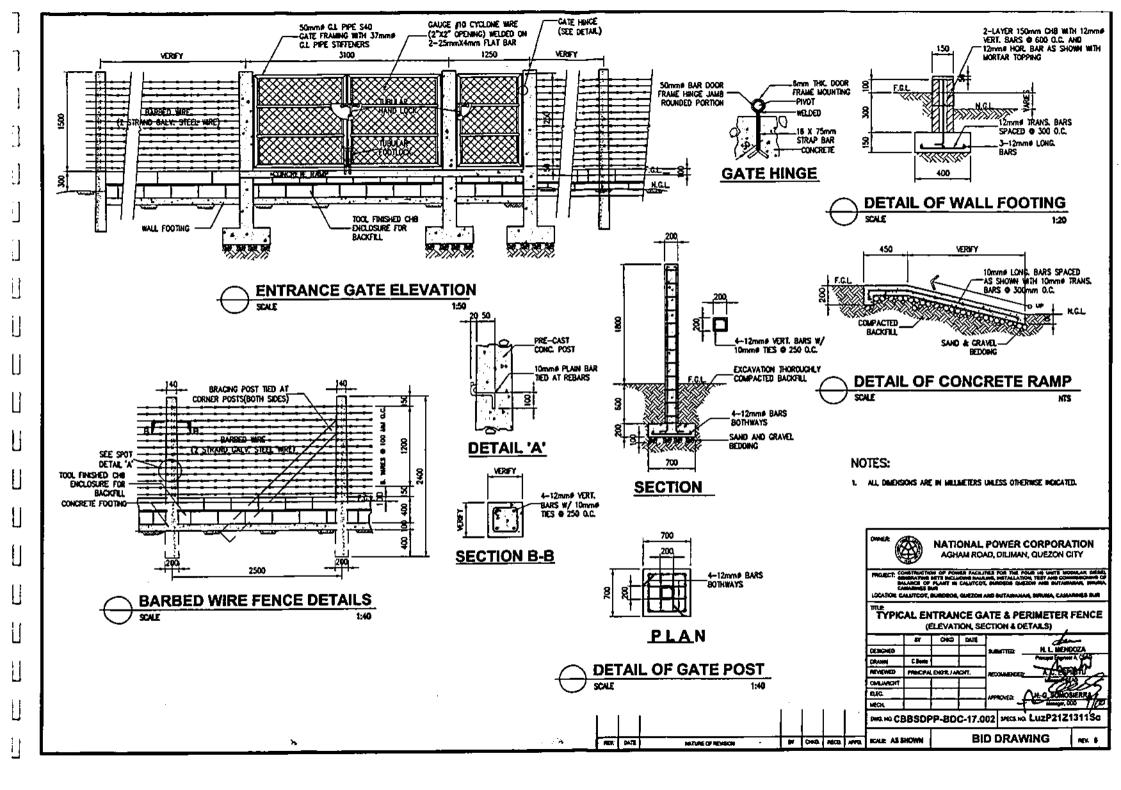
CBBSDPP-BDA-17,001

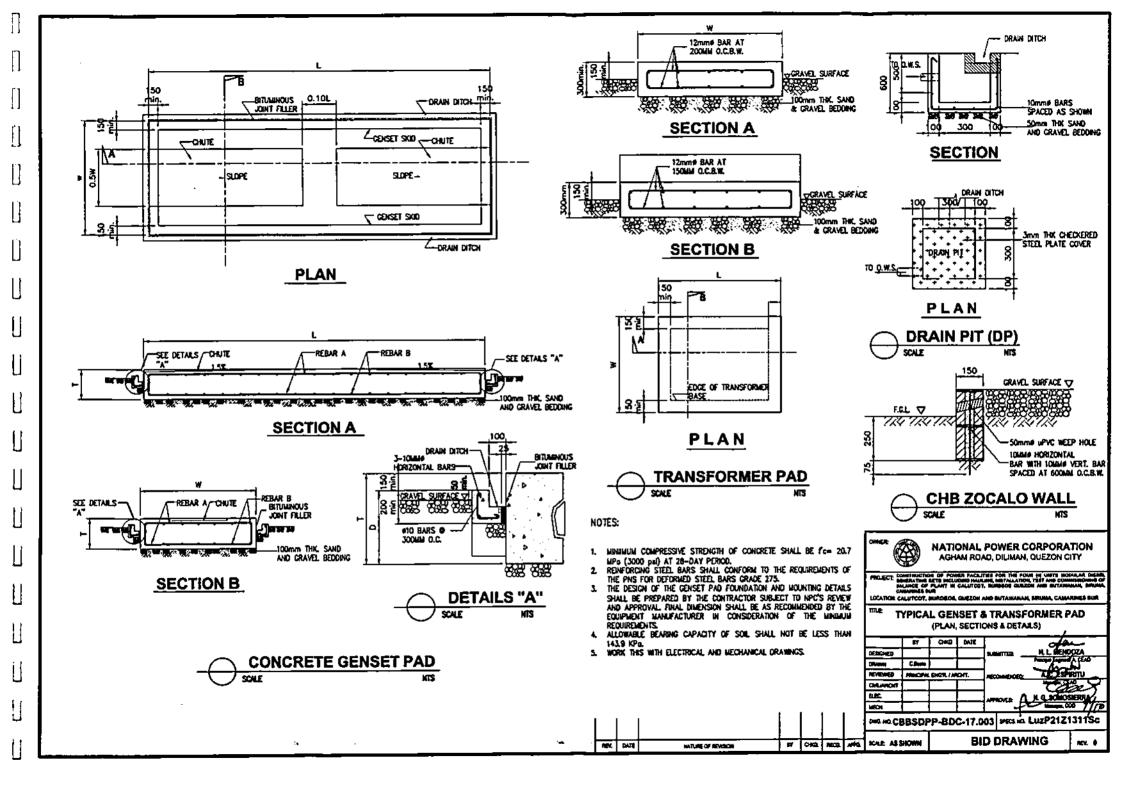
TYPICAL PREBRICATED CONTAINER HOUSE (TYPICAL FLOOR PLAN AND ELEVATION)

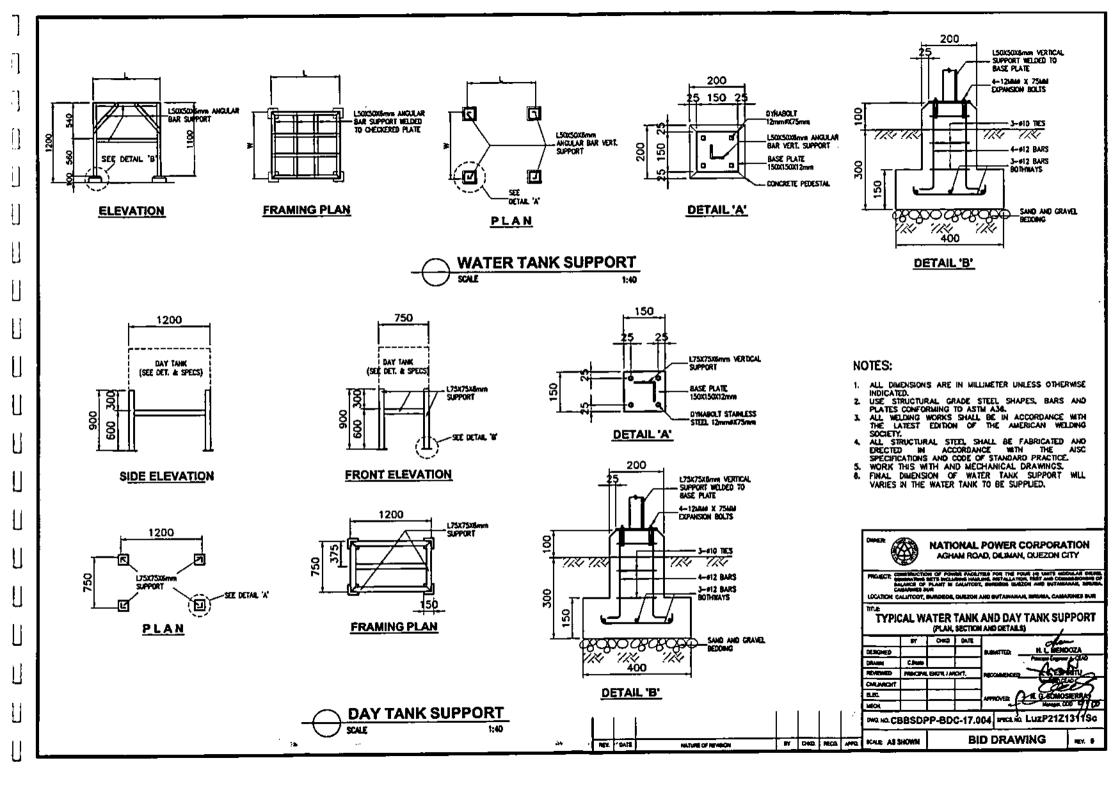


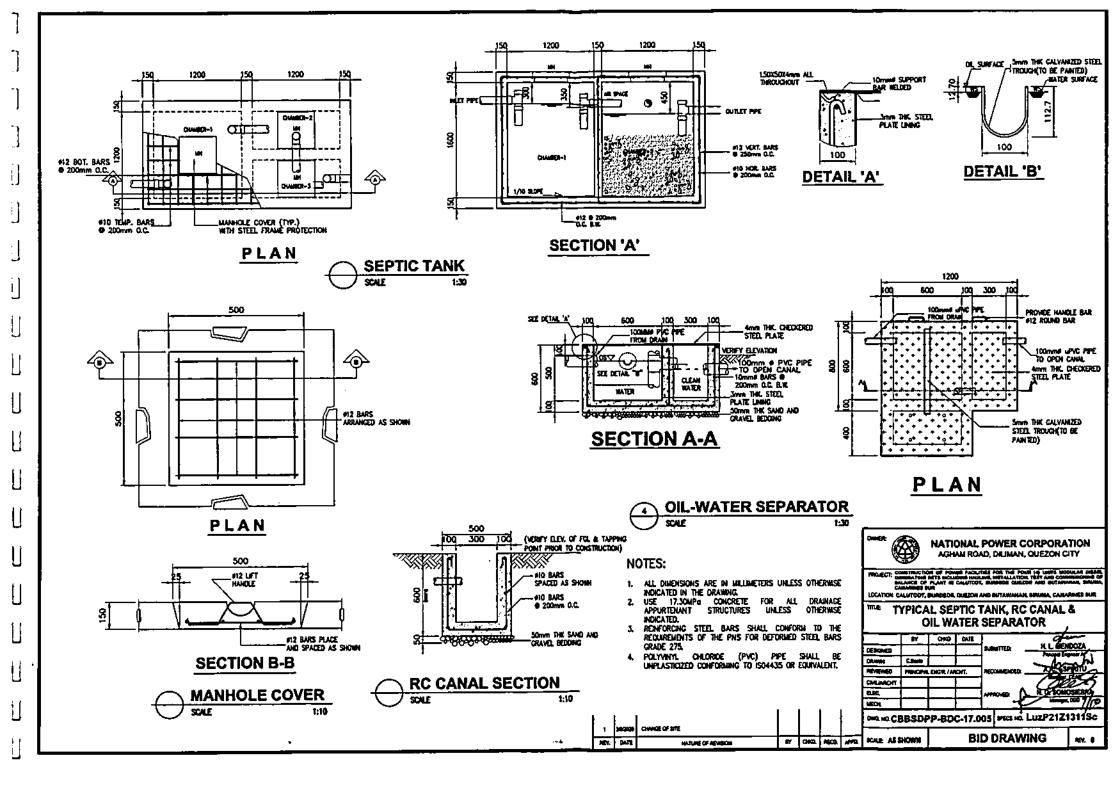


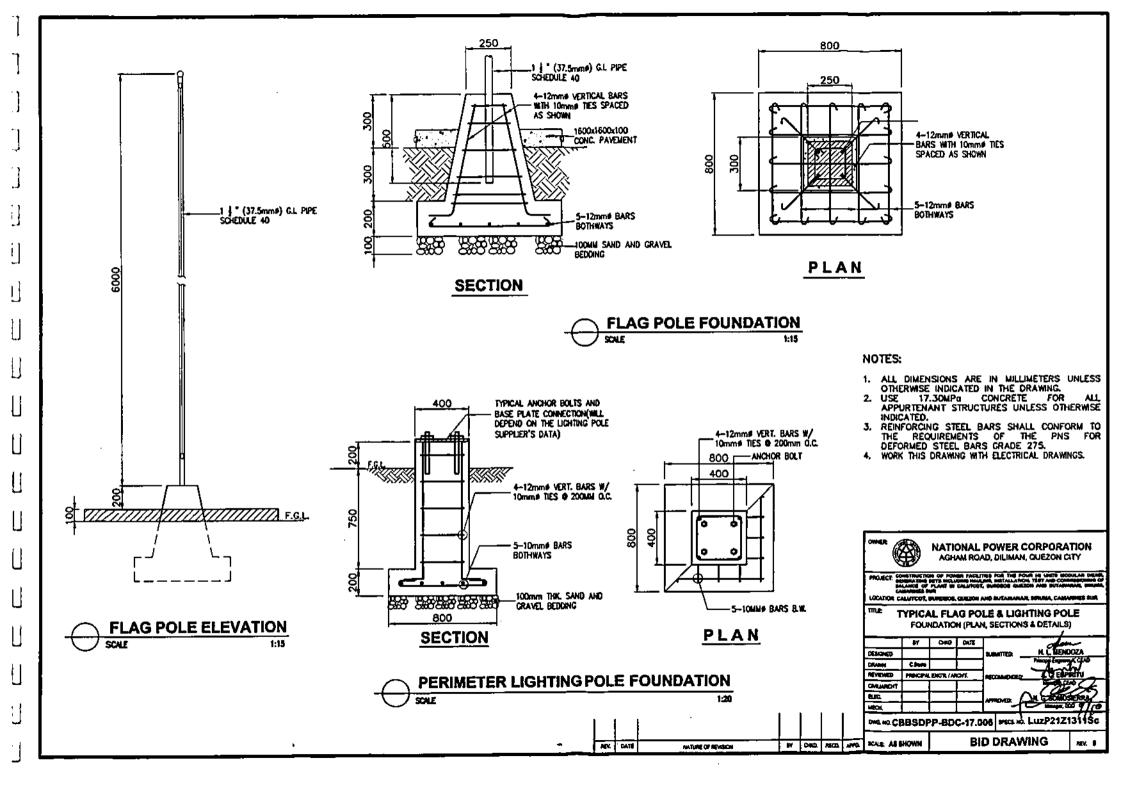


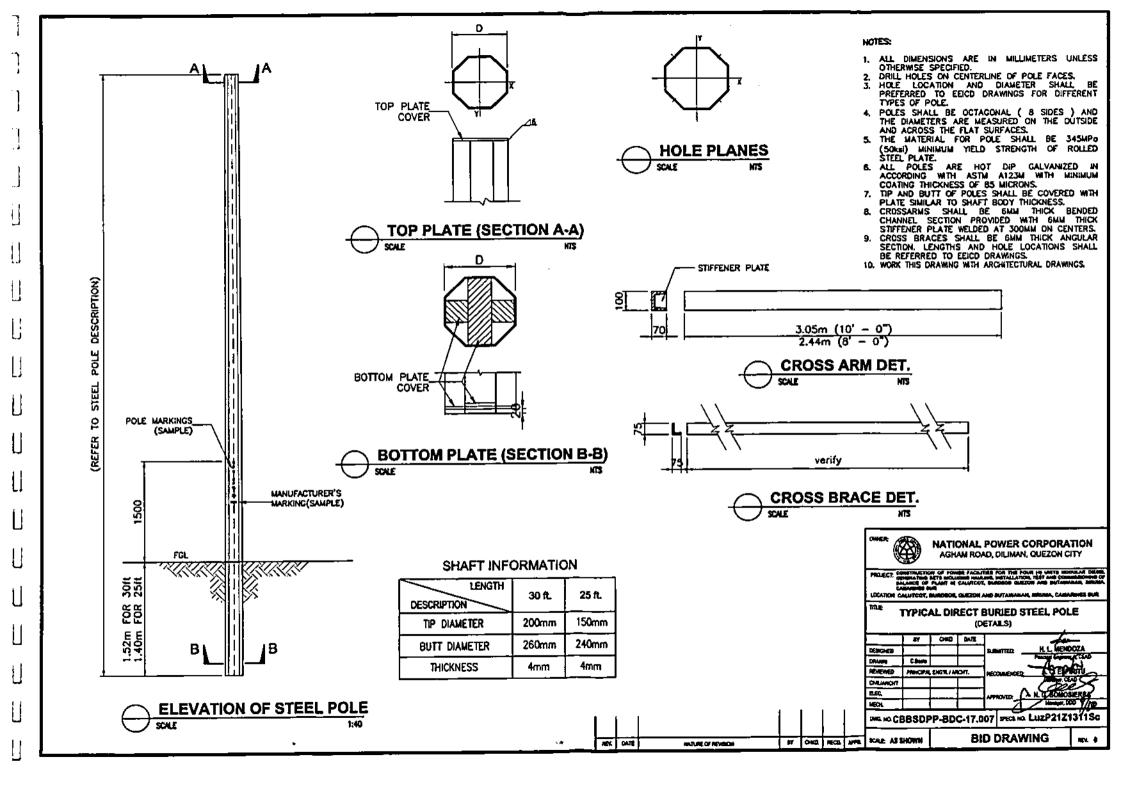


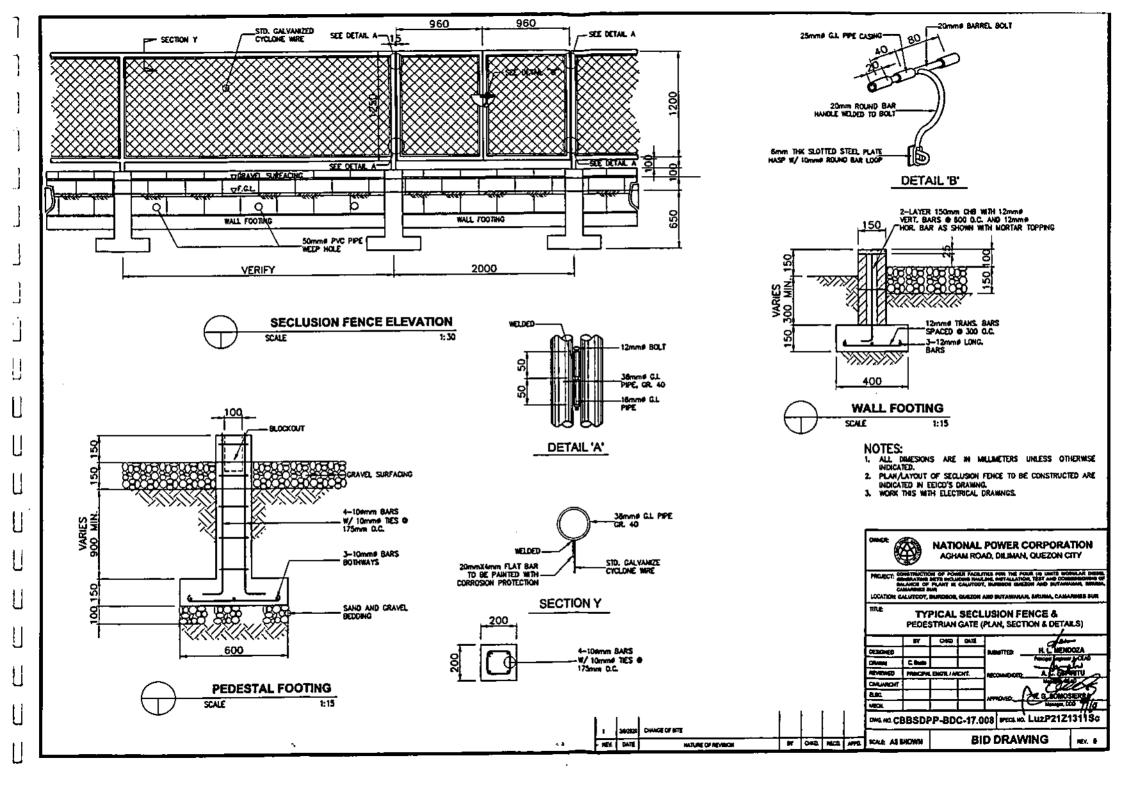












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CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAI SIRUMA, CAMARINES SUR

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SECTION IX

BID DRAWINGS (ARCHITECTURAL WORKS)



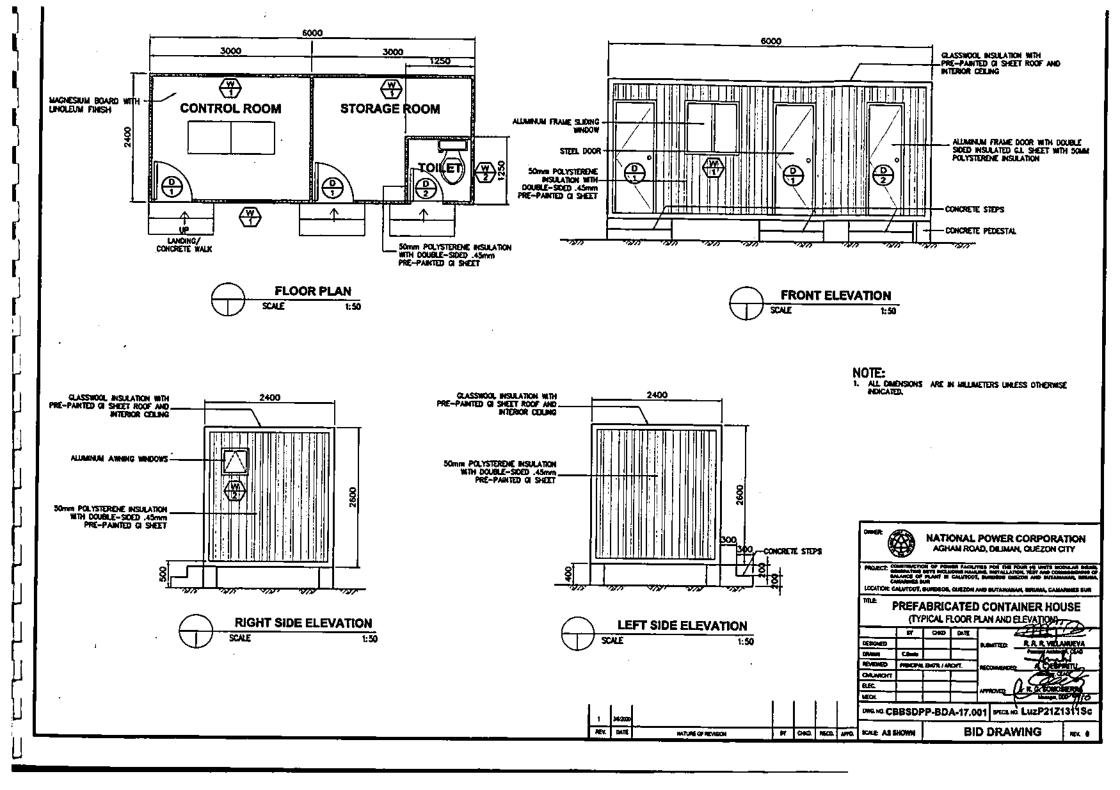
CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

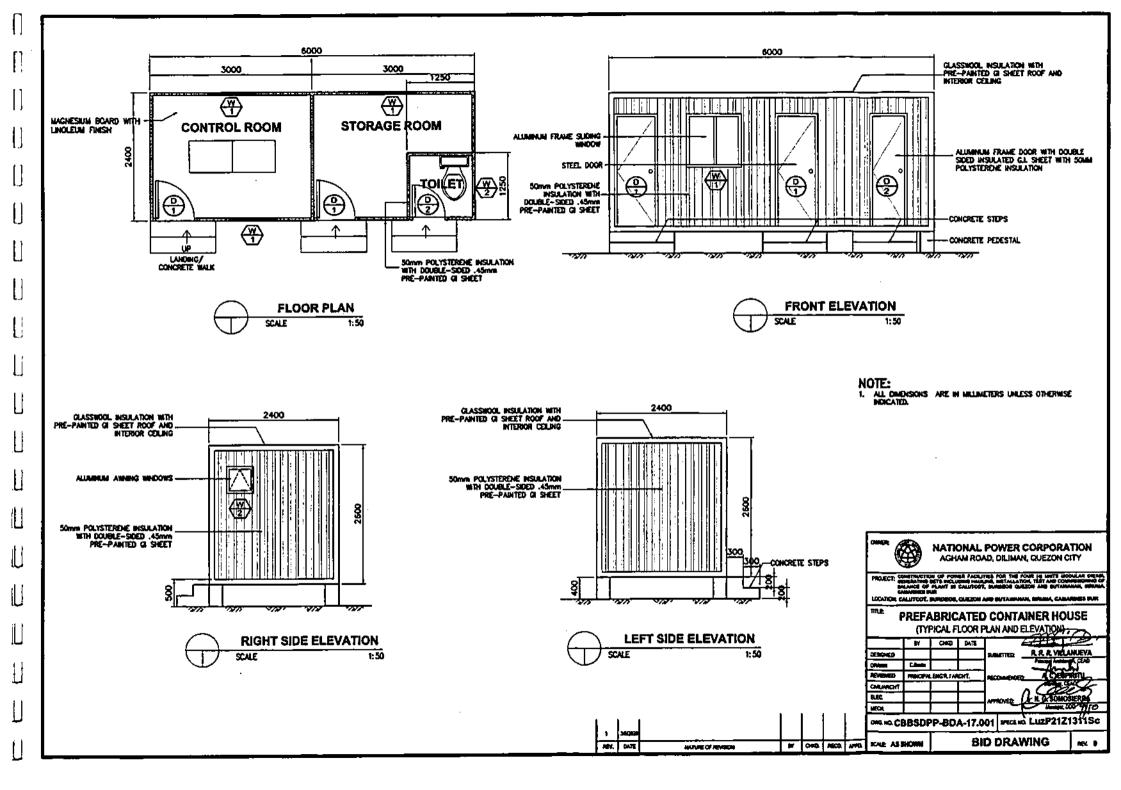
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SECTION IX

BID DRAWINGS (ARCHITECTURAL WORKS)







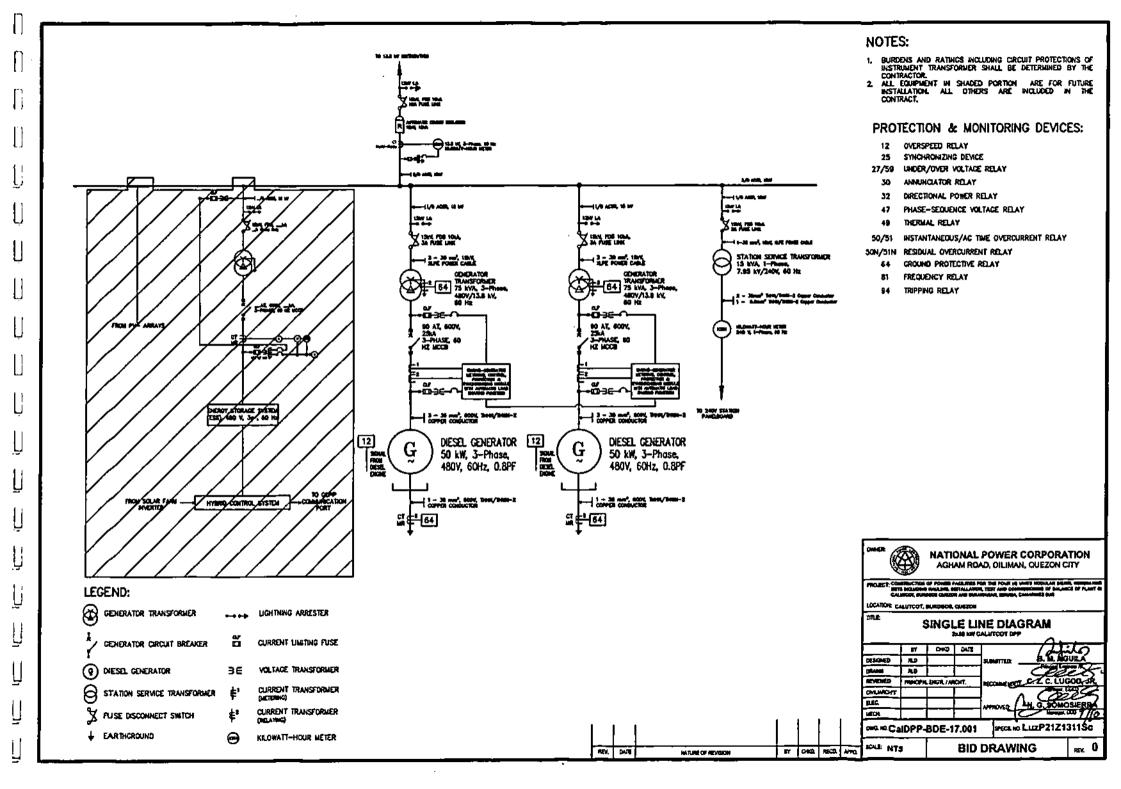
CONSTRUCTION OF POWER FACILITIES FOR THE FOUR (4) UNITS MODULAR DIESEL GENERATING SETS INCLUDING HAULING, INSTALLATION, TEST AND COMMISSIONING OF BALANCE OF PLANT IN CALUTCOT, BURDEOS QUEZON AND BUTAWANAN, SIRUMA, CAMARINES SUR

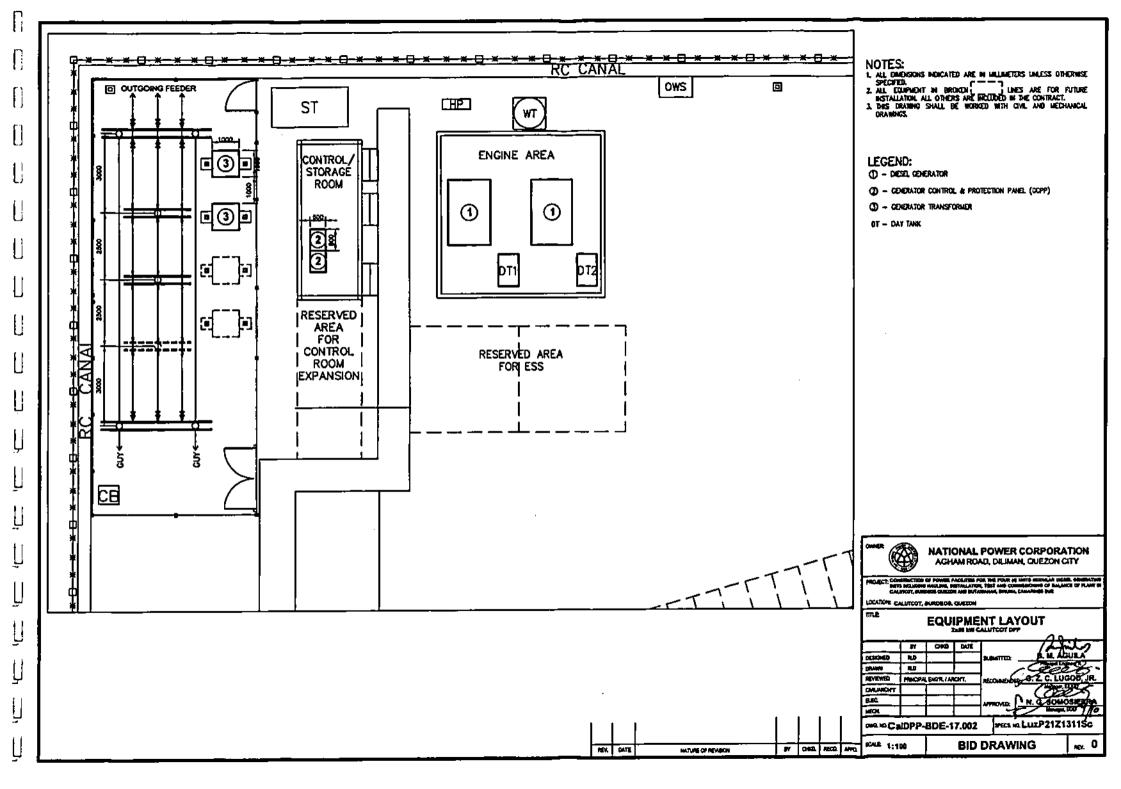
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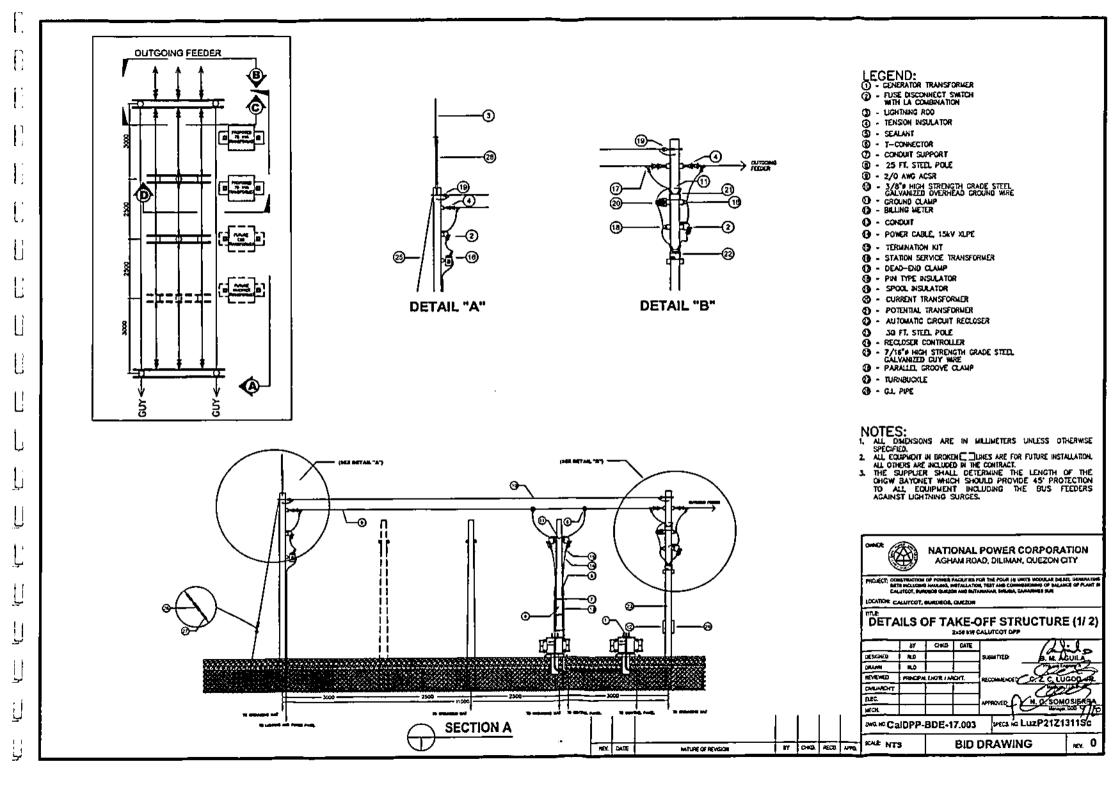
SECTION IX

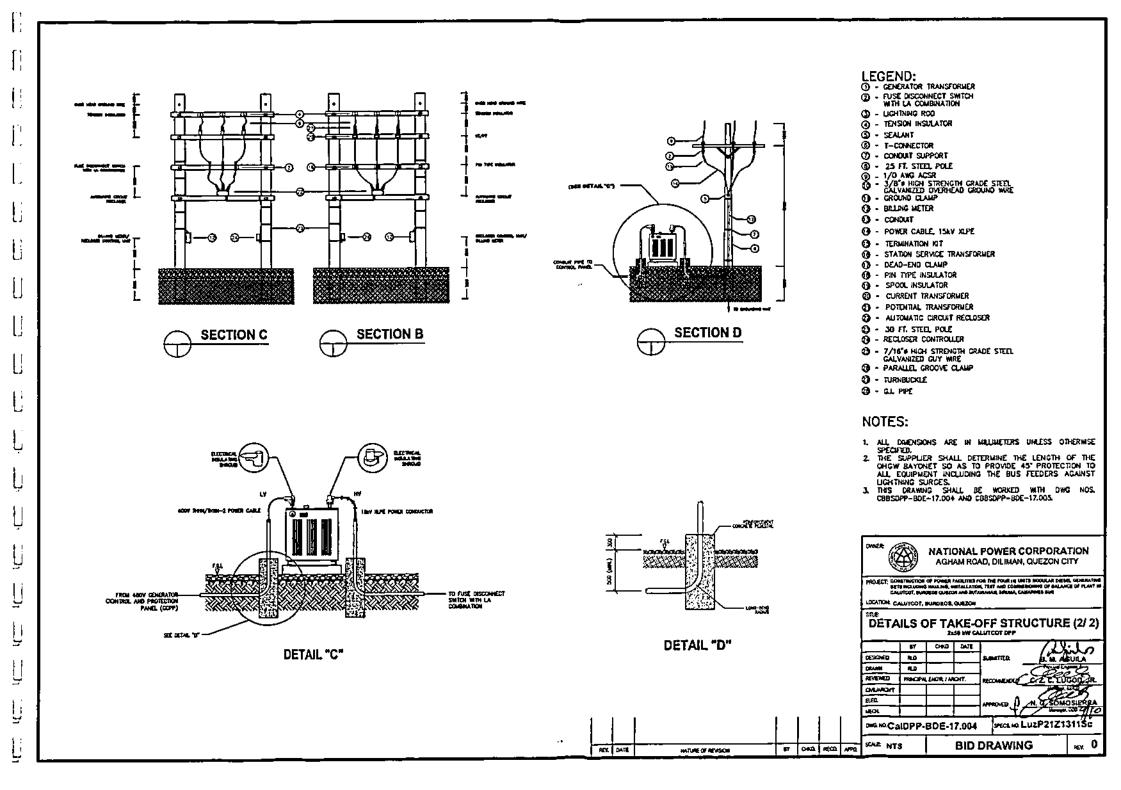
BID DRAWINGS (ELECTRICAL WORKS)

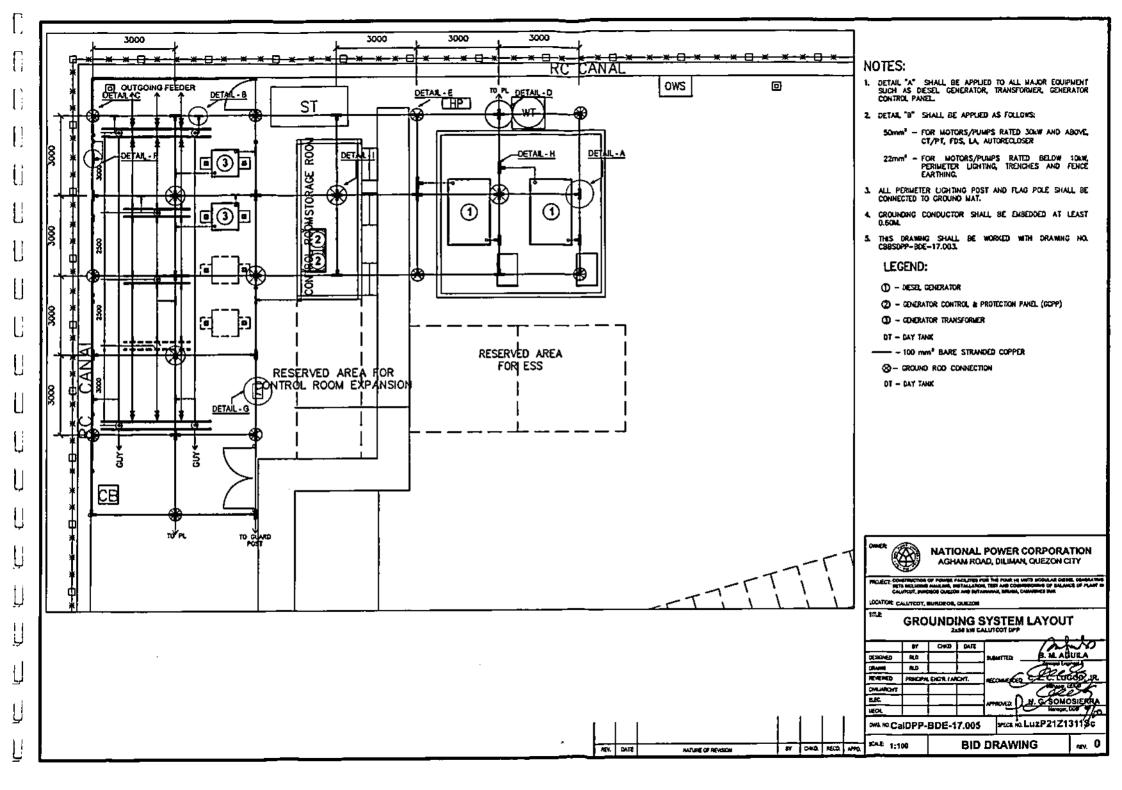


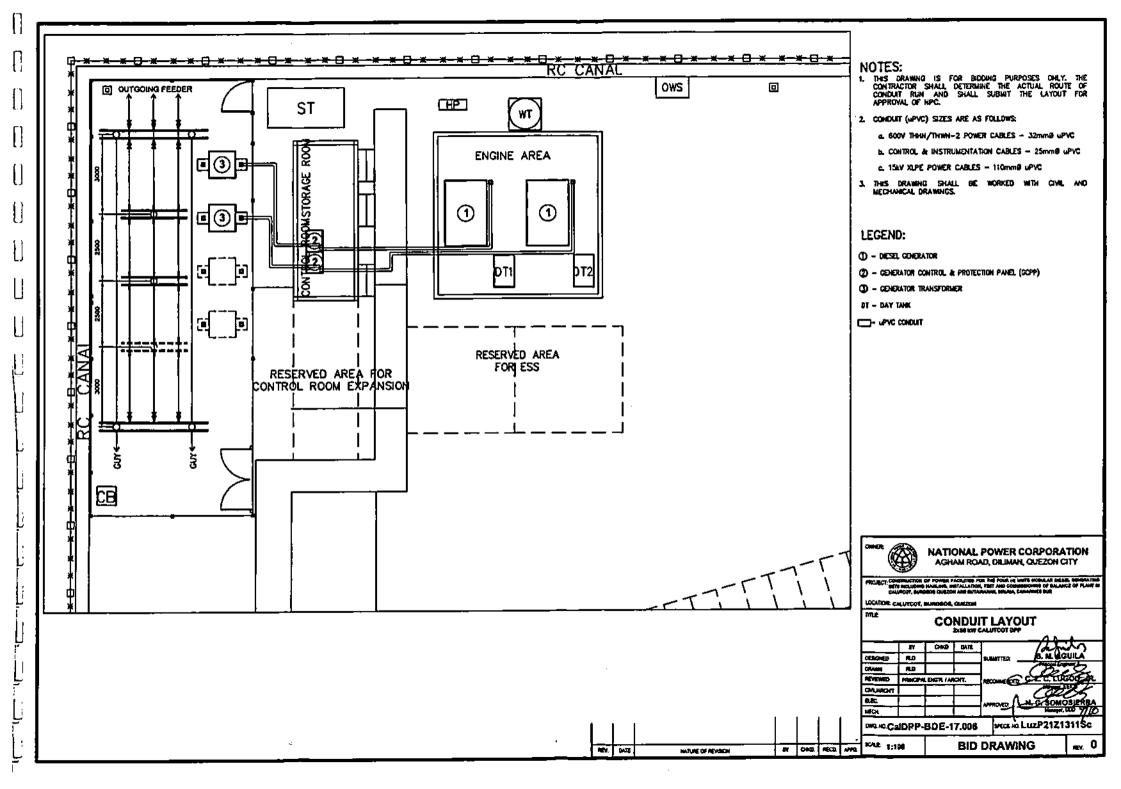


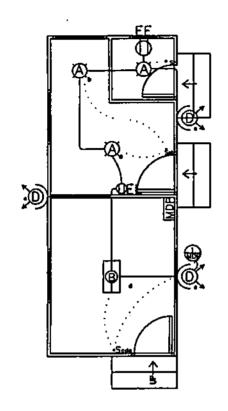




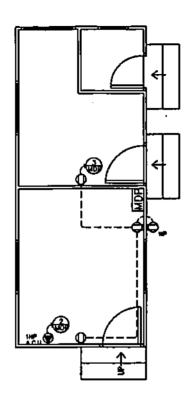








LIGHTING LAYOUT



POWER LAYOUT

REV. DATE

NATURE OF REVISION

- NOTES:

 1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST PROVISIONS OF THE PHILIPPINE ELECTRICAL COOP, LOCAL COMMANCES AND REQULATIONS.

 2. CONDUIT RUNS ARE INDICATIVE ONLY. THE ACTUAL LOCATION SHALL BE DETERMINED IN THE FELD.

 3. ALL WIRES SHALL BE TYPE THEM/THINN-2 SODY INSULATION, 90° OPERATING TEMP, STRANDED COPPER COMMITTED.
- CONDUCTOR.
- CONDUCT SHALL BE LIPVC, SCH. 40.
 THIS GRAWING SHALL BE WORKED WITH DRAWING NOS.
 COUDPP-BDE-17:009, SCHEDULE OF LOADS & RISER
 DIAGRAM AND COBSOPP-BDE-17:007 FOR DETAILS OF LICHTING FOCTURES.
- 8. THIS DRAWING SHALL BE WORKED WITH CIVIL AND MECHANICAL BID DRAWINGS.

LEGEND:

 $\boldsymbol{\omega}$ - FIXTURE TYPE A

■ FIXTURE TYPE B

- EMERGENCY UCHT OUTLET

- FIXTURE TYPE D

- SINGLE POLE SWITCH

- DUPLEX SWITCH

(SUBSCRIPT DENOTES LAMP BEING CONTROLLED)

- THREE GANG WALL SWITCH

(SUBSCRIPT DENOTES LAMP BEING CONTROLLED) - 200 VA DUPLEX CONVENIENCE OUTLET

200 VA DUPLEX CONVENIENCE OUTLET

(WEATHER PROOF)

- EXHAUST FAN

ENCLOSED CIRCUIT BREAKER W/BULT-IN UNIVERSAL OUTLET FOR WINDOW TYPE ACU

- CIRCUIT RUNNING ON CEILING

- CIRCUIT RUNNING UNDERGROUND

· · · - CONTROL CIRCUIT

- CIRCUIT HOMERUN

- MAIN DISTRIBUTION PANEL



NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN, QUEZON CITY

PROJECT: COMPRESCRIBE UP PUMPE PACELTRES POR THE POLICY OF UNITY INDUCED GRAND, OBMERATION THE BICLIMENS HARRING, REPLACATION, THEY AND COMPRESSIONS OF SALARICE OF PLANT IN CALIFFORM, RANDONG RECEIPM AND ENTERSHAMEN, THE

LIGHTING AND POWER LAYOUT (CONTROL ROOM AND STORAGE ROOM) 2x10 MW CALUTCOT DPP

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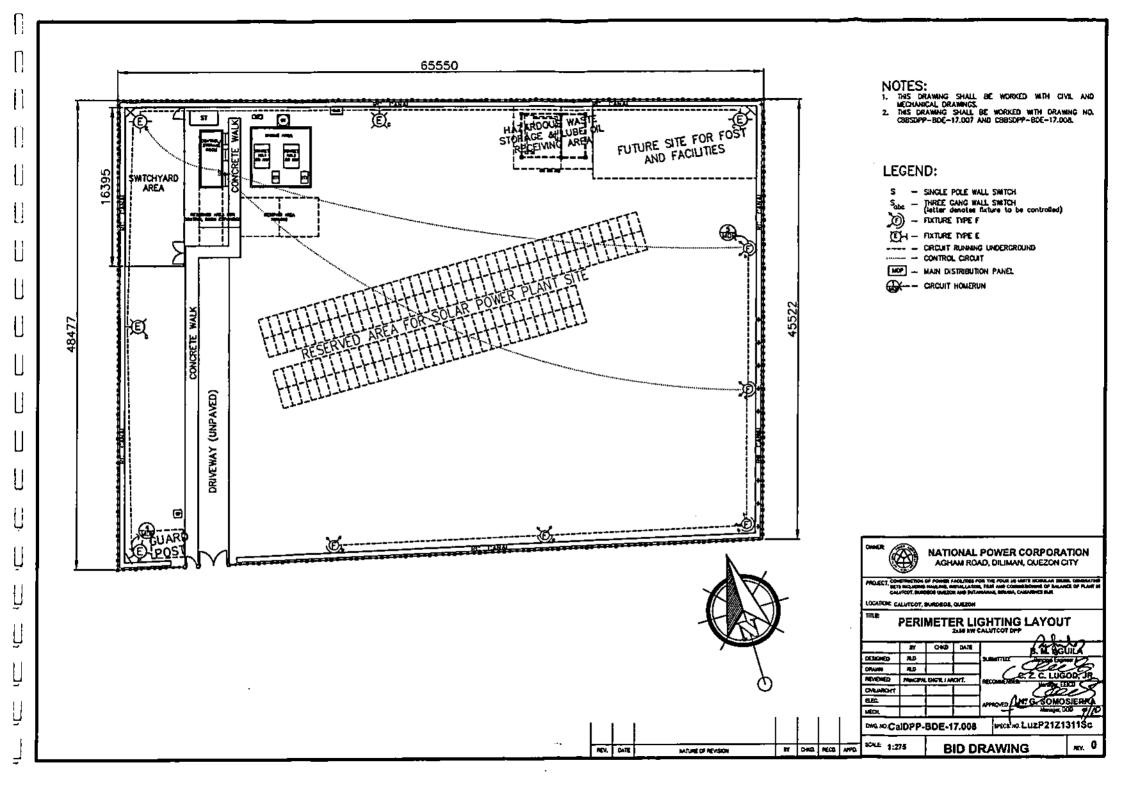
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Secretar LuzP21Z1311Sc

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BID DRAWING

REV. O



	SOMETHE OF LONGS								
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CIKT ING.	DESCRIPTION	VA	٧	^	BREAKER	MAC	CONOUT		
1	1 - 2 X SW LED LAMP TUBE, TYPE B 3 - SW COMPACT LED LAMP, TYPE A 1 - 100WA EMERGENCY LICHT OUTLET 1 - 100WA EDWLIST FAN 3 - SOW FLOOD LED FLOOD LICHT, TYPE D	444	230	1.93	SOAF / ISAT	2 - 3.5mm* Tree/Dess-2	20mmill siPVC		
2	1 - 1.GHP AIR CONDITIONER UNIT	1840	230	E.DQ	50AF / 20AT	2 - 3.5mm ² THH/THH-2 1 - 3.5mm ² THH/THH-2	20mm0 uPVC		
,	3 - 200M CONVENENCE OUTLET 1 - 200M CONVENENCE OUTLET (WEATHER PROOF)	800	230	14	50AF / 20AT	2 - 3.5mm² Trent/Trent-2 1 - 3.5mm² Trent/Trent-2	20mm@ uPVC		
-	5 - 1 x 30W FL000 LIGHT (WEATHERPROOF), TYPE F	188	230	0.02	50AF / 1SAT	3 - COmm ³ Treet/Treet-2	20mm8 uPVC		
5	5 - 1 × 30V LED PERMETER USHTNO, TIPE E	188	230	0.02	SOAF / ISAT	2 - 8.0mm* THRI/THRI-2	20mme uPVC		
•	1 - 100VA SPACE HEATER FOR SOME MODULAR D/G SET	1500	230	6.53	50AF / 20AT	2 - 3.5mm Test/Test-2 1 - 3.5mm Test/Test-2	20mmil seVC		
7	1 - 100VA SPACE HEATER FOR SOMM MODULAR D/O SET	1500	236	(15)	SOAF / 20AT	2 - 3.5mm D00/7/00-2 1 - 3.5mm THOI/7/00-2	20mm8 uPVC		
•	FOR ESS LOADS	8500	230	41.30	SOAF / SOAT	2 - \$Conn ² Test/Test-2 1 - \$Conn ² Test/Test-2	20mm@ uPVC		
•	SPARE	1500	236	6.52	50AF / 20A7				
10	SPARE	1500	230	6.52	50AF / 20AT				
	TOTAL	18000	230	82.43					

PROVIDE: 250 AF / 100 AT, 2P MCCB WITH BRANCH CIRCUIT OF:

1 - 50AF/50AT, 2P, MCB

6 - 50AF/20AT, 2P, MCB 3 - 50AF/15AT, 2P, MCB

PROVIDE:

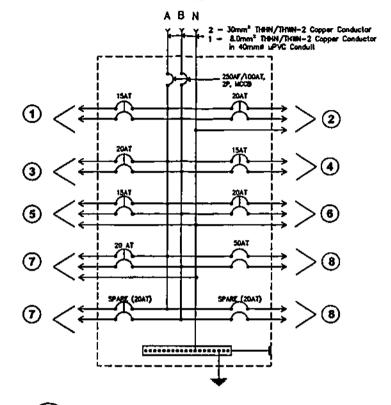
2 - 30mm3 THHN/THWN-2 & 1 - 8.0mm2 THHN/THWN-2

Copper Conductor

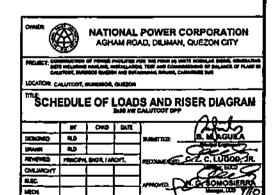
in 40mm# uPVC Conduit

SCHEDULE OF LOADS MAIN DISTRIBUTION PANEL (MDP)

FROM STATION SERVICE TRANSFORMER



RISER DIAGRAM MAIN DISTRIBUTION PANEL (MDP)

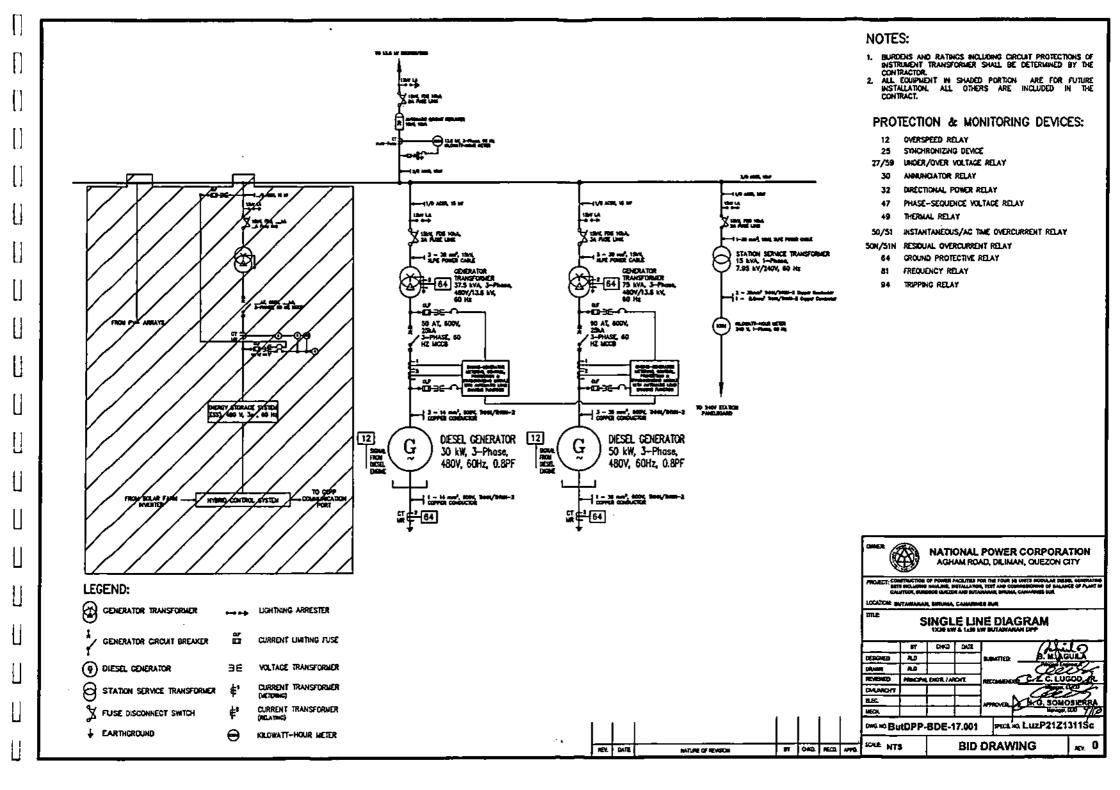


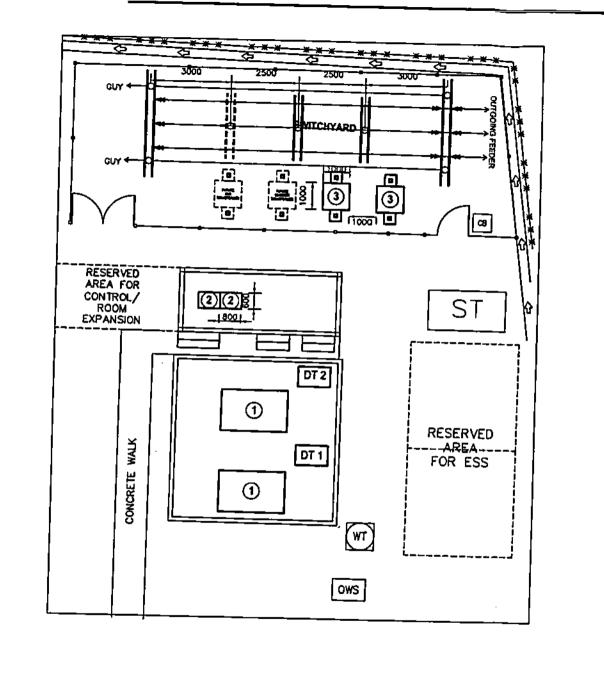
HATURE OF REVISION

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Secs in LuzP21Z1311Sc CalDPP-BDE-17.009 **BID DRAWING**

REV. O





MEX. DATE

HATURE OF REVISION

BY CHAIL RECT APPO

NOTES:

1. ALL DIMENSORS INDICATED ARE IN MILLIMETERS LINESS OTHERWISE SPECIFED.

2. ALL EQUIPMENT IN BROKEN.

2. ALL EQUIPMENT IN BROKEN.

1. THIS DRAWING SHALL BE WORKED WITH CIVIL AND MECHANICAL DRAWINGS.

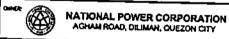
LEGEND:

(1) - DESEL CENERATOR

(CCPP) - CENERATOR CONTROL & PROTECTION PANEL (CCPP)

(I) - CENERATOR TRANSFORMER

DT - DAY TANK



PROJECT: COMMUNICATION OF POWER PACKAGES FOR THE POWER OF WORTS METRIAN CHARACTER PROJECT AND AND ANALYSIS OF PLANT OF COMMUNICATION OF BEAUTICE OF PLANT OF CAMPACO, MINISTER CAMPACO AND ANALYSIS OF PLANT OF CAMPACO, AND

LOCATIONS BUTANISMAN, SINGHAA, CANADINES BUT TITLE

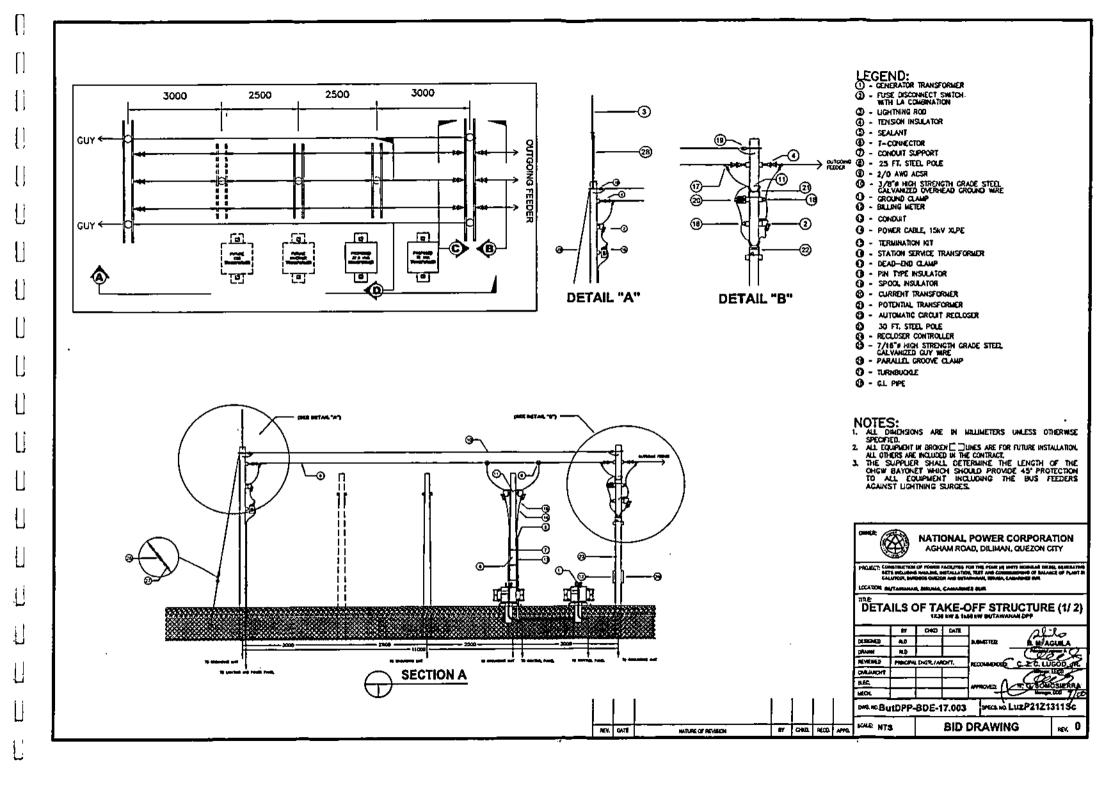
EQUIPMENT LAYOUT

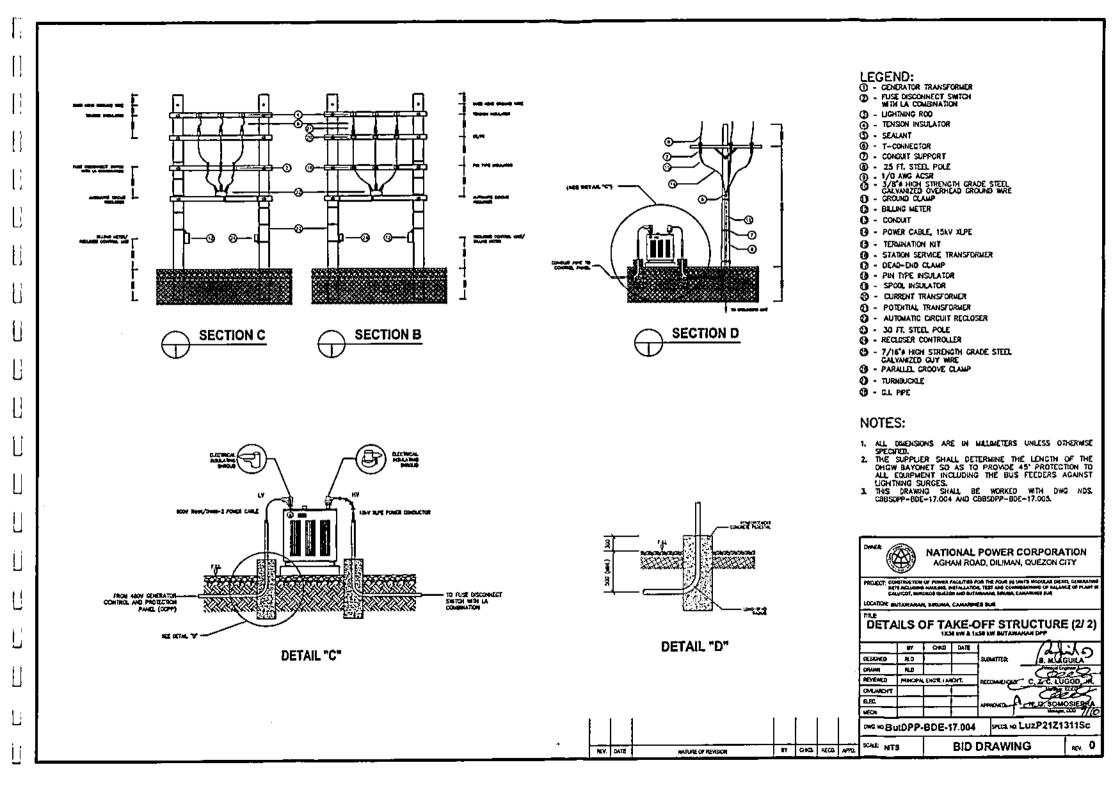
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Official	N.O					7		-
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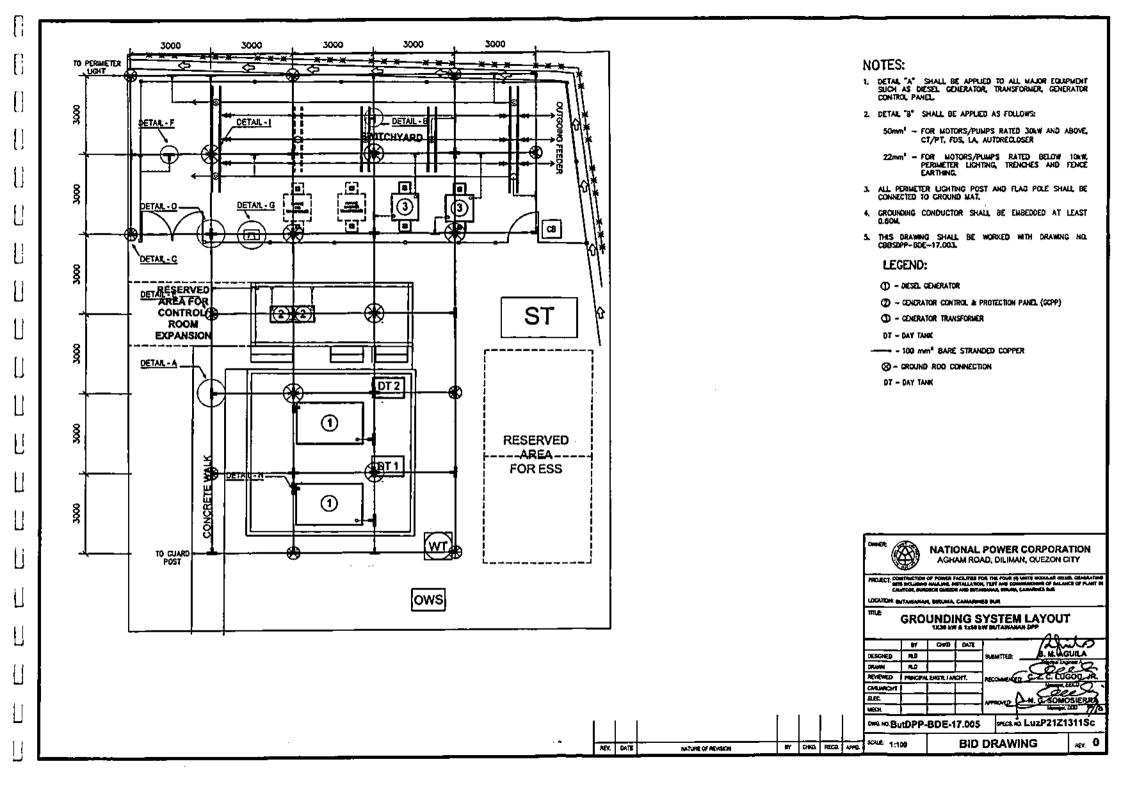
ONE NO BUILDPP-BDE-17.002 PECS NO LUZP21Z1311Sc SCALE 1:100

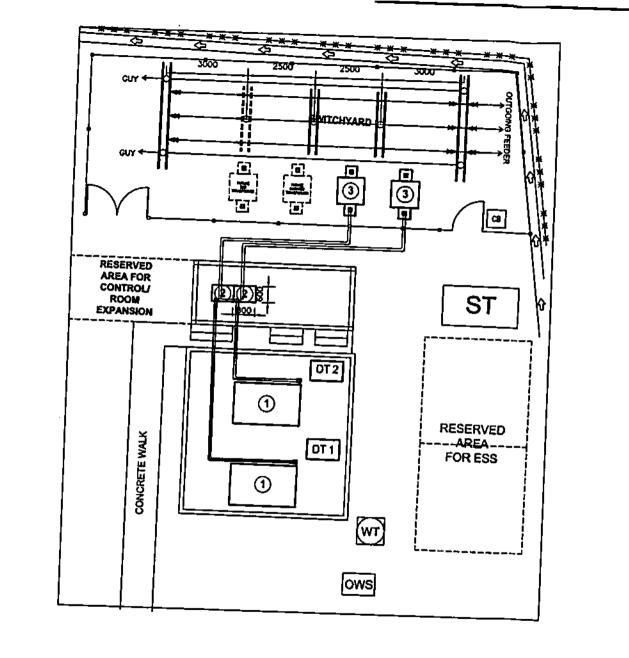
BID DRAWING

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REV. DATE

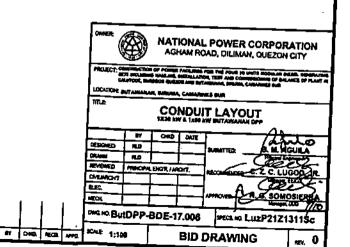
NATURE OF REVISION

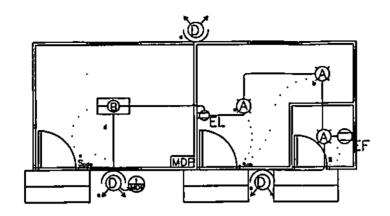
NOTES:

- 1. THIS ORAMHIC IS FOR BIDDING PURPOSES ONLY. THE CONTRACTOR SHALL DETERMINE THE ACTUAL ROUTE OF COMOUNT RUN AND SHALL SUBMIT THE LAYOUT FOR APPROVAL OF NPC.
- 2. CONDUIT (UPVC) SIZES ARE AS FOLLOWS:
 - a. 600V THUN/THWN-2 POWER CABLES 32mm# uPVC
 - b. CONTROL & INSTRUMENTATION CASLES 25mms uPVC
 - c. 15kV XLPE POWER CASILES 110mm@ uPVC
- 3. THIS DRAWING SHALL BE WORKED WITH CIVIL AND MECHANICAL DRAWINGS.

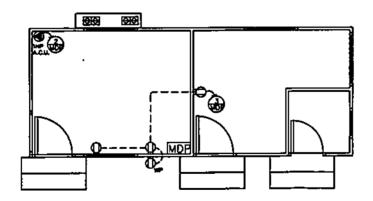
LEGEND:

- 1 DIESEL CONFRATOR
- (2) GENERATOR CONTROL & PROTECTION PANEL (GCPP)
- 3 CENERATOR TRANSFORMER
- DT DAY TAKE
- uPVC conduct





LIGHTING LAYOUT



POWER LAYOUT

- NOTES:

 1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST PROVISIONS OF THE PHUPPINE ELECTRICAL COOR, LOCAL ORDINANCES AND REGULATIONS.
- 2. CONDUT RUNS ARE INDICATIVE DM.Y. THE ACTUAL LOCATION SHALL BE DETERMINED IN THE FIELD.
- ALL MIRES SHALL BE TYPE THIN/THIN-2 600V INSULATION, 90° OPERATING TEMP., STRANDED COPPER
- NSULATION, 90° UPERATITIO TELETA, STRUCTURE, CONDUCTOR, CONDUCT SHALL BE UPVC, SCAL 40.
 THIS ORAWING SHALL BE WORKED WITH DRAWING NOS. BWDPP-BBC-17.007 FOR DETAILS OF LIGHTING FIXTURES.
- 8. THIS DRAWING SHALL BE WORKED WITH CIVIL AND MECHANICAL BID DRAWINGS.

LEGEND:

 \square - FIXTURE TYPE A

FIRE - FIXTURE TYPE B

Q_n - EMERGENCY LIGHT OUTLET

Ø - FIXTURE TYPE D

- SINGLE POLE SWITCH

- DUPLEX SMITCH

(SUBSCRIPT DENOTES LAMP BEING CONTROLLED) THREE GANG WALL SWITCH

(SUBSCRIPT DENOTES LAMP BEING CONTROLLED) - 200 VA DUPLEX CONVENIENCE OUTLET

= 200 VA DUPLEX CONVENIENCE DUTLET (WEATHER PROOF)

- EXHAUST FAN

ENCLOSED CIRCUIT BREAKER W/BULT-IN UNIVERSAL OUTLET FOR WINDOW TYPE ACU

- CIRCUIT RUNNING ON CEILING

- CIRCUIT RUNNING UNDERGROUND

- CONTROL CIRCUIT

--- -- CIRCUIT HOMERUN

- MAIN DISTRIBUTION PANEL



NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN, QUEZON CITY

LOCATION BUTAINANAN SIRVINA CANADISS SUR

EST CHIEF DATE

LIGHTING AND POWER LAYOUT (CONTROL ROOM AND STORAGE ROOM)

TAXE MY & THE MY BUTANNAM OFF

TEXTO 6.0	-			SUBMITTEE B. M. M. GUILA
DPAMM)	ND			~ CEEE'S
NEVE/HED	MINICEN	ENGA. I A	ICHT.	MONTH OF Z. C. LUCOP, JR
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ELEC.				APPROVED THE SOMOSIERRY
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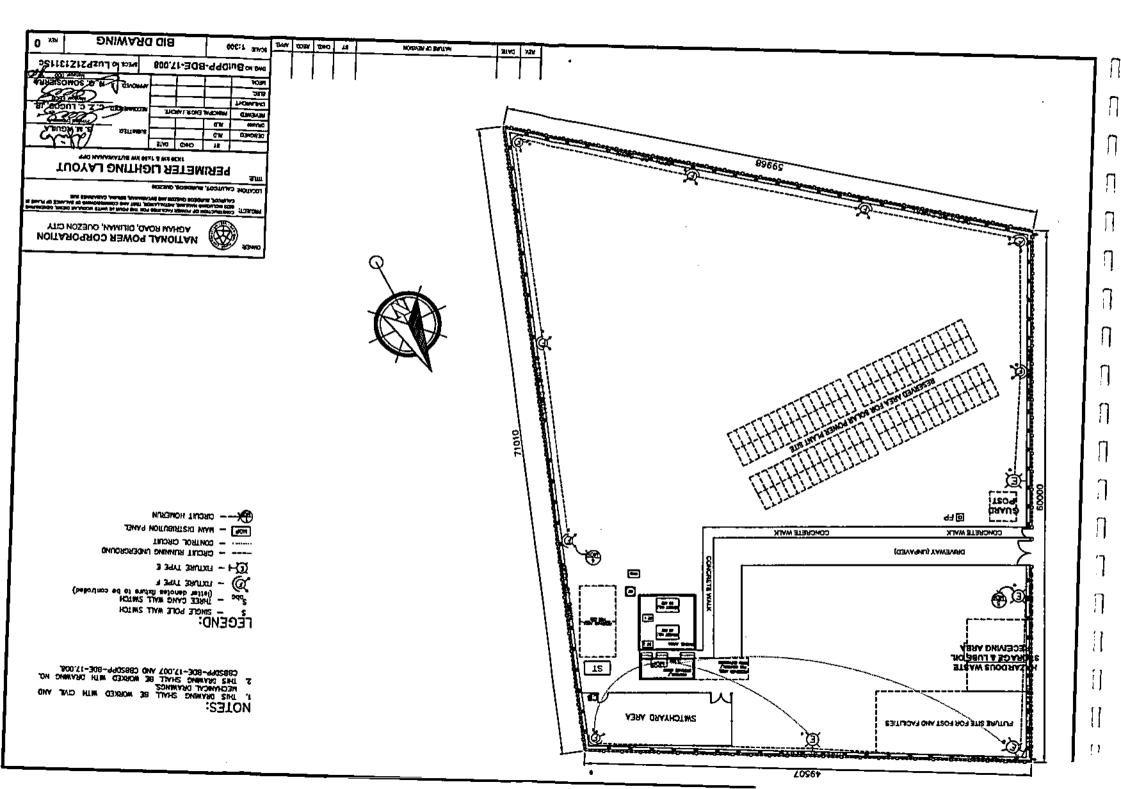
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secs to LuzP21Z1311Sc

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BID DRAWING

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	SCHEDULE OF LOADS								
					\$123				
CKT HQ.	DESCRIPTION	VA.	٧	^	BREWER	WE	COMPUST		
1	1 - 2 X PM LED LAMP TUBE, TYPE B 3 - 9W COMPACT LED LAMP, TYPE A 1 - 100WA EMERGENCY LIGHT OUTLET 1 - 100WA EDMALST FAN 3 - SOW FLOOD LED FLOOD LIGHT, TYPE D	444	230	1.63	80AF / 15AT	2 → 3.5mm ² Rebl/Trass-2	20mm@ uP/Q		
2	1 - 1.0HP AR CONDITIONER UNIT	1840	230	8.00	50AF / 20AT	2 - 35mm B+H/THM-2 1 - 15mm T+H/THH-2	20mm@ µFV0		
3	3 - 200M COMMEMBICE OUTLET 1 - 200M COMMEMBICE OUTLET (WEATHER PROOF)	800	230	148	SQAF / 20AT	2 - 15mm Deet/Trus-2 1 - 15mm Deet/Trus-2	20mm# uPVC		
4	1 - 1 x 30W LED PERMETER LIGHTING, TIPE E 7 - 1 x 30W (LOO) LIGHT (MEATHERPROOF), TYPE F	300	230	1.30	SOAF / ISAT	2 - 8.0mm* 764/7hm-3	20mmal uPVC		
	1-3 x 300 flood light (Mean-dupphoof), Thre F $3-1$ x 300 (ED PUMETER LIGHTMG, Tipe E	150	7.30	0.65	50AF / 15AT	2 - 4.0mm ² 799N/7HWI-2	20mm# uPVC		
6	1 - 1500VA SPACE HEATER FOR JOHN MODULAR D/O SET	1500	230	6.52	50AF / 20AT	2 = 3.5mm* 1604/1004-2 1 = 3.5mm* 1604/1006-2	20mm@ uPVC		
7	3 - 1500NA SPACE HEATER FOR SOME MODULAR D/G SET	1500	230	E.32	50AF / 20AT	2 = 3.5mm ² Dem/Dem-2 1 = 3.5mm ² Rem/Dem-2	20mm@ uPVC		
	FOR ESS LOADS	9500	230	41.30	39AF / 59AT	2 - 8.0mm* 30H/1HM-2 1 - 6.0mm* R4M/1HM-2	20mmil uPVC		
٠	SPARE.	1500	230	6.52	50AF / 20AT				
10	SPARIE	1500	230	E.54	50AF / 20AT				
	TOTAL	19634	230	82.76					

PROVIDE: 250 AF / 100 AT, 2P MCCB

WITH BRANCH CIRCUIT OF:

1 - 50AF/50AT, 2P, MCB

6 - 50AF/20AT, 2P, MCB 3 - 50AF/15AT, 2P, MCB

PROVIDE:

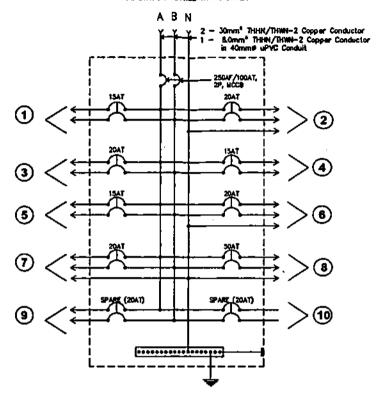
2 - 30mm² THHN/THWN-2 & 1 - 8.0mm² THHN/THWN-2

Copper Conductor

in 40mm# uPVC Conduit

SCHEDULE OF LOADS MAIN DISTRIBUTION PANEL (MDP)

FROM STATION SERVICE TRANSFORMER

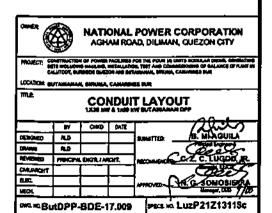


RISER DIAGRAM MAIN DISTRIBUTION PANEL (MDP)

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MATURE OF REVISION



BID DRAWING

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SECTION IX - BID DRAWINGS

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SECTION IX - BID DRAWINGS

EW - ELECTRICAL DRAWINGS

DRAWING NO.	TITLE
CalDPP-BDE-17.00	1 SINGLE LINE DIAGRAM (2x50 kW CALUTCOT DPP)
CalDPP-BDE-17.003	
CalDPP-BDE-17.003	-
CalDPP-BDE-17.004	DETAILS OF TAKE-OFF STRUCTURE 2/2 (2x50 kW CALUTCOT DPP)
CalDPP-BDE-17.005	GROUNDING SYSTEM LAYOUT (2x50 kW CALUTCOT DPP)
CalDPP-BDE-17.006	
CalDPP-BDE-17.007	LIGHTING AND POWER LAYOUT (CONTROL ROOM AND STORAGE ROOM) (2x50 kW CALUTCOT DPP)
CalDPP-BDE-17.008	PERIMETER LIGHTING LAYOUT (2x50 kW CALUTCOT DPP)
CalDPP-BDE-17.009	SCHEDULE OF LOAD & RISER DIAGRAM (2x50 kW CALUTCOT DPP)
ButDPP-BDE-17.001	SINGLE LINE DIAGRAM (1x30 kW & 1x50 kW BUTAWANAN DPP)
ButDPP-BDE-17.002	EQUIPMENT LAYOUT (1x30 kW & 1x50 kW BUTAWANAN DPP)
ButDPP-BDE-17.003	DETAILS OF TAKE-OFF STRUCTURE 1/2 (1x30 kW & 1x50 kW BUTAWANAN DPP)
ButDPP-BDE-17.004	DETAILS OF TAKE-OFF STRUCTURE 2/2 (1x30 kW & 1x50 kW BUTAWANAN DPP)
ButDPP-BDE-17.005	GROUNDING SYSTEM LAYOUT (1x30 kW & 1x50 kW BUTAWANAN DPP)
ButDPP-BDE-17.006	CONDUIT LAYOUT (1x30 kW & 1x50 kW BUTAWANAN DPP)
ButDPP-BDE-17.007	LIGHTING AND POWER LAYOUT (CONTROL ROOM AND STORAGE ROOM) (1x30 kW & 1x50 kW BUTAWANAN DPP)

SECTION IX - BID DRAWINGS

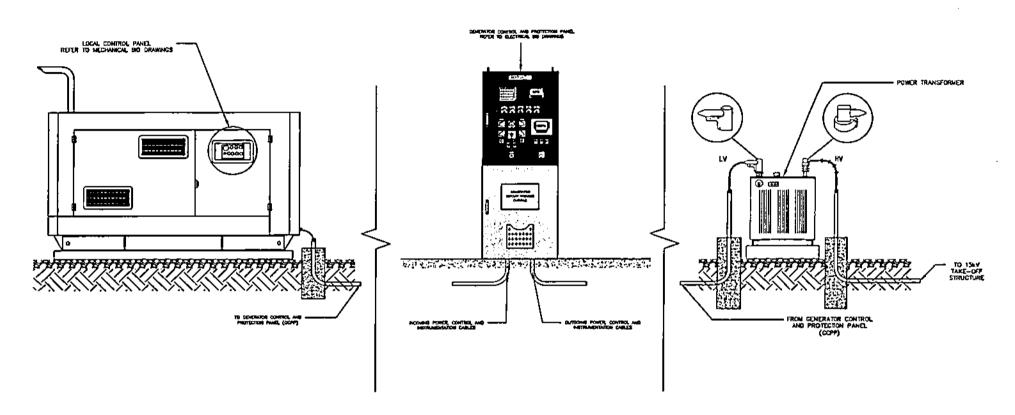
LuzP21Z1311Sc

ButDPP-BDE-17.008 PERIMETER LIGHTING LAYOUT (2x50 kW CALUTCOT DPP)

ButDPP-BDE-17.009 SCHEDULE OF LOAD & RISER DIAGRAM (2x50 kW CALUTCOT DPP)

TYPICAL DRAWINGS

DRAWING NO.	TITLE
CBBSDPP-BDE-17.001	SYSTEM CONFIGURATION
CBBSDPP-BDE-17.002	GENERATOR CONTROL AND PROTECTION PANEL (GCPP) OUTLINE DRAWING
CBBSDPP-BDE-17.003	DETAILS OF GROUNDING SYSTEM
CBBSDPP-BDE-17.004	DETAILS OF TRANSFORMER TERMINATION
CBBSDPP-BDE-17.005	LIGHTNING PROTECTION SYSTEM
CBBSDPP-BDE-17.006	DETAILS OF CONTROL HOUSE & CABLE ENTRY
CBBSDPP-BDE-17.007	DETAILS OF LIGHTING FIXTURES
CBBSDPP-BDE-17.008	PERIMETER LIGHTING DETAILS
CBBSDPP-BDE-17.009	GENERAL NOTES



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 BRAWNINGS.
- DRAWNISS.

 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:

LOCAL CONTROL AND PROTECTION PANEL LCPP

CCPP GENERATOR CONTROL AND PROTECTION PANEL

DPM DIGITAL POWER METER



NATIONAL POWER CORPORATION AGRAM ROAD, DILIMAN QUEZON CITY

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LOCATION: CALLITCOT, GUEZON AND BUTAWARAN, SHRAMA, CAMADISS SUR

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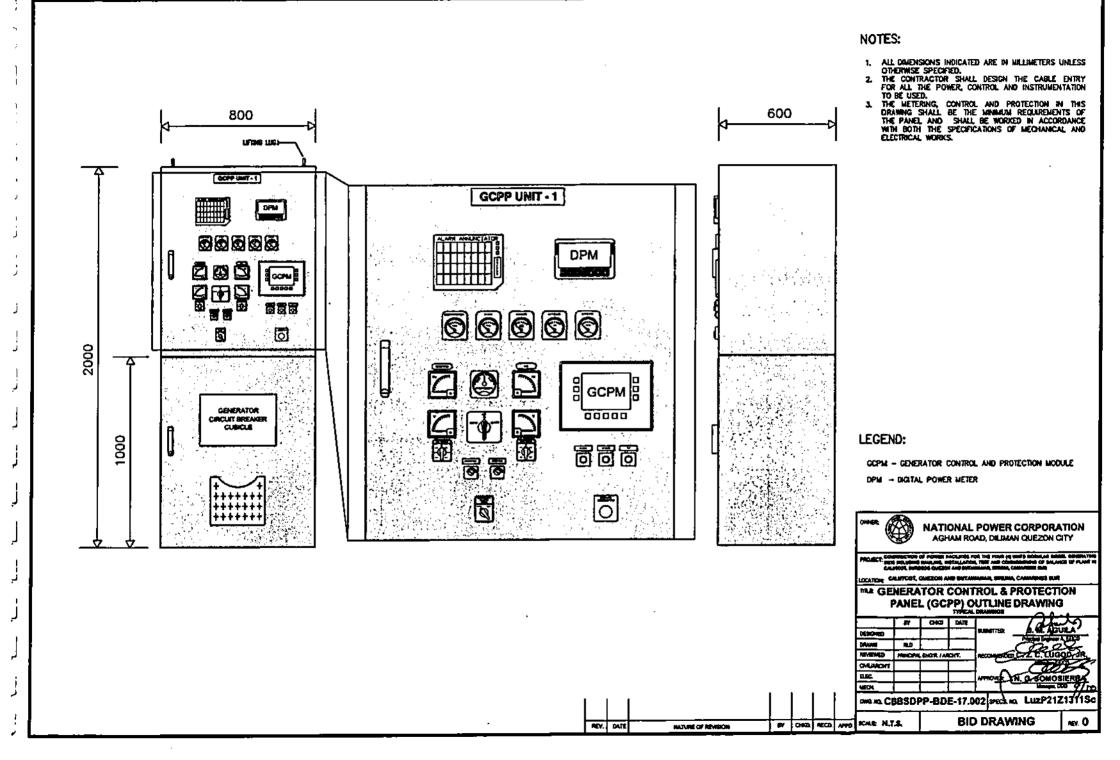
SYSTEM CONFIGURATION

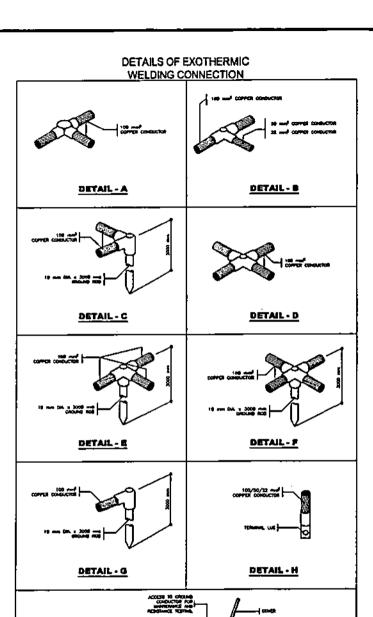
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OME NO. CBBSDPP-BDE-17.001 SPECS NO. LUZP21Z1311SC

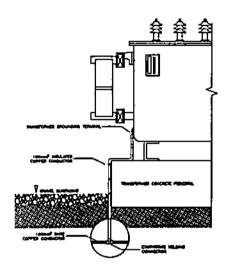
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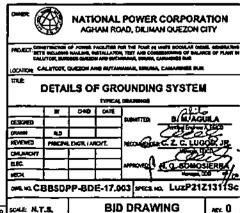
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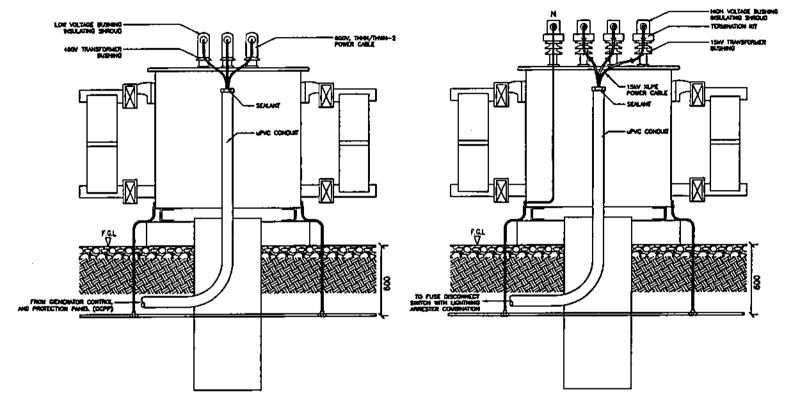
EQUIPMENT GROUNDING CONNECTION

NOTES:

- ALL DIMENSIONS INDICATED ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- INSTALLATION OF NEW CROWNING SYSTEM SHALL BE WORKED WITH EQUIPMENT CROWNING CONNECTION—1 AND DETAILS OF EXOTHERMIC WELDING CONNECTION.
- J. CROUNDING CONDUCTOR SHALL BE EMBEDDED AT LEAST 0.60M.
- 4. ALL EQUIPMENT GROUNDING SHALL BE CONNECTED TO THE EXISTING GROUNDING MAT.
- 3. THE SUPPLER SHALL PROVIDE TWO (2) TERMINALS FOR EQUIPMENT BODY GROUNDING OF ALL MAJOR COULPHENT (LA. DIESEL GENERATOR, GENERATOR CONTROL AND PROTECTION PANEL, CENERATOR TRANSFORMER) AND SHALL BE CONNECTED TO THE EXISTING/NEW GROUNDING MAT USING TOOLING MISULATED COPPER CONDUCTOR AND EXOTHERMIC WELDING PROCESS.
- CT/PT, AUTOMATIC CIRCLIT RECLOSER, STEEL POLES AND FENCE EARTHING SHALL BE PROPERLY GROUNDED WITH SOMM³ INSULATED COPPER CONDUCTOR.
- CABLE TRAYS SHALL BE PROPERLY GROUNDED WITH 22546¹² INSULATED COPPER CONDUCTOR.
- E. 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 ECOPPLENT GROUNDING AS SHOWN ON EQUIPMENT GROUNDING CONNECTION—2.



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NOTES:

NOTES:

1. THE NUMBER OF POWER CABLES PER PHASE FOR THE LOW VOLTACE (LV) SIDE IS FOR BIDDING PURPOSES ONLY. THE SUPPLIER SHALL VERFY WHAT IS INDICATED IN THE SHOLE LINE DUGGRAM AND SHALL PROVIDE PROPER CABLE TERMINATION.

2. THE CONTRICTOR SHALL PROVIDE TERMINATION INT FOR THE HICH VOLTACE (HV) POWER CABLES AND SHALL DESIGN PROPER TERMINATION SHALL BE PROVIDED WITH SUITABLE INSULATING SHOULD. THE INSULATING SHOULD SHALL BE MANUFACTURED THROUGH DIP MOULDING PROCESS AND SHALL BE MADE FROM FLEXIBLE POLYAINY. CHLORIDE (PVC) MATERIAL, SUITABLE FOR LOW VOLTAGE TO HIGH VOLTAGE APPLICATIONS.

4. THE INSULATING SHROUD SHALL BE FLAME RETARDANT, CHONFORMING WITH THE UL. 94 STANDARDS AND SHALL BE TYPE TESTED FOR ELECTIC STRENGTH IN ACCORDANCE WITH IEC 60243—1 OR APPROVED EQUIVALENT STANDARDS.

TRANSFORMER LOW VOLTAGE CABLE TERMINATION

TRANSFORMER HIGH VOLTAGE CABLE TERMINATION

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NATIONAL POWER CORPORATION AGHAM ROAD, DILMAN QUEZON CITY

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LOCATION: CALLETON, CHIESEN AND BUTANISMAN, BRIDGE, CARACTERS IN R

THE DETAILS OF TRANSFORMER TERMINATION

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MAN CBBSDPP-BDE-17.004 SPECK NO. LUZP21Z1311SC

SCAR N.T.S. 64 CHE MECO 1447 MATLE OF REVENON

BID DRAWING

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LICHTHANG ROD (2000mmx16mm4) 60mm# GJ. PIPE DOWN CONDUCTOR -TO GROUNDING SYSTEM W/ CABLE CLAMPS SPACED @ 1.20 METERS DO OF G.L PIPE BOLTED AT THE TOP OF THE SOFT STEEL POLE TO GROUNDING MAT LIGHTNING PROTECTION SYSTEM

REV. DATÉ

- NOTES:

 1. THE LICHTHING PROTECTION SYSTEM SHALL BE INSTALLED APPROXIMATELY AS SHOWN ON THE DRAWING.

 2. THE DIOWN CONDUCTOR SHALL BE COMMECTED TO THE GROUNDING MAT.

 3. THE CONTRACTOR SHALL SUBMIT SPECIFICATION, FARRIC
- NPC.
 4. THE C.I. PIPE SHALL HAVE AN INTERNAL CHAMETER OF SOMITH AND SHALL HAVE A MINIMUM LENGTH OF 3.0 M



NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN QUEZON CITY

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THE BELLES HANDS OUTSIANISH HET AND COMPANIES OF PLANT IN

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LOCATION CALIFORN CHESCH AND INTERNAL MINING CHEATERS FOR

TILE

LIGHTNING PROTECTION SYSTEM

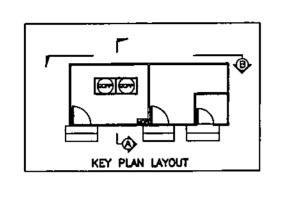
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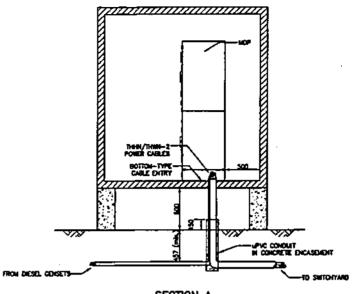
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BID DRAWING

BY CHE MECO APPO MICHE H.T.S. NATURAL OF REVISION





SECTION A

NOTES:

- 1. ALL DIMENSONS INDICATED ARE IN MILIBRETERS UNLESS OTHERWISE SPECIFED.
 2. THE NUMBER OF FEEDERS AND CONDUITS ARE FOR BIDDING PURPOSES DIMY. THE CONTRACTOR SHALL DESIGN THE APPROPRIATE CARLE ENTRY FOR ALL THE POWER, CONTROL AND INSTRUMENTATION CABLES INCLUDING CABLES FOR POWER AND INSTRUMENTATION CABLES INCLUDING CABLES FOR POWER AND EXCHANGE TO BE USED.

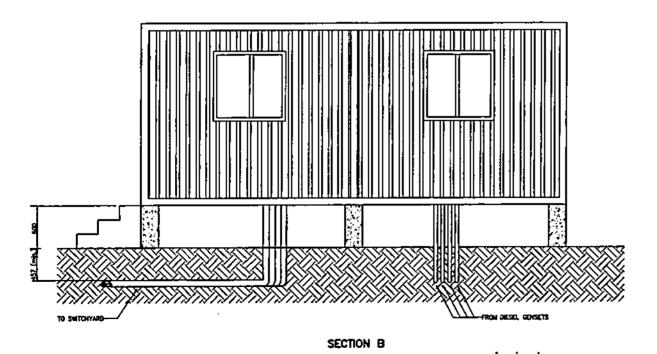
 3. THE CONTRACTOR SHALL SCORE PROTECTION FOR THE CABLES AND PAMELS AGAINST SUDGEN BROTEST PENETRATIONS.

 4. THIS DRAWING SHALL BE WORKED WITH CIME BID DRAWINGS.

LECEND:

CCPP -- GENERATOR CONTROL AND PROTECTION PANEL

MOP - GENERATOR CONTROL AND PROTECTION PANEL



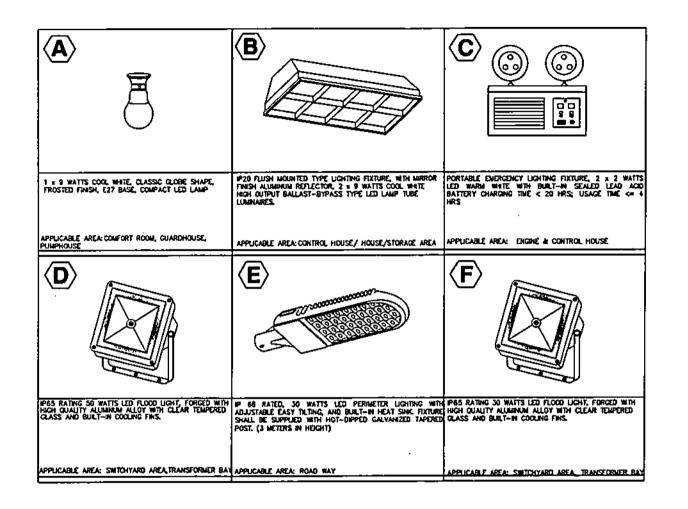
NATIONAL POWER CORPORATION AGHAM ROAD, DILIMAN QUEZON CITY LOCATION: CALLIFOOT, CHIESTON AND SINTAMINANA, SIMILINA, CAMADISSES SINS DETAILS OF CONTROL HOUSE & CABLE ENTRY BY CHE CATE 10 MEVENED PRINCIPAL ENGIR / ARCHIT. DALWADIT SPECE NO. LUZPZIZIZIZISC OMS.NO. CBB\$DPP-BDE-17.006

BY CHE MECE AFTE MEY. DATE MATLINE OF REVISION

SCHE N.T.S.

BID DRAWING

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DETAILS OF LIGHTING FIXTURES

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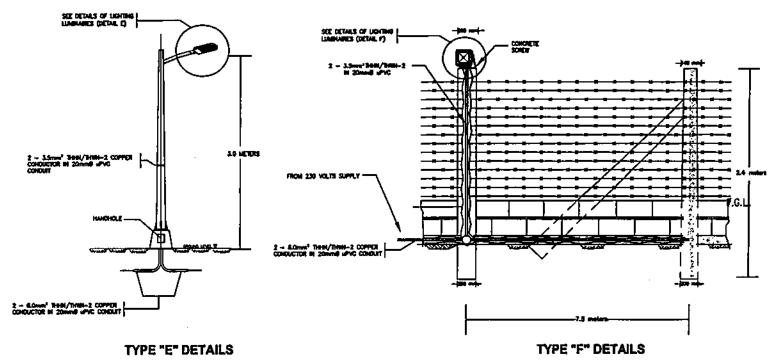
DETAILS OF LIGHTING FIXTURES

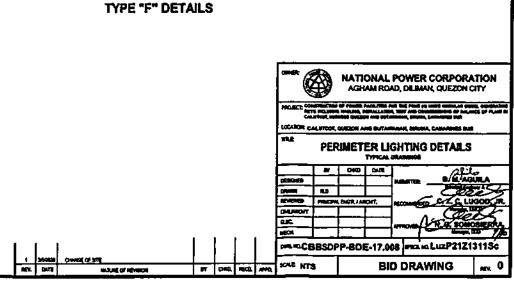
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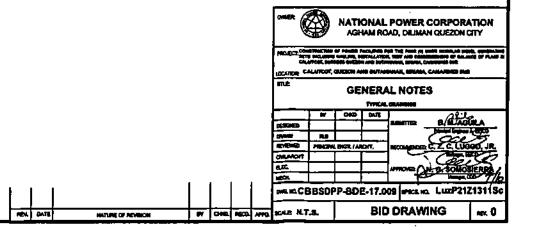




GENERAL NOTES:

- 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).
- 2. 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
- 3. 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, 7970/13800Y V 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. JEC 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
- q. 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-10.0 FACTORY ASSEMBLY AND TESTS
- NON-COMPLIANCE TO THE REQUIREMENTS STATED IN THIS TENDER SHALL BE GROUNDS FOR DISQUALIFICATION.

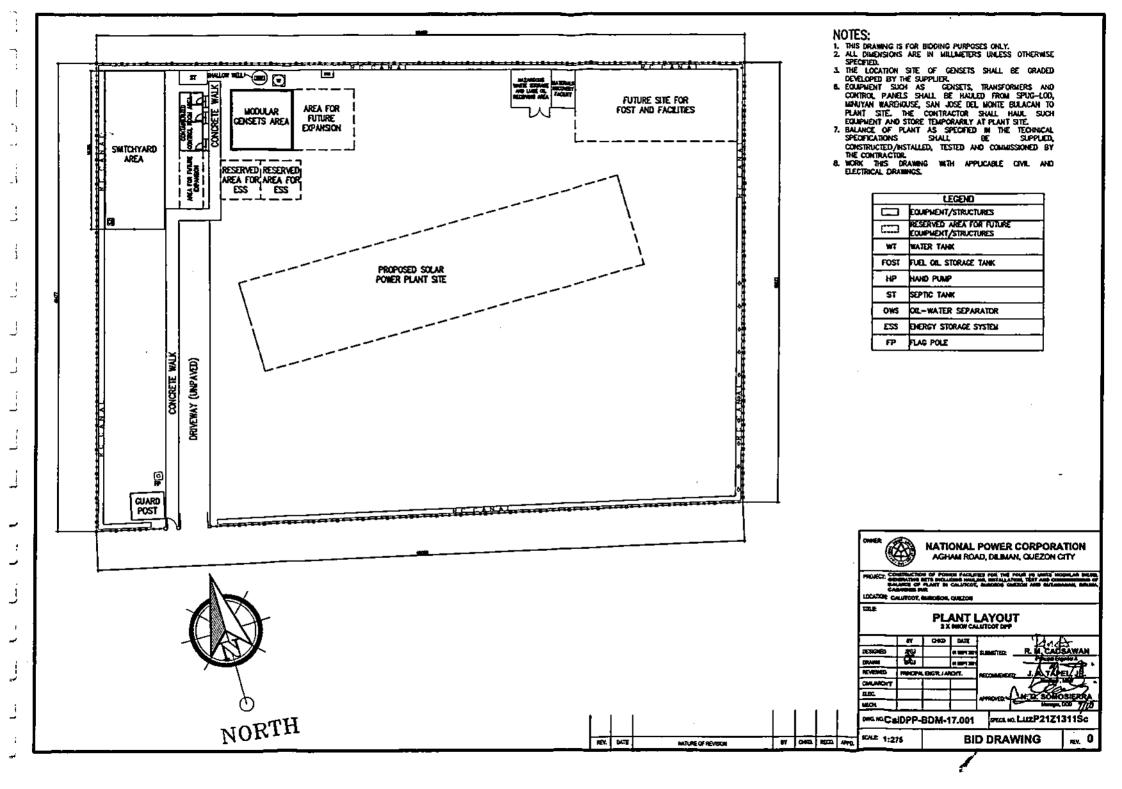


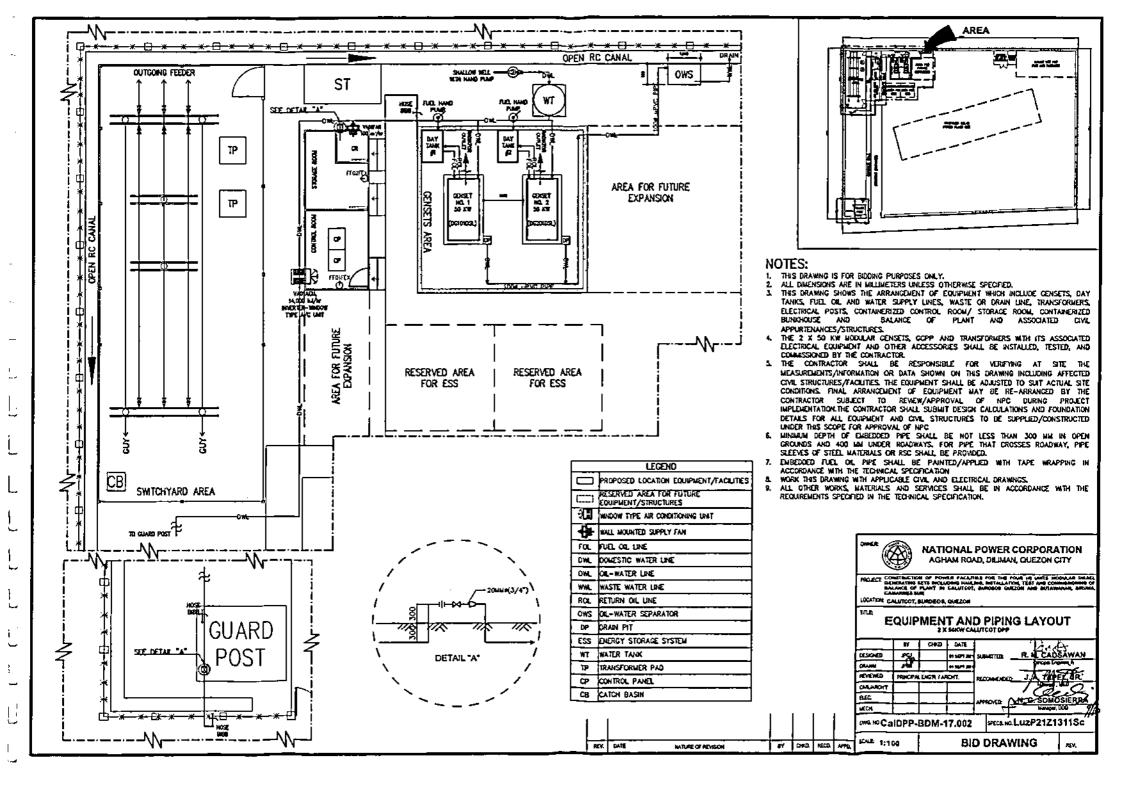
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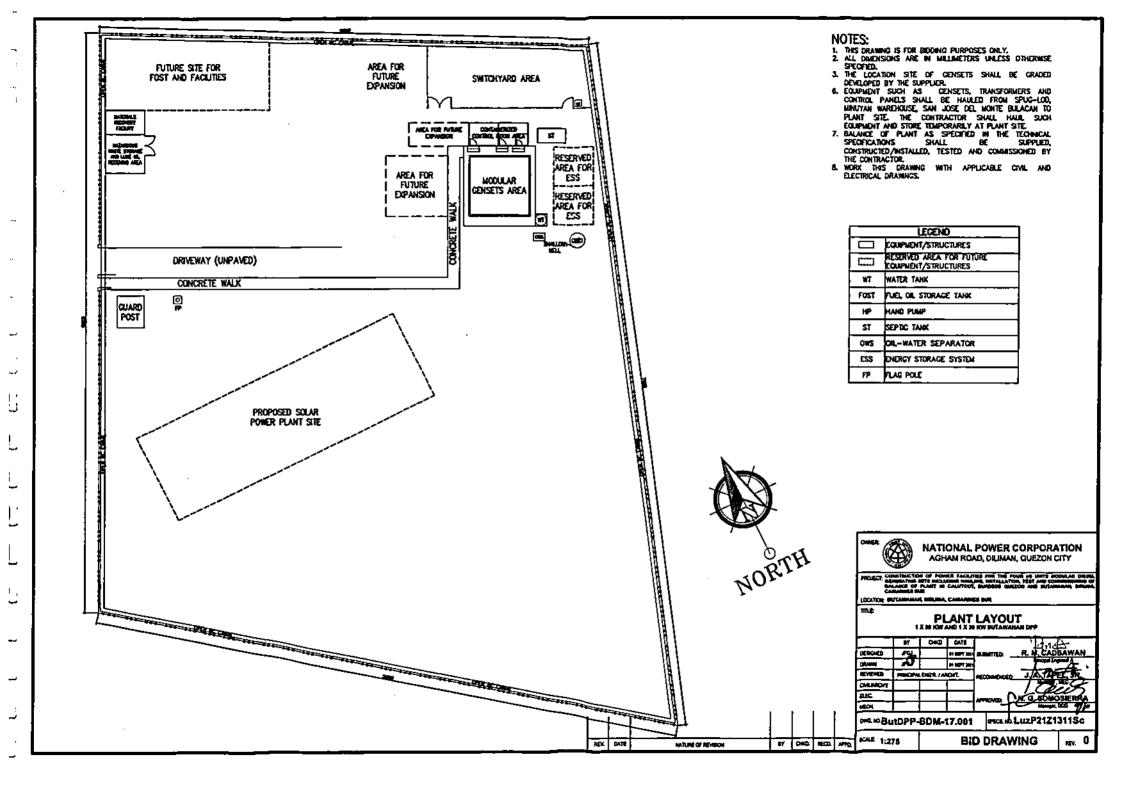
SECTION IX

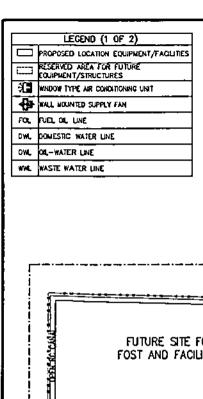
BID DRAWINGS (MECHANICAL WORKS)











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	LEGEND (2 OF 2)					
ROL	OL RETURN OIL LINE					
OWS	OIL-WATER SEPARATOR					
DP	CRAIN PIT					
ESS	ENERGY STORAGE SYSTEM					
wf	WATER TANK					
1P	TRANSFORMER PAD					
CP	CONTROL PANEL					
æ	CATCH BASIN					

NOTES:

1. THIS DRAWING IS FOR DIDDING PURPOSES ONLY.

2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. THIS DRAWING SHOWS THE ARRANGEMENT OF EQUIPMENT WHICH INCLUDE CENSETS, DAY TANKS, FUEL OIL AND WATER SUPPLY LINES, WASTE OR DRAIN LINE, TRANSFORMERS, ELECTRICAL POSTS, CONTAINERIZED CONTROL ROOM/ STORAGE ROOM, CONTAINERIZED BUNKHOUSE AND BALANCE OF PLANT AND ASSOCIATED CIVIL APPURTENANCES/STRUCTURES.

 THE 1 X 50 KW AND 1 X 30 KW MODULAR CENSETS, COPP AND TRANSFORMERS WITH ITS ASSOCIATED ELECTRICAL EQUIPMENT AND OTHER ACCESSORIES SHALL DE INSTALLED, TESTED, AND COMMISSIONED BY THE CONTRACTOR.

5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFTING AT SITE THE MEASUREMENTS/INFORMATION OR DATA SHOWN ON THIS DRAWING INCLUDING AFFECTED CIVIL STRUCTURES/FACULIES. THE COUPMENT SHALL BE ADJUSTED TO SLAT ACTUAL SITE CONDITIONS. FINAL ARRANGEMENT OF EQUIPMENT MAY BE RE-ARRANGED BY THE CONTRACTOR SUBJECT TO REVIEW/APPROVAL OF NPC DURING PROJECT IMPLEMENTATION. THE CONTRACTOR SHALL SUBJECT TO REVIEW/APPROVAL OF NPC DURING PROJECT EQUIPMENT AND CIVIL STRUCTURES TO BE SUPPLIED/CONSTRUCTED UNDER THIS SCOPE FOR APPROVAL OF NPC

 MINIMUM DEPTH OF EMBEDOED 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.

 CMBEDDED FUEL OIL PIPE SHALL BE PAINTED/APPLIED WITH TAPE WRAPPING IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION

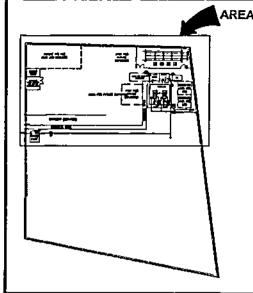
WORK THIS DRAWING WITH APPLICABLE CIVIL AND ELECTRICAL DRAWINGS.

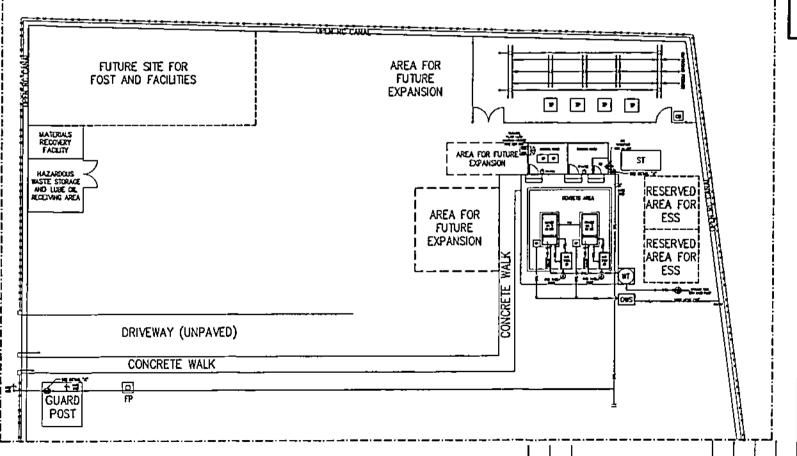
9. ALL OTHER WORKS, MATERIALS AND SERVICES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE TECHNICAL SPECIFICATION.

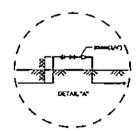
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NATIONAL POWER CORPORATION
AGHAM ROAD, DILMAN, QUEZON CITY

PROJECT: CONSTRUCTION OF POWER FACESTES FOR THE FOUR IN UNITS MODIFIED DESER-CHERRATHS ESTS NECLUDIES HALLING, INSTALLATION, TEST AND COMMISSIONING OF BRAINCE OF PLANT OF CALIFFEIT, BURDEOS QUEZON AND SUTAMANAM, SIRVINA CAMMINISTERS

LUCATION BUTTAMANANE BIRLING CAMADINES BUR

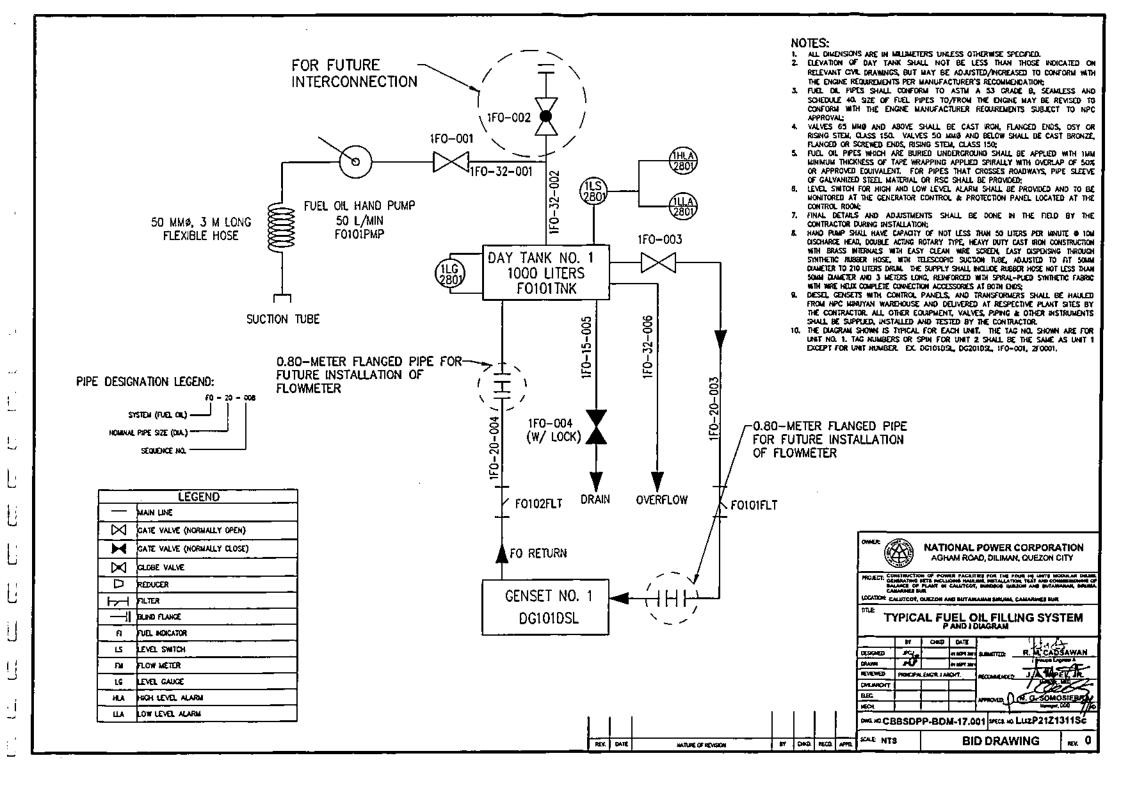
EQUIPMENT AND PIPING LAYOUT

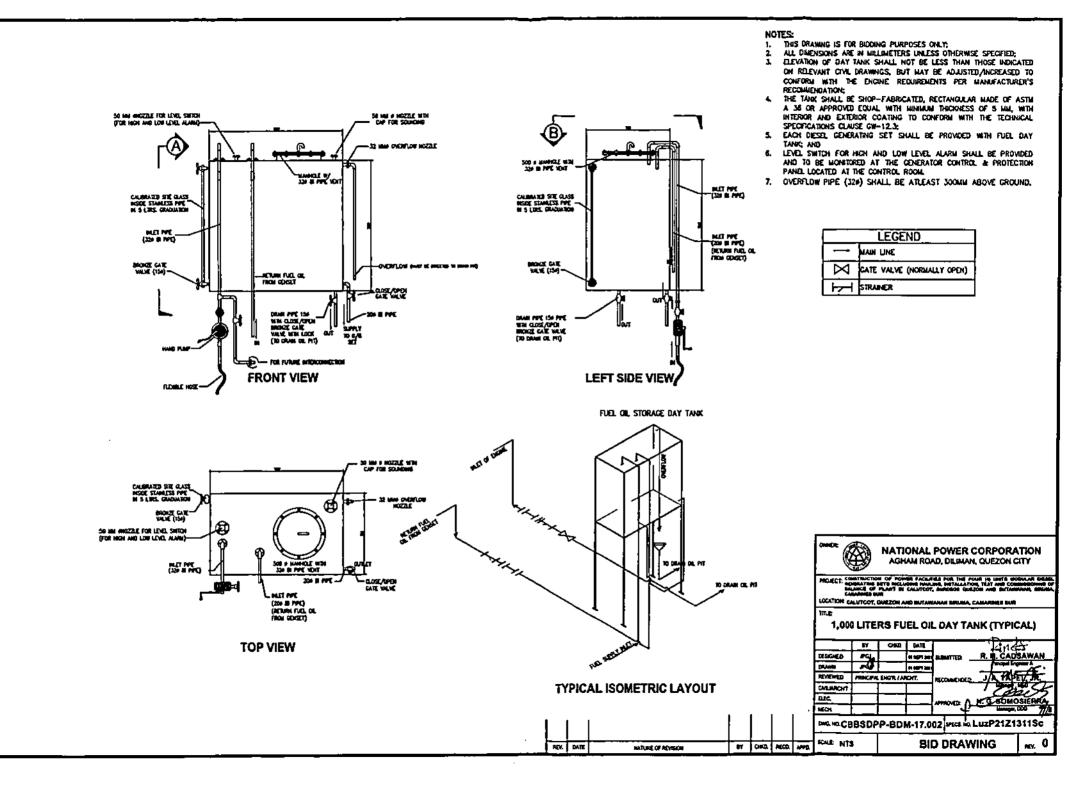
	BY	OKD	DATE	1200			
DESCRED	.5%		et 107 (20)	SUBMITTED: R. M. CADSAWAN			
DRAMN	76€		On \$5077 3827	President Expression			
REVEWED	PRINCIPAL ENGR. / ARCHT.			RECOMMENDED J/A TAPEY OR			
CMUMPCHT				1/25/2			
ELEC.				APPROVED N. G. SOMOSIERRA			
WECK				Manager, DEG 9/10			
DAME HO'B'	ItDPP-	BDM-	17.002	Sect. & LuzP21Z1311Sc			

SCALE 1:200

BID DRAWING

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