REPUBLIC OF THE PHILIPPINES

NATIONAL POWER CORPORATION

(Pambansang Korporasyon sa Elektrisidad)

BID DOCUMENTS

Name of Project : **SUPPLY, DELIVERY, CONSTRUCTION, INSTALLATION, TESTING AND COMMISSIONING OF 10MVA MASBATE (MALINTA) SUBSTATION**

Project Location : **Malinta, Masbate**

Specs No. : **LuzP23Z1636Sce**

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VOLUME I OF IV

Design and Development Department

SECTION I

INVITATION TO BID

National Power Corporation
INVITATION TO BID
PUBLIC BIDDING – BCS 2025-0131

1. The NATIONAL POWER CORPORATION (NPC), through its approved Corporate Budget of CY 2025 intends to apply the sum of **(Please see schedule below)** being the Approved Budget for the Contract (ABC) to payments under the contract. Bids received in excess of the ABC shall be automatically rejected at Bid opening.

PR Nos./PB Ref No. & Description	Similar Contracts	Pre-bid Conference	Bid Submission / Opening	ABC/ Amt. of Bid Docs
HO-PIG25-002 / PB250408-AM00075 Supply, Delivery, Construction, Installation, Testing and Commissioning of 10MVA Masbate (Malinta) Substation • PCAB License: License Category of at least **"Category A – Electrical Works"** and registration classification of at least **"Medium B – Electrical Works"**	Supply, Delivery, Installation, Test and Commissioning of at least 69kV Substation or Switching Station	25 March 2025 9:30 A.M.	08 April 2025 9:30 A.M.	₱ 177,127,000.00 / ₱ 50,000.00
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-PIG25-002	Three Hundred (300) Calendar Days	-

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. Payments via check, the payee should be: **NPC Bid Document Transactions**. *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.*

6. The National Power Corporation will hold a Pre-Bid Conference on the date, time and venue stated above. Interested bidder/s is/are allowed to join and participate in the Pre-Bid Conference at the Kañao Room or virtually. However, those attending virtually shall assume the risk of any internet connectivity issues. Further, interested bidders are hereby informed of the following:

   a. Only a maximum of two (2) representatives from each bidder / company shall be allowed to participate
   b. Wearing of Face Masks is recommended but not required in view of Proclamation No. 297 S.2023 lifting the State of Public Health Emergency Throughout the Philippines
   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.

9. Bid opening shall be in the 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
Gabriel Y. Itchon Building
Senator Miriam P. Defensor-Santiago Ave. (formerly BIR Road)
Cor. Quezon Ave., Diliman, Quezon City, 1100
Tel Nos.: Tel Nos.: 8921-3541 local 5564/
Email: bcsd@napocor.gov.ph /

12. You may visit the following websites:

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

LARRY I. SABELLINA
Vice President, MinGen and
Chairman, Bids and Awards Committee

SECTION II

INSTRUCTION TO BIDDERS

SECTION II - INSTRUCTIONS TO BIDDERS

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SECTION II - INSTRUCTIONS TO BIDDERS

1. Scope of Bid

NPC invites Bids for the **SUPPLY, DELIVERY, CONSTRUCTION, INSTALLATION, TESTING AND COMMISSIONING OF 10MVA MASBATE (MALINTA) SUBSTATION**, with Project Identification Number **LuzP23Z1636Sce.**

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 2025 in the amount stated 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.

5.2. The bidder must have completed an SLCC that is similar to the contract to be bid, and whose value, adjusted to current prices using the PSA consumer price indices, must be at least fifty percent (50%) of the ABC to be bid: Provided, however, That contractors under Small A and Small B categories without similar experience on the contract to be bid may be allowed to bid if the cost of such contract is not more than the Allowable Range of Contract Cost (ARCC) of their registration based on the guidelines as prescribed by the PCAB. For Foreign-funded Procurement, the GoP and the foreign government/foreign or international financing institution may agree on another track record requirement.

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.

7.2. 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.

7.3. 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.

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.

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 Two (2) copies of the first and second components of its Bid, marked **Original** and photocopy. Only the original copy will be read and considered for the bid.

Any misplaced document outside of the **Original** copy will not be considered. The photocopy is ONLY FOR REFERENCE.

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.

Bidders must also comply with the Disclaimer and Data Privacy Notice specified in the **BDS**.

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 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**.

SECTION III

BID DATA SHEETS

SECTION III - BID DATA SHEET

ITB Clause	
5.2	For this purpose, contracts similar to the Project refer to supply, delivery, installation, test and commissioning of at least 69KV Substation or Switching Station. 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 prospective bidder shall submit a valid and updated Certificate of PhilGEPs Registration under Platinum Membership (all pages including the Annex A of the said Certificate). **Non-compliance shall be a ground for disqualification.**
	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: 1. Contract/Purchase Order and/or Notice of Award 2. Certification coming from the project owner/client that the performance is satisfactory as of the bidding date/signed Status Report as of the bidding date from Bureau of Construction containing relevant details of slippage, if any, for the declared on-going contracts with Department of Public Works and Highways (DPWH) 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: 1. 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 A – ELECTRICAL WORKS"** and registration classification of at least **"MEDIUM B – ELECTRICAL WORKS".**

10.4	The list of key personnel shall include the following minimum requirements: **a. One (1) Project Manager** Professional Electrical Engineer (PEE) who had managed or supervised at least a similar project within the last ten (10) years. **b. One (1) Project/Site Engineer** Registered Electrical Engineer (REE) or Registered Civil Engineer who had supervised at least one (1) similar project within the last ten (10) years. Must have five (5) years professional experience on similar project. **c. One (1) Materials Engineer** Registered Civil Engineer with valid accreditation from the Department of Public Works and Highways (DPWH) as Materials Engineer I **d. 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) 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: 1. Delivery/Transport Vehicle (Van or Pick-up) - 1 unit 2. Dump Truck - 1 unit 3. Payloader - 1 unit 4. Grader - 1 unit 5. Truck Mounted Water Tank - 1 unit 6. Vibratory Soil Compactor - 1 unit 7. Concrete Mixer, 2-bagger - 1 unit 8. Concrete Vibrator, Engine driven - 1 unit 9. Plate Compactor, Engine driven - 1 unit 10. Welding Machine - 1 unit
10.6	Bidders shall also submit the following requirements in their first envelope, Eligibility and Technical Component of their bid: 1. Documents to be submitted with the Bid Proposal as specified in Annex A of Section VI – Part II, Technical Data Sheet (Electrical Works) 2. Complete eligibility documents of the proposed sub-contractor, if any
10.7	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.
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: 1. 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.
16.0	All bid submissions and related correspondences are confidential and for viewing only by the intended recipient/s. Any unauthorized access to review, reproduce, or disseminate the information contained therein is strictly prohibited. The National Power Corporation (NAPOCOR) does not guarantee the security of any information electronically transmitted. Bid submissions and related correspondences may contain personal and sensitive personal information, and are subject to the Data Privacy Act of 2012, its implementing rules, regulations and issuances of the National Privacy Commission of the Philippines ("Privacy Laws"). By viewing, using, storing, sharing and disposing (collectively "Processing"), such bids submissions and correspondences, you agree to comply with the Privacy Laws. By responding to correspondence, you consent to the Processing by NAPOCOR of the Personal Data contained in your submission/reply in accordance with NAPOCOR's Personal Data Privacy Policy which you can find at **http://www.napocor.gov.ph**. To report any privacy issue, contact the Data Privacy Officer at **dpo@napocor.gov.ph**. NAPOCOR is not liable for the proper and complete transmission of the information contained in bid submission/correspondences nor for any delay in its receipt.
19.2	Partial Bid is not allowed. The project is grouped in a single lot and the lot shall not be divided into sub-lots for the purpose of bidding, evaluation, and contract award.
20	Additional Documents to be submitted during post-qualification: a. Class A – Eligibility Documents listed on the Annex A of Certificate of PhilGEPs Registration under Platinum Membership pursuant to Section 34.3 of the Revised IRR of R.A. 9184 b. 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); c. 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/signed Status Report as of the bidding date from Bureau of Construction containing relevant details of slippage, if any, for the declared on-going contracts with Department of Public Works and Highways (DPWH); d. Contract/Purchase Order for the contract stated in the Statement of the bidder's Single Largest Completed Contract (SLCC) similar to the contract to be bid (Form No. NPCSF-INFR-03) e. Certificate of Employment, Bio Data and valid PRC License of the (professional) personnel (NPCSF-INFR-10a, NPCSF-INFR-11)

	f. Certificate of Employment, Bio Data and Certificate of accreditation or ID card issued by DPWH for the Materials Engineer (NPCSF-INFR-10a, NPCSF-INFR-11) g. Certificate of Employment, Bio Data and Construction Safety and Construction Safety and Health Training Certificate from OSHC/STOs accredited by DOLE of the Safety Officer (NPCSF-INFR-10b, NPCSF-INFR-11) h. Proof of ownership and/or certificate of availability issued by Equipment Lessors for the submitted List of Contractor's Equipment (owned, leased or under purchase agreement) under form NPCSF-INFR-12 i. Documents and Calculations to be submitted during post-qualification as specified in Annex B of Section VI - Part I, Technical Specifications (Electrical Works); 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 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. j. 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: 1. Notice to Proceed 2. Construction schedule and S-curve 3. Manpower Schedule 4. Construction Methods 5. Equipment Utilization Schedule 6. 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.

SECTION IV

GENERAL CONDITIONS OF CONTRACT

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.

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.

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.

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.

SECTION V

SPECIAL CONDITIONS OF CONTRACT

SECTION V – SPECIAL CONDITIONS OF CONTRACT

GCC Clause	
2	Sectional completion is not specified.
3.1	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.
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: 1. 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; 2. Suspend payment of the portion of work under question; 3. Correct the situation by employing 3rd party and charge all expenses incurred to the Contractor's collectibles/securities; and 4. 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. 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.
5	1. The following must be indicated in the performance bond to be posted by the Contractor: i. Company Name ii. Correct amount of the Bond iii. Contract/Purchase Order Reference Number iv. Purpose of the Bond: "To guarantee the faithful performance of the Principal's obligation to undertake *(Contract/Purchase Order Description)* in accordance with the terms and conditions of *(Contract No. & Schedule/Purchase Order No.)* entered into by the parties." 2. The bond shall remain valid and effective until the duration of the 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. 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. 4. Other required conditions in addition to the standard policy terms issued by the Bonding Company: i. The bond is a penal bond, callable on demand and the entire amount thereof shall be forfeited in favor of the Obligee upon default of the Principal without the need to prove or to show grounds or reasons for demand for the sum specified therein; ii. The amount claimed by the Obligee under this bond shall be paid in full and shall never be subject to any adjustment by the Surety; 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.
8.0	**CORRECTION OF PUNCHLIST ITEMS:** After to the conduct of Test and Commissioning/Joint Final Inspection or upon the advice by the NPC, the Contractor/Supplier must correct any remaining works and work deficiencies identified in the punchlist issued for the project within one (1) month considering the approved remaining contract time. Failure to comply with this provision shall be grounds for non-issuance of Certificate of Satisfactory Performance which is a requirement for future bidding with the NPC. This, however, shall not preclude NPC's claim for liquidated damages, imposition of any other penalties and/or filing of blacklisting actions in accordance with the blacklisting guidelines issued by the Government Procurement Policy Board (GPPB).

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.
11.2	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: (b) 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. (c) 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.
13	The maximum amount of advance payment is fifteen percent (15%) of the Contract Price and paid in lump sum.
14	No further instructions.
15.1	The date by which "as built" drawings and operating and maintenance manuals are required is within thirty (30) calendar days after completion of contract.
15.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required is Five percent (5%) of contract amount.

SECTION VI

TECHNICAL SPECIFICATIONS

SECTION VI

PART I

TECHNICAL SPECIFICATIONS

GENERAL WORKS

PART I - TECHNICAL SPECIFICATIONS

GW - GENERAL WORKS

TABLE OF CONTENTS

GW - GENERAL WORKS

GW-1.0 PROJECT HIGHLIGHTS

GW-1.1 GENERAL

The works to be done by the successful bidder shall consist of furnishing all supervision, labor, materials, tools and equipment (except materials and equipment specified to be furnished by NPC), and the construction and installation of substation equipment including all necessary appurtenances for the complete and reliable operation of Masbate (Malinta) Substation.

All equipment and materials which the Contractor shall supply and install shall be new and unused. They shall be suitable for their intended purpose complying with all applicable regulations, quality and dimension standards.

GW-1.2 LOCATION OF THE PROJECT

The contract to be bid is located at Malinta, Masbate.

GW-1.3 SCOPE OF WORKS

The scope of work shall cover but not limited to the following:

Civil Works/Architectural Works

1. Mobilization, demobilization, clean-up, provision of temporary office & housing and storage, and all miscellaneous works requires for the implementation of the project;

2. Site development and grading to required elevations of designated area/equipment location for switchyard equipment and structures in accordance with the details shown in the bid drawings;

3. Design and construction of switching station reinforced concrete foundation for gantry and switchyard structures. Design calculations and detailed drawing shall be submitted for NPC's review and approval prior to construction;

4. Complete construction of concrete pavement, gutters, concrete walks including aggregate sub-base course for proper bedding as shown in the bid drawings;

5. Compete construction of cable trenches as indicated in the bid drawings;

6. Complete construction of slope protection works (retaining wall and grouted riprap) indicated or as shown in the bid drawings;

7. Complete construction (erection/installation) of perimeter lighting foundation, perimeter fence, seclusion fence, vehicular and pedestrian gate;

8. Complete construction of guardhouse, pump house and control house;

9. Complete construction of drainage systems and appurtenant structures;

10. Complete construction of elevated water storage tank;

11. Laying of gravel at the switchyard area; and

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

Electrical Works

1. Design, manufacture, supply, delivery, installation, test and commissioning of the following substation equipment:

    a. Power Circuit Breakers;
    b. Disconnect Switches (w/ ES and w/o ES);
    c. Main Control Switchboards;
    d. Metalclad Switchgears;
    e. Lightning Arresters;
    f. Current Transformers;
    g. Voltage Transformers;
    h. Power, Control and Instrumentation Cables;
    i. Switching station Steel Structures;
    j. Installation Materials including High voltage buswork, insulator assemblies, conductors, hardwares, connectors, overhead ground wires, etc.;
    k. Grounding System;
    l. AC & DC Station Auxiliary Switchboard;
    m. Storage Batteries;
    n. Station Service Transformer;

2. Assessment Test including Frequency Response Analysis (FRA), Oil test / Winding Resistance Test, Dielectric Breakdown and Power Factor (Perform Electrical Test) of the existing/spare 10/10/10MVA Power Transformer in Mobo S/S;

3. Dismantling and undressing of 10/10/10MVA Power Transformer accessories and de-tanking and transfer the existing transformer insulation oil in a clean drum container;

4. Crating and hauling of Power Transformer 10/10/10MVA, 3-winding, 69/13.8/13.8 kV, ONAN, 3-Phase, 60Hz and its accessories from Mobo S/S to Masbate S/S;

5. Supply of Transformer Insulating Oil in accordance with ASTM D3487, specifications and technical data sheet;

6. Replace gaskets of the secondary housing of the current transformer, radiator valve and oil piping flanges;

7. Replace rubber bushing for secondary terminal bushing;

8. Calibration of the mechanical protection of the transformer (winding temperature, oil temperature, oil level indicator, rapid pressure, pressure relay, and buchholz relay);

9. Re-Installation/Erection, Testing and Commissioning of 10/10/10 MVA Power Transformer and its accessories to Masbate Substation including filling and testing of new transformer insulating oil;

10. Re-wiring, Testing and Commissioning of new transformer protection panel to 10/10/10MVA Power transformer and instrument transformers;

11. Supply, delivery, installation, test and commissioning of Line Protection Panel, Transformer Protection Panels and Transformer OLTC Control Panel;

12. Supply, delivery, installation, test and commissioning of Telephone System;

13. Supply, delivery, installation, test and commissioning of Intercom System;

14. Supply, delivery, installation, test and commissioning of CCTV Surveillance System;

15. Supply, delivery, installation, test and commissioning of VSAT System;

16. Supply, Installation and Test of Lighting & Power System and its Accessories;

17. Supply and installation of cable trays, including supports and accessories;

18. Supply, laying, tagging, bundling, termination and test of power, control and instrumentation cables;

19. Supply and installation of embedded and/or exposed electrical metallic/non-metallic conduits, boxes, fittings and accessories for power and control cables;

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

Mechanical Works

The work to be done under this section shall comprise the furnishing of all labor, tools, equipment, supply of appurtenant materials and other incidentals including installation/erection and test of all mechanical works enumerated hereunder in accordance with the Specifications contained herein and as

shown in the drawings or otherwise directed by the NPC, which shall consist of but not limited to the following:

1. Well drilling, Well development and pumping test with a minimum depth of approximately 20m, 50mm ∅ well casing and pump suction pipe installation and well disinfection;

2. One (1) unit of convertible jet pump, 2.6 m^3/hr (11.5 gpm);

3. One (1) unit of elevated water tank with a capacity of not less than 900 liters (237 gal);

4. Two (2) units of Wall Mounted Split Type, Inverter Type, Air Conditioner of 12,000 kJ/hr minimum cooling capacity for Switchgear/Auxiliary Room, complete with its mounting accessories and controls;

5. Two (2) units of Wall Mounted Split Type, Inverter Type, Air Conditioner of 20,000 kJ/hr minimum cooling capacity for Control/Relay Room, complete with its mounting accessories and controls;

6. One (1) unit of Wall Mounted Exhaust Fan, 150 m^3/hr minimum capacity for Restroom Area, complete with its mounting accessories and controls;

7. One (1) unit of Wall Mounted Exhaust Fan Explosion Proof, 450 m^3/hr minimum capacity for Battery Room, complete with its mounting accessories and controls;

8. One (1) lot of Domestic Water Supply Piping materials, valves, including pipe fittings, gaskets, flanges, bolts and nuts, pipe supports, excavation and backfilling works for embedded pipes and other incidentals to complete the domestic water supply piping system;

9. Four (4) units of Portable Type Fire Extinguisher, Clean Agent (HCFC or Halotron I Type), 7.1 kg. (15.5 lbs), wall-hung type and shall be in certified/ approved by the certifying body specified in MW-6.1 to be installed in designated areas as shown on the drawings; and

10. All other works and services required to complete the project.

GW-1.4 CONTRACT PERIOD

The Contractor shall complete the works within **THREE HUNDRED (300) CALENDAR DAYS**. The contract period is inclusive of twenty (20) rainy/unworkable days considered unfavorable for the prosecution of work at the site. The number of calendar days shall be counted from the date of contract effectivity as specified in the Notice to Proceed.

GW-2.0 GENERAL ADMINISTRATIVE REQUIREMENTS

GW-2.1 GENERAL

GW-2.1.1 Purpose

This Section specifies the general requirements applicable to engineering documentation, planning and scheduling, inspection, tests, materials, workmanship and standards related to the implementation of the Contract. Supplementary requirements of a special nature are contained in subsequent sections.

GW-2.1.2 Correspondence

To expedite action or response to all communications pertaining to this Contract, the Contractor shall address all such communication to:

THE MANAGER
Project Management Department
National Power Corporation
Quezon Avenue corner Agham Road
Diliman, Quezon City

with a copy furnished to the Vice President, Power Engineering Services.

The Contractor shall maintain a register for all correspondences which shall be accessible to the NPC for information. The Contractor shall forward correspondences to the NPC in one (1) original.

All correspondences between the NPC and the Contractor shall be numbered consecutively.

GW-2.1.3 Language and System of Measurement

All documentation relative to this Contract shall be in English. Submitted drawings, literature, etc., which are not in English language will be considered as not submitted at all.

Metric units shall be used in all documents, correspondence, technical schedules and drawings. On drawings or printed pamphlets where other units have been used, the metric equivalent shall be marked in addition.

GW-2.2 CONTRACTOR'S ORGANIZATION AND PERSONNEL

GW-2.2.1 Organization

The Contractor shall maintain in its project site offices, the Contractor's project organization charts for management, control and execution of the Contract. The Contractor's organization and personnel shall be as stated in the proposal.

The Contractor shall maintain an up-to-date project organization chart, which shall be submitted to the NPC for approval in the event of any changes.

GW-2.2.2 Key Positions

The key positions in the organization charts of the Contractor pertain to individuals assigned to management/supervisory positions, who at any time during the execution of the work can give decision and recommendation to the NPC on matters pertaining to the proper and early completion of the Work.

The appointment, transfer and replacement of personnel to all key positions shall be subject to the NPC's prior approval.

Engineering and procurement in key positions shall be committed to continue through the Contract period in order to maintain continuity.

GW-2.3 PLANNING AND SCHEDULING

GW-2.3.1 General

The Contractor shall be responsible for planning and scheduling, progress monitoring and reporting of all works and activities at sites.

The Contractor shall submit for approval by the NPC within thirty (30) days of the Effective Date of Contract, a detailed Contract Schedule resulting from the deployment of the Contractor's project management tool(s) for monitoring project activity progress, such as a Critical Path Method (CPM) Network or Project Evaluation and Review Technique (PERT) Diagram. The detailed schedule shall show commencement and completion dates for at least the following activities and "milestones":

a. Engineering Design;
b. Submittal of specifications and drawings for review and approval of NPC;
c. Fabrication or manufacture
d. System integration and shop testing;
e. Factory Acceptance Tests;
f. Shipments;
g. Civil works, erection;
h. Installation, testing and commissioning;
i. Trial operation;
j. Handover to the NPC.

GW-2.3.2 Format and Presentation

The Contractor shall prepare an activity network with the activities listed in early start order and showing the following:

a. activity code
b. activity description
c. duration in days
d. early start and finish dates
e. late start and finish dates.

The Contractor shall also prepare a bar chart identifying all activities which cannot be performed without the NPC's approval, and the need dates for the NPC's decision.

The Contract Schedule submitted shall meet the completion dates in the Construction Schedule and Schedule of Timings and shall clearly demonstrate the manner in which the various phases of the Works shall be completed.

All activities required for execution of the Works shall be carried out in accordance with the sequence and times and completion dates shown on the Contract Schedule or subsequent revisions thereto as approved by the NPC.

GW-2.3.3 Progress Monitoring Principle and System

Throughout the duration of the Contract, the Contractor shall monitor progress of the Works, and shall immediately advise the NPC in advance of any anticipated schedule delays, and the reason therefore.

If the Contractor believes it is necessary or advantageous to change the sequence of events shown on the Contract Schedule, he shall submit a proposed revision accompanied by a full explanation of the reasons and ramification of the change to the NPC for approval. No change shall be made in the order in which the Works activities are being performed until the NPC's approval for the revised Contract Schedule has been obtained.

Actual progress of each activity of the Works shall be compared with progress indicated on the approved Contract Schedule at least once every month by the Contractor.

After the NPC approves the Contractor's detailed Contract Schedule and planned activity completion dates, the Contractor shall update and analyze the Contract Schedule once a month and submit updated revision to the NPC on or before the 5th day of the following month.

The Contractor shall not change the sequence of activities shown on the approved Contract Schedule without the NPC's prior approval.

GW-2.4 MEETINGS

GW-2.4.1 Progress Review Meetings

The NPC shall schedule and hold monthly progress review meetings with the Contractor to a mutually agreed agenda. The meetings shall normally take place at the Contractor's site offices.

GW-2.4.2 Interface Meetings

The Contractor shall attend interface meetings with the NPC's other contractors as arranged by the NPC on a monthly or specifically called basis. The Contractor may also call for such meetings, if necessary.

GW-2.4.3 Design Review Meetings

The Contractor may request for a design review meeting during the processing stage of seeking the approval of the NPC to all design drawings to review, clarify and evaluate the design submitted with reference to the tender, the final design and the Contract Specification. The Contractor shall submit a meeting agenda seven (7) days prior to the meeting.

GW-2.4.4 Other Meetings

The Contractor shall arrange discipline meetings and other meetings as necessary with sub-contractors, etc. The NPC shall be notified in due time of such arrangements and given opportunity to attend.

The Contractor and the NPC shall, as required, hold meetings on specific subjects.

GW-2.4.5 Call for Meetings

Except for regular scheduled meetings, calls for meetings and agenda shall be sent out by the party calling the meeting to all requested attendees.

GW-2.4.6 Minutes of Meetings

Minutes shall be prepared by the Contractor on an agreed form and be issued for the NPC's review the next working day after the meeting has taken place. Minutes shall be approved by the NPC before copies are distributed to all attendees.

Matters requiring action shall be assigned the responsible party with dates for completion of such action. Result of action from previous meetings shall be recorded.

Copies of minutes of meetings from interface meetings shall be sent to the NPC in six (6) copies.

GW-2.5 REPORTS

GW-2.5.1 Monthly Reports

The Contractor shall from the second month after Commencement Date, submit to the NPC a monthly report related to the Works performed during the previous month. The Contractor shall present the report with diagrams in printed format.

Cut-off date for the report shall be the last Sunday of each month. The monthly report shall be submitted to the NPC no later than 12.00 hours on Wednesday after the cut-off date. The monthly report shall include as a minimum the following items:

a. narrative of major achievements and any deviations from time schedule, reasons for delays and deviations, with recommended actions and potential effects;

b. the Contract Detail Schedule showing the status at the cut-off date by means of a front line or equivalent;
c. a systematic listing and analysis of all significant time critical activities;
d. a summary of HSE activities and reported incidents in own and major sub-contractor's activities;
e. report on interface activities; and
f. narrative report on quality management activities.

GW-2.5.2 Close-out Reports

Project Control Close-out Report

The Contractor shall submit to the NPC a project control close-out report within ten (10) days after issue of the Completion Certificate which shall contain as a minimum the following items:

a. final as-is Contract Detail Schedule;
b. final as-is cost report; and
c. final as-is Contract amendment (if any) and Variation Order register, if any.

GW-2.6 HEALTH, SAFETY AND ENVIRONMENT (HSE)

GW-2.6.1 General

The Contractor shall at all times during the performance of the Contract be responsible for the safety of all personnel involved therewith.

Safe working practice for engineering and manufacturing shall be based on regulations, standards and HSE objectives.

The Contractor shall take all necessary precautions in connection with the performance of the Works in order to ensure the safety and health of the personnel of the NPC, the Contractor as well as Third Parties, and to protect the Works, the property of the NPC and all Third Parties.

The Contractor shall prepare and HSE program and submit this to the NPC for review and acceptance within thirty (30) days after the Effective Date of Contract.

The HSE program shall indicate how the Contractor shall implement his HSE requirements, how to perform follow-up and a proposed level of reporting to the NPC. The Contractor has the overall responsibility to ensure that all Site activities are planned, organized, performed and documented according to the Contractor's program. Accordingly, the Contractor is responsible for coordinating the HSE activities for all Site personnel working on the Contract.

GW-2.6.2 Reporting to the NPC

All situations not complying with approved procedures and other requirements shall immediately be reported to the NPC. All accidents shall be reported to the NPC.

GW-2.6.3 Pollution Control

The Contractor shall perform the Works without discharge into the atmosphere, from any source whatever, smoke, dust or other air contaminants in violation of law.

GW-2.6.4 Fossils and Articles of Value

All fossils, coins, precious or semi-precious stones, precious metals, articles of value or antiquity, and structures and other remains or things of geological or archaeological interest discovered on the Site of the Works shall be deemed to be the absolute property of the Government. The Contractor shall take appropriate precautions to prevent his workmen or any person from removing or damaging any such article or thing and shall immediately, upon discovery and carry out, at the expense of the Government, the NPC's orders as to the disposal of same.

GW-2.7 DOCUMENTS TO BE PREPARED BY THE CONTRACTOR

GW-2.7.1 General

The general documents, calculations, certifications, manuals, drawings, etc. relating to the manufacturing works, civil works, installation, testing and commissioning works which are to be prepared during detailed design by the Contractor are listed here below. The Contractor's attention is drawn to various sections of this Specification, where detailed contents of documentation are specified.

GW-2.7.2 Outline Drawings

The Contractor shall, within sixty (60) calendar days after the Effective Date of Contract, submit outline drawings of the equipment to be furnished under this Contract, together with weights, external forces, anchoring details and sufficient overall dimensions to facilitate preparation of final designs of the structure foundations.

GW-2.7.3 Diagrams

Schematic, circuit and wiring diagrams including list of materials, cable lists, etc. shall also be submitted by the Contractor for approval.

These diagrams shall show the internal and external connections of all apparatus, their designation, terminal numbers, color codes, etc. and shall be used for manufacturing, equipment installation and operation of the equipment.

GW-2.7.4 Detailed Drawings, Designs and Specifications

Before proceeding with the manufacture of equipment, the Contractor shall submit corresponding detailed drawings, designs and detailed specifications (in typewritten hardbound form) which shall show all details of materials,

manufacture, assembly, testing, erection, commissioning, operation and maintenance of the equipment in conformity with the Contract requirements.

The detailed drawings and specification shall include, but not necessarily be limited to the following:

a. general assembly drawings;

b. assembly drawings, showing:

1. sectional views
2. details of mounting of the internal equipment,
3. function of the assemblies,
4. adjustment and operating ranges,
5. concrete pedestals and foundation bolts and anchors'
6. field tolerances,
7. all field joints,
8. methods of lubrication (if required)

c. detail manufacturing drawings showing:

1. detail dimensions
2. tolerances
3. materials
4. nameplate diagrams

d. engineering instructions and detailed specifications for:

1. manufacturing
2. fabrication
3. painting, including final color scheme
4. heat treatment
5. welding
6. surface treatment
7. testing

GW-2.7.5 Design Computation and Final Design Data

After the Contractor has completed the preliminary design of the equipment, he shall submit the final design data, design analysis and design computations (referred to as designs) along with all other specified designs and studies, all in typewritten and book-bound form, clearly laid out with all the design criteria and standards indicated for the NPC's review and approval.

GW-2.7.6 Parts Bills

The Contractor shall submit with the first drawing issue, where applicable, corresponding parts bills. Reference to the respective detail or assembly drawing, materials used or catalog shall be made.

GW-2.7.7 Catalogue Cuts, Illustrations, Etc.

Applicable requirements of this paragraph with reference to drawings shall apply equally to catalogue cuts, illustrations, printed specifications, design data, analysis and calculation, and manufacturer's descriptive literature and instructions for all equipment furnished to demonstrate fully that all parts will conform with the requirements and intent of the Contract Documents.

GW-2.7.8 Installation Manual

The Contractor shall provide the NPC with an Installation Manual covering installation procedure and instruction to facilitate smooth erection, assembly and testing on site of all equipment to be installed.

The instructions therein shall specify the exact procedures to be followed during installation, indicate data to be measured and recorded (adjustments, setting of limits, etc.), quantities, dimensions and tolerances to be checked, etc.

The manual shall include information on handling and slinging the major pieces of equipment, erection, tolerances, settings and adjustments and special precautions to be taken during installation.

The Contractor shall submit six (6) copies each of the Installation Manual for each equipment per substation per schedule to the NPC.

GW-2.7.9 Commissioning Manual

The Contractor shall provide the NPC with a Commissioning Manual, which shall be similar in size and form to the Installation Manual and shall include procedures and instructions to be followed during the commissioning of all equipment to be installed.

The instructions therein shall specify the exact procedures to be followed during commissioning and shall indicate all data to be measured (and where appropriate, recorded in the manual itself) and all adjustments, setting of limits, etc., quantities, dimensions and tolerances to be checked.

The Contractor shall submit six (6) copies each of the Commissioning Manual for each equipment per substation per schedule to the NPC

GW-2.7.10 Operation and Maintenance Manual

The Contractor shall provide the NPC with an Operation and Maintenance Manual similar in size and form with the other manuals and shall include procedures and instructions to be followed by the operating and maintenance staff necessary for reliable operation and maintenance of the equipment.

The manual shall contain at least the following documents and data as a minimum:

- General description of the equipment, operation in particular;
- Main technical characteristics;

- Connection to external system;
- Instructions for operating personnel including periodic tests, check-points, actions required following each individual alarm signal, etc.;
- Summary of important rules, standards, safety precautions and instructions to be followed during equipment operation and maintenance;
- Safety and warning signs to be placed in the plant/substations, etc.;
- Enclosures: Important principle diagrams.

Sections on "maintenance" shall be divided into two parts, namely:

a. Current (preventive) maintenance indicating inspection periods, routine cleaning and lubricating procedures (if required), safety checks, adjustments, etc.;

b. Repairs and overhauls describing the dismantling, removal and replacement of parts (with spare parts), trouble-shooting guides, repair instructions, etc.

The Operation and Maintenance Manual supplemented by any additional drawings and project documents to be submitted to the NPC will be the only document to be generally used by the power plant/substation operating staff.

The Contractor shall submit six (6) copies each of the Operation and Maintenance Manual for each equipment per substation per schedule to the NPC. Likewise, four (4) sets of CDs containing these documents preferably in MS WORD Format shall be provided. Other format can be accepted provided software for this format is included in the CDs that will be furnished.

GW-2.7.11 Final/As-Built Drawings

The Contractor shall furnish a complete set of an original reproducible copies of an approved type and four (4) sets of recordable DVDs which can be loaded and handled on a personal computer each containing copies of all drawings as finally approved and built. Such DVDs shall be suitable for DVD ROM/WRITE drive of computer system. The Contractor, if required in the Technical Data Sheets, shall supply the necessary hardcopy and softcopy as a complement for the submission of Final/As-Built Drawings. Four (4) additional prints of same drawing with dark lines on a white background shall be furnished. For all approved drawings with no subsequent revisions, the reproducible copies earlier furnished may be considered part of this set. The NPC will not release the final payment and the performance security until the foregoing conditions have been fulfilled.

GW-2.8 PRESENTATION OF DOCUMENTATION

All documents to be prepared by the Contractor shall be submitted to the NPC for approval. The timing of such submission shall be in accordance with Section GW-2.9, Procedure for Delivery of Documents.

All documents to be approved by the NPC shall meet the following requirements:

a. Metric units shall be used in all documents, correspondence, technical schedules and drawings.

b. Drawings, electrical diagrams, key charts, process diagrams, etc., shall be in A3 format and flow directions shall be from left to right or from top to bottom. The NPC's document number, document name and revision index must be readable when folded to A4. It is of vital importance that cross references between electrical diagrams are performed in a way that makes it possible to follow any signal from its source to its visualized position.

c. All other documentation shall be forwarded in A4 format with four (4) holes at intervals of 80-80-80 mm symmetrically around the center axis of the document. The NPC's document number, document name and revision index must be readable on all pages.

d. All drawings and copies shall be on white paper and with black print unless otherwise agreed upon.

e. All drawings shall be provided with clear space (approximately 80 mm x 50mm) for the NPC's stamping of **"Approved"** or **"Approved with Corrections Indicated"** or **"Returned for Correction"**.

"Approved"; this mark authorizes the Contractor to proceed with the Contract Work therein indicated.

"Approved with Corrections Indicated"; this mark authorizes the Contractor to proceed with the Contract Work therein indicated taking into account of the notes and/or comments by the Contractor and re-submit the drawings, specifications or designs for approval.

"Returned for Correction"; this mark requires the Contractor to make the corrections indicated and re-submit the drawings, specifications or designs for approval before commencing the Contract Work therein indicated.

f. For documentation submitted in binders, the binders shall have four (4) rings at intervals of 80-80-80mm symmetrically around the center axis. The maximum width of the binder shall be 75 mm. The binders shall have text at front and at spine.

Award of contract does not imply approval of drawings and data submitted by the Contractor with his tender.

Approval of the Contractor's drawings shall not be held to relieve the Contractor or any part of the Contractor's obligations to meet all the requirements of this specification nor of the responsibility for the correctness of the Contractor's drawings.

When revised drawings or drawings which have been returned to the Contractor marked **"Approved with Corrections Indicated"** or **"Returned for Correction"** are re-submitted for approval, the revision block shall be completed with the description and date of revision and the appropriate

revision letter or numeral which shall be clearly indicated adjacent to the revision or modification which requires approval.

No revision affecting the design shall be made after a drawing has been "**Approved**" without re-submitting the drawings suitably revised for formal approval.

The NPC will complete the review and/or approval of the Contractor's drawings within twenty (20) calendar days after receipt at NPC office. If within the twenty (20) calendar days, Contractor has not received any reply from the NPC regarding the approval drawings, the Contractor may proceed with the design and manufacture of equipment or materials as if the drawings have been approved. The Contractor however, shall not be held to be relieved to meet all the requirements of this specification nor of the responsibility for the correctness of the Contractor's drawings.

GW-2.9 PROCEDURE FOR DELIVERY OF DOCUMENTS

GW-2.9.1 General

The Contractor shall submit the following information to the NPC. The number of copies to be supplied shall be as indicated below:

GW-2.9.2 Within Thirty (30) Days after the Effective Date of Contract:

Detailed time schedule showing the commencement and completion dates for the various activities and milestone specified in Section GW-1.3

three (3) sets of:

- Drawing classification plan
- List of detailed drawings
- Quality Control and Assurance Program
- Detailed Contract Schedule

GW-2.9.3 Within Forty-Five (45) Days after the Effective Date of Contract:

three (3) sets of:

- Design and manufacturing schedules
- Delivery, erection and commissioning schedules
- Principal drawings, schemes, tables and electrical diagrams
- Type test reports and literature concerning the equipment if not submitted with the bid
- A program of performance, material and workshop tests to be carried out

GW-2.9.4 Within Sixty (60) Days after the Effective Date of Contract:

three (3) sets of:

- Outline drawings of the equipment

- Loading of foundations for all items of equipment to be supplied and details of anchors and supports
- Principal electrical diagrams
- Schematic diagrams
- Drawings for structures
- Delivery of all drawings related to civil works

GW-2.9.5 Before Beginning of Manufacturing

three (3) sets of:

- Detailed manufacturing drawings with all important dimensions, final assembly drawings, governing and control schemes, cabling and wiring diagrams and block and circuit diagrams intended to aid understanding and provide full information about the principles of operation
- Performance and stress calculations as the NPC may require

GW-2.9.6 During Manufacture

six (6) sets of:

- Progress photographs of the shop work done. Photographs shall be approximately 20 x 25 cm in size, including a margin of 2.5 cm on one of the 25 cm sides for binding. Four (4) views will be required for each piece of equipment. Each photograph shall contain upon its face the date, the name of the manufacturer and the title of the view taken.
- Notice of material tests and shop inspection

GW-2.9.7 At Least Fifteen (15) Days Prior to Shipment

- Six (6) copies of Inspection report
- Five (5) copies of Test certificates or test reports together with certificate of inspections (additional two (2) complete set bound in books required).

GW-2.9.8 At Least Thirty (30) Days Prior to Shipment

- Six (6) sets of packing lists for each consignment
- Six (6) sets of instructions for loading, unloading, handling and special precautions to be observed for storage at site
- Six (6) sets of Installation Manuals for each equipment to be supplied

GW-2.9.9 Within Ten (10) Days After the Last Shipment of Equipment

- Six (6) sets of Commissioning Manual
- Six (6) sets of Operating and Maintenance Manual

GW-2.9.10 Before Issuance of Certificate of Provisional Acceptance

- One (1) reproducible (rolled) and six (6) light copies of all drawings marked **"Final/As-Built Drawings"** and four (4) sets of recordable CDs each containing copies of all the drawings as finally approved and built.

GW-2.10 QUALITY ASSURANCE REQUIREMENTS

GW-2.10.1 General

The Contractor shall have a well-organized Quality Assurance Program (QAP) which shall comply with the requirements of ISO 9001 – "Model for Quality Assurance in Design/Development, Production, Installation and Servicing", or equivalent quality standard relevant for the Works to assure that items and services, including subcontracted items and services, comply with this specification.

Within thirty (30) days of the Effective Date of Contract, the Contractor shall submit six (6) copies of his complete quality control and assurance procedures, manuals for review and approval by the NPC. The manual shall include pro-forma check lists for all requirements of the Contractor's quality control and assurance program and those called for in this Specification.

GW-2.10.2 Quality Assurance Program

The Contractor shall, for all work covered by the Contract:

a. Establish procedures for adequate planning and resourcing of all quality related activities including the preparation of quality plans.

b. Establish measures for the identification and control of items throughout all stages of the Contract. This shall include measures to maintain traceability as identified in agreed quality plans.

c. Arrange for the protection of the quality of the product to include delivery to the specified destination.

d. Control their measuring and test equipment in accordance with established procedures for measurements and calibration systems and ensure that such equipment that may be used by subcontractors to verify work is similarly controlled.

e. Ensure adequate quality systems exist for compliance with the requirements identified in Sections GW-2.10.1 to GW-2.10.10 inclusive.

Where any site installation and/or test and commissioning work is involved, the Contractor shall prepare contract-specific quality assurance procedures in agreement with the NPC prior to commencements of such works.

The Contractor shall be responsible for specifying the quality assurance requirements to his subcontractors, for approving subcontractor's quality assurance program and for ensuring compliance with the requirements.

The Contractor shall ensure that all appropriate technical information is extracted from the Contract documents and specifications and passed on to the subcontractors.

The Contractor shall ensure that all computer systems and software to be utilized on the project is qualified for the application under consideration and such qualification is documented.

GW-2.10.3 Quality Plan

The Contractor shall establish and implement quality plans detailing the specific activities, design reviews, operations, control procedures, inspections, testing, approvals and certification requirements applicable. All procedures, which support the quality plan shall be referenced and distributed to the NPC together with the quality plan. Quality plans shall be submitted to the NPC for review and approval.

Where inspection schedules are generated in support of a quality plan, these are also required by the NPC for review and approval. The format and content of schedules shall ensure that inspection operations are planned and performed in a systematic manner.

The Contractor shall keep the NPC informed of any changes in the quality plan during the Contract period.

The quality plan shall document how the Contractor shall apply his quality system in the execution of the Contract. For the quality plan description and definition, the Contractor is referred to ISO 8402 and ISO 9000-4. The quality plan shall meet the guidelines of ISO 10005.

The quality plan shall consist of a set of plans, for which other terms than quality plan may be used, e.g. inspection plan. The hierarchy of the quality plan shall be shown. The quality plan shall contain a master test plan.

The Interface Coordination plan shall be a part of the Quality Plan and reflect the interfaces in the project and to the Scope of Work of the Contract. The Interface Coordination plan shall be a tool in safeguarding the handling of interface issues as well as a documentation of the same. The plan shall be maintained on a continuous basis and shall contain all interfaces towards other contractors and/or the NPC, including target dates for exchange of information/documentation. The Contractor shall prepare the required documentation as input to other contractors in order to enable them to perform their scope of works.

Documents referred to in quality plans shall be available to the NPC for review, if required.

Specific quality plans shall be prepared for site work and submitted for review and approval by the NPC prior to commencement of such work.

The Contractor shall approve all quality plans, inspection and test schedules of their subcontractors and vendors.

The Contractor shall identify his verification requirements on the quality plans submitted to the NPC for review and approval and shall identify the following:

a. Stages subject to random surveillance.

b. Inspection that require to be carried out or witnessed, by the NPC or a third party following satisfactory verification and acceptance by the Contractor.

c. Hold points beyond which work cannot proceed before completion of all operations, verifications and related activities identified after the previous hold point on the quality plan.

GW-2.10.4 Subcontractors and Suppliers

For each subcontractor, the Contractor shall identify the relevant quality standard ISO 9001, 9002 or 9003 to be selected in accordance with guidelines given in ISO 9000-1 and ISO 9000-3. The Contractor shall asses the subcontractor's quality system and their implementation to confirm adequate qualification standard.

The Contractor shall plan and carry out the Quality Surveillance (QS) of his subcontractors (ref. ISO 8402, Clause 3.11) at a level of detail sufficient to ensure fulfillment of the quality requirements of the Contract. The NPC shall have the right to participate as observer in such QS activities.

The Contractor shall submit his QS plans to the NPC for acceptance and keep the NPC informed of any change thereof.

GW-2.10.5 Quality Audits

The Contractor shall plan and carry out quality audits in his own organization and in subcontractors' organizations. The NPC shall review the Contractor's audit plans and coordinate his own audit plans with the Contractor's. The scope and frequency of the audits shall be adequate to confirm that the quality activities and results comply with the quality system and the planned arrangements.

NPC reserves the right to request, review and maintain for the duration of the contract a copy of the Contractor's Quality Manual.

During the course of the Contract, NPC reserves the right to carry out quality audits of the Contractor, subcontractors or their subcontractors. Monitoring will be by means of surveillance of activities at the work locations and where appropriate by formal audits. Representatives of the NPC shall be afforded unrestricted access, facilities and assistance at all reasonable times to carry out this quality audits.

GW-2.10.6 Records

The Contractor shall generate records as required by the quality assurance system and quality plans. Records, including audit reports shall be made available for inspection by NPC.

All records shall be concisely compiled, indexed and cross referenced to the project contract number and the relevant subcontract numbers. They shall be clearly identifiable to the individual parts and assemblies to which they refer. Those records required by the NPC, as defined in the contract specifications and quality plans shall be available at the time of delivery of the equipment. Such records shall include reports and certification in respect of pressure retaining components together with general traceability records for all items through certification and build documentation as a minimum. Six (6) copies of these records shall be supplied to NPC with the exception of radiographic films where the original set of films shall be supplied.

All records generated during the course of the Contract, including those generated as evidence of effective implementation of the quality assurance program of the Contractor and his subcontractors, shall be retained by the Contractor for a minimum period of five (5) years from the date of contract completion. These records shall be made available to NPC on request during the retention period.

GW-2.10.7 Particular QA Requirements

General

As a supplemental document to the QA program, the Contractor shall submit for approval of the NPC, a separate document with detailed particular requirements and specific acceptance criteria of all equipment.

At Shop

Corresponding to each major and minor equipment, the following data are required for submission to and approval of the NPC:

a. Test and inspection procedure;
b. Guaranteed technical rated or design data;
c. List of hold points and/or routine tests;
b. Acceptance criteria and reference standards;
c. For of test results/data with comparison to the guaranteed data. All allowable tolerances with respect to dimensional control of assemblies and sub-assemblies at shop shall be clearly indicated in the manufacturer's drawings.

At Site

The dry tests at site shall be in accordance with the latest edition of ANSI or applicable IEC Standard. Verification tests after installation shall be thoroughly discussed with the requirements similar as stated above.

The NPC or his duly authorized representative shall control said site tests, in collaboration with the Contractor's representatives.

GW-2.10.8 Reporting and Corrective Action

The Contractor's quality assurance program shall provide for prompt detection and correction of all conditions adversely affecting quality, including

failures, malfunctions, incidents, trends, deficiencies, deviations, non-conformances, and defective materials. The Contractor shall establish and maintain methods for verifying and determining the cause of an adverse condition and for initiating necessary improvement and corrections to preclude repetition. Quality trends shall be analyzed to furnish a basis for improvement in work performance. The Contractor's corrective action system shall extend to the performance of other participating contractors, sub-contractors, and Contractors, when necessary, and shall provide for the interchange of corrective action information. Identification of the adverse condition, its cause, and the corrective action taken shall be recorded and reported to appropriate levels of management.

The Contractor shall establish and implement procedures for reporting, verifying, analyzing, and correcting failures, including those that occur during development and qualification testing. The procedure shall provide assurance that the cause and mode of each failure are determined, that potential safety and availability implications are evaluated, and that corrective action is taken.

A failure report shall be prepared to identify the failed item and its origin or source of manufacture and shall describe the failure, the test status at time of failure, the probable cause and mode of failure, and the recommended corrective action.

GW-2.10.9 Design Revision and Substitution of Material

Any revision affecting the design and manufacturing of the equipment as well as substitution of materials that is deemed necessary shall be notified by the Contractor to the NPC for the latter's review and approval.

GW-2.10.10 Nonconformity Handling

For nonconformity handling, the requirements of ISO 9001, Clauses 4.13 (Control of Non-Conforming Material) and 4.14 (Corrective and Preventive Action) shall apply.

The Contractor shall provide all information required to enable the NPC to evaluate the Contractor's nonconformity request.

Nonconformities which had been accepted by the NPC and decided to be "as is" shall be documented in the as-built documentation.

Nonconformities as mentioned above, which are introduced by subcontractors and their subcontractors and their subcontractors, shall also be recorded and handled by the Contractor.

Any request for the NPC's approval of a nonconformity shall be on a specific report form which shall fulfill the following requirement. The nonconformity report shall:

a. clearly state whether the nonconformity will be a permanent "as is" nonconformity or not;
b. give reference to violated requirements;
c. state whether it is violating authority requirements;

b. be justified with sufficient explanation and documentation for easy review and approval
c. clearly refers to affected area where applicable.

GW-2.10.11 Contractor's Responsibility

Approval by NPC of the Contractor's quality assurance program, quality plans and inspection and test plans or of those of his subcontractors will not relieve the Contractor of his obligation to provide goods and services which meet the requirements of the Contract.

GW-2.11 TRANSPORT, PACKING, ETC.

GW-2.11.1 General

No shipping or transport limitation shall be imposed by the NPC on the Contractor. The responsibility shall lie on the Contractor whether the dimensions of his supplied equipment and materials in crate or in box will be appropriate for loading, unloading and transported to the Site.

The Contractor must at his own expense, conduct an ocular route survey of all roads, bridges, overpasses, etc. from the Port of Entry to the Site and examine for himself the conditions of all roads and bridges.

The Contractor shall check the capacity and availability of loading and unloading facilities which will be utilized in connection with his transport operation, as well as its characteristics, taking appropriate measures to avoid damaging the same. All costs related to the reinforcement of roads, bridges and the like, if any, shall be borne by the Contractor.

The Contractor shall coordinate his own transport program and shall advise proper authorities of the transit of the heaviest items to be transported and shall comply with the instructions given by said authorities.

All damages caused to public roads, streets or public structures shall be compensated by the Contractor at his own expense.

GW-2.11.2 Packing

Each crate, box or package must have a packing list and in addition to the usual and customary marks, the following identifying marks:

Republic of the Philippines
NATIONAL POWER CORPORATION
Diliman, Quezon City

Project : _____

Contract No. : _____

Destination : _____

Case No. : _____

Gross Weight :

Net Weight :

Dimension : L x W x H

In addition, each crate, box or package shall be color coded and marked with abbreviation code to aid the NPC in sorting materials for the various substations. The identifying marks and the color codes shall be as stated in the Technical Data Sheets of the equipment.

GW-2.11.3 Transport Marking

The outside of all containers, cases, etc. shall be clearly marked with the total weight, point of maximum weight and correct position for the attachment of lifting hooks and cables and shall bear identification marks relating to the appropriate dispatch documents. Where appropriate, the cases or boxes shall bear special instructions such as **"top", "handle with care", "keep dry", etc.**

All parts of the Contracted Equipment and the Contractor's equipment shall be well-packed and protected against loss or damage during transport by sea and overland, and while in storage. Perishable material provided in spares and repair sets shall be provided in sealed containers with a shelf-life of at least ten (10) years. All packaging shall be performed in a such a way that overturning of the packages will not damage the equipment.

Instructions for handling shall be clearly marked on all parts, packages and crates.

All parts, packages and crates shall be adequately marked in order to enable identification. Each item contained in a package shall be clearly identified on the packaging list by its description and part number, package date, shelf-life and assembly drawing reference, and each item shall be marked or labeled to correspond with the packaging list.

The costs of all equipment necessary for the temporary fixing and supporting of the various parts of the Plant and the various packages to crane hooks, rail wagons, etc., during handling, transport and storage, and the cost of load distribution beams, etc., where they form part of the packages or crates, shall be included in the tender price.
The Contractor shall be entirely responsible for all packing and unpacking, and any loss or damage shall be compensated to the satisfaction of the NPC by the Contractor and, where not otherwise provided, at the Contractor's own expense.

GW-2.11.4 Preparation for Shipping and Storage

GW-2.11.4.1 Pre-Shipment Preparation

The Contractor shall prepare equipment for shipment to protect it from damage during shipment and subsequent storage not exceeding one year,

unless specified otherwise in the Technical Data Sheets for each equipment under this specification.

Equipment shall be completely drained of all water and thoroughly dry prior to shipment. When such draining requires removal of plugs, drain valves, etc., the Contractor shall make sure that these parts are reinserted or reassembled prior to shipment.

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 12.5 mm or thicker plywood disc, or suitable alternate, bolted to the face of the flange.

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

Wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners shall protect butt weld connections.

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. If equipment is braced internally for shipment, it shall be marked conspicuously, **"Remove internal braces before testing and operating"**.

The outside of all containers, cases, etc. shall be clearly marked with the total weight, point of maximum weight and correct position for the attachment of lifting hooks and cables and shall bear identification marks relating to the appropriate dispatch documents. Where appropriate, the cases or boxes shall bear special instructions such as **"top", "handle with care", "keep dry",** etc.

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.

For transformers, the following provisions shall also be considered:

a. Transformer designed for oil immersed operation shall be shipped oil-filled, unless otherwise specified. Provision shall be made for oil expansion caused by temperature changes during shipment. If transformers are shipped with gas, pressure gauge for transportation shall be provided and valves shall be sealed and effectively crated to prevent tampering or removal while in transit, and a means provided for allowing gas pressure to be measured in a simple way after uncrating, without requiring release of the gas. Valves shall be securely covered by a pipe cap or other tamperproof cap. If shipped gas filled, the Contractor's recommended oil filling procedure shall be submitted for NPC's approval.

b. If transformers are shipped filled with dry air, the dry air shall have a dewpoint of -50^{0}F or lower, otherwise, the same provisions as for gas-filled transformers shall be followed.

c. The transformer shall be shipped with NPC accepted three dimensional impact recorders with time period recording chart of at least three (3) months for transportation on the basis of returning back after the transformer arrive at the substation site. If it is missing or damaged, if the seal is broken or it has been disturbed in any way, a specific carrier's inspection report must be issued by the Contractor's carrier to relieve the NPC of responsibility for the recorder. Instructions for the recorder, and for special tests which may be required, are in the instruction letter enclosed in the recorder. The recorder and tape must be examined only in the presence of the Contractor or the Contractor's agent.

For the conductors, it shall be supplied on type of reels as specified in the Technical Data Sheets and shall be sturdy enough to withstand rough, but normal and customary, handling during loading, transport, unloading, field deployment and installation. The inside surfaces of the drum and flanges shall be smooth and without protrusions so that the conductor is not damaged during winding and unwinding. The cable shall be protected by plastic or other suitable material against dust and sprays (particularly salt spray). Steel-banded lagging is required on the outside of wooden flanges and between the flange I-beams of metal reels. Reels shall be marked consecutively from a production run.

Tubular bus conductors shall be packed in individual boxes. Tools shall be packed in individual boxes. Individual boxes may be shipped in larger shipping units such as containers or pallets.

All fittings, connectors, spacers and clamps shall be neatly packed in boxes or crates and shall be protected against dust and sprays (particularly salt sprays) by providing a hermetically sealed polyethylene sheet covering. Shipment without this covering will not be accepted.

All anchor bolts and accessories shall be packaged per unit structure such that a bundle shall contain the corresponding approved number of bolts and accessories.

GW-2.11.4.2 Shipping and Transportation to Site

The Contractor shall arrange and pay for the transport of the equipment, materials, etc. to the site, as well as handling and storage within the site. The Contractor shall also be responsible for the transport, handling and storage of his equipment and tools that he will be using in the installation/erection, testing and commissioning of all equipment and materials under the Contract, as well as the return of these equipment and tools to the country of origin.

The Contractor shall be responsible for making sure that shipping is arranged on vessels having suitable equipment for loading and unloading of the equipment and materials, or that harbor has the corresponding facilities.

The NPC shall approve the transport arrangements. The Contractor shall, in good time, inform the NPC about each consignment by providing a list of contents, including the shipping date and the expected date of arrival.

It shall be deemed that all costs in connection with the transport, including storage, insurance, etc., detailed above and in Conditions of Contract, being the responsibility of the Contractor, have been included and allocated in his prices stated in the Schedule of Prices.

The Contractor shall arrange and carry out under his own responsibility and supervision, the local transport from the port of unloading to the Site.
The Contractor shall gather all information and arrange for all necessary provisions in order to obtain accurate information about unloading and local transport facilities, as well as prevailing local conditions, specifically the safe load bearing capacity of public road and bridges. The Contractor shall bear every and all expenses related herewith, which shall be included in the tender.

The Contractor shall use every reasonable means and care to prevent any of the roads and bridges on the route to the Site from being damaged by any traffic by the Contractor or any of his sub-contractors. He shall select routes, choose and use vehicles, restrict and distribute loads so that any such extra ordinary traffic that will inevitably arise from the moving of the Contractor's equipment and material to or from the Site shall be limited as far as reasonably possible, and so that no damage may be caused to roads and bridges.

If, during execution of the Work or at any time afterwards, the Contractor should receive any claim arising from the execution of the Works with respect to damage to roads or bridges, he shall immediately report this to the NPC and subsequently negotiate the settlement of any payment of all sums due with respect to all claims, proceedings, damages, costs, charges and expenses in related to the claim.

GW-2.11.4.3 Inventory List

An inventory list approved by the NPC shall be furnished prior to shipment of materials and equipment, and shall consist of lists for:

a. Materials
b. Spare parts, tools and equipment
c. Test Equipment

The materials listed shall consist of an itemization of materials furnished at the factory site.

GW-2.11.4.4 Storage

The storage will be in an environment similar to the installed location, i.e., indoor equipment will be stored indoors (without heating and ventilation), and outdoor equipment will be stored outdoors. Where required to protect against

condensation and humidity, a desiccant shall be provided and its presence, with the need of periodic removal and dryout, shall be so marked. When electric space heaters are provided for that purpose, these should be wired to the outside of the equipment so that energizing immediately upon receipt is possible without disassembly of crates, etc. This also requires that no combustible materials be left in the inside of the equipment.

Items which may be subjected to open storage for several months on site shall be suitably packed and protected from the weather.

The Contractor shall provide storage and handling instructions including descriptions for periodic inspection and/or storage maintenance to ascertain that no deterioration will occur during storage. One set of these instructions shall be fastened securely to the outside of the shipping unit.

The Contractor shall provide at NPC's request, the Contractor recommended instructions for long term storage.

When equipment is specified for export shipment, the Contractor shall include packaging adequate for export shipment, and this packaging shall be such as to obtain approval and acceptance by transportation companies.

All equipment shall be shipped from the factory completely assembled as far as practicable, subject to the limitations of length, height, depth, and weight, etc. described in the Special Conditions of Contract or in the Technical Data Sheets for each of the equipment under this Specification.

GW-2.12 MISCELLANEOUS

GW-2.12.1 Contractor's Supervision

The Contractor shall provide a competent (Engineer) Service Engineer, or technician during installation and perform the complete tests, commissioning and start-up of all equipment.

The Contractor shall send only service engineer, or technician who have adequate working knowledge of the English language.
The NPC reserves the right, if services for a longer period are needed, to ask for extension of the Contractor's supervisors until such time that the NPC's personnel have been fully trained in the operation, test and maintenance of the equipment supplied by the Contractor, at no cost to NPC.

The Contractor shall notify the NPC sixty (60) days in advance of the date when the service engineer or technician should commence the installation, tests and commissioning of the equipment at the site in order for the NPC to prepare his personnel in participating such activities.

The service engineer or technicians shall not be considered employee of the NPC for all legal intents and purposes and the Contractor shall be responsible for the payment to said service engineer or technician of all indemnities accruing of any labor accident which may occur in the course of the work and for which the Contractor maybe responsible either under the Philippine Laws or any foreign laws.

GW-2.12.2 Training of NPC Personnel

GW-2.12.2.1 General

If required in the Technical Data Sheets of the equipment, the Contractor shall provide overseas and local training courses for NPC personnel in English.

Training shall be geared towards the technical engineers and maintenance personnel of NPC through the transfer of technical knowledge.

Training overseas shall include classroom instruction courses conducted on the Contractors premises during manufacture of the equipment and hands-on training to enable NPC's personnel to manage, install, test, commission, maintain, operate and service the equipment on completion of the works in accordance with maintenance and operating procedures established by the Contractor. All expenses in the overseas training shall be borne by the Contractor including airfares, accommodation, transportation and allowances.

The training overseas shall not be more than one (1) month and shall commence at the latest, two (2) months before the date of the main shipment of the equipment to be supplied. NPC shall dispatch the required number of engineers specified in the Technical Data Sheets of the equipment where training is required to attend the training at the factory sites. They should be able to see and study the equipment to be supplied to NPC.

Local training shall also be conducted for ten (10) NPC personnel for not more than one (1) month. The Contractor shall provide similar training documentation and local meals to the NPC personnel. The NPC shall provide training room and any available test facilities.

Training selected from among NPC's maintenance staff will be qualified electrical and/or electronic personnel. Their experience will be of a broad and general technical nature, including general familiarity with electronic systems and testing facilities.

The cost of performing the training course shall be included in the Contract Price for the equipment.

GW-2.12.2.2 Training Objectives

The training courses shall be designed to:

a. Enable maintenance staff to perform maintenance of the equipment by teaching principle of operation trouble-shooting methods and procedures leading to the identification and replacement of faulty piece of equipment, modules, units and components, with the objective that NPC personnel will become capable of carrying out repair and maintenance without outside assistance.

b. Enable maintenance staff to perform routine maintenance of the equipment by way of electrical and mechanical adjustments, lubrication and/or replacement of parts subject to wear or with a limited life.

c. Provide an understanding of the software and a working knowledge of the database for additions, modifications, and deletions and the practical use of diagnostic programs.

GW-2.12.2.3 Course Content

The training course shall consist of formal courses given on the Contractor's premises including classroom training, instruction and explanation during shop tests and/or Factory Acceptance Tests and practical work sessions with the Contractor's specialists during the implementation of requirements of the Contract. Training shall be on the same hardware and software supplied under the contract.

GW-2.12.2.4 Course Documentation

The Contractor shall submit a daily schedule for the entire training period and a syllabus for each course with a listing of course documentation, no later than thirty (30) days prior to the start of training.

Documentation shall be provided covering each course to a level of detail so that the text is self-explanatory and sufficient as future reference.

Prior to the start of a course, each trainee shall receive at least one (1) set of documentation covering that course. The Contractor shall submit to NPC one (1) set of course documentation per trainee no later than fifteen (15) days prior to start of each course.

GW-2.12.3 Documentary Film

The Contractor, if required in the Bid Data Sheets of the General Requirements shall record and provide documentary film of the Scope of Works covering:

- footage on the various substations covered under this Project
- site preparation and mobilization
- processing and manufacturing of equipment to be used for the Project
- factory tests: type test, special test and routine test for the equipment that will be supplied
- equipment transport
- installation
- system testing
- commissioning of the system
- key personnel involved in the Project both on the NPC's side and the Contractor's side
- etc., which the Contractor may think would be necessary for inclusion on the documentary film.

The documentary film should last for a minimum of twenty (20) minutes and must be on a DVD type video disk on at least MP4 format. Six (6) copies are to be provided by the Contractor to the NPC.

GW-2.13 MEASUREMENT OF PAYMENT

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

SECTION VI

PART I

TECHNICAL SPECIFICATIONS

ARCHITECTURAL WORKS

SECTION VI – TECHNICAL SPECIFICATIONS

AW – ARCHITECTURAL WORK

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TECHNICAL SPECIFICATION

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 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 request shall indicate the reasons for substitution. No substitute material shall be used without written authorization from the NPC Representative.

The Contractor shall submit written request for substitution at least one (1) month before such materials are actually needed. Such 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 manufacturer or sole distributor of equipment and materials to be furnished and installed by the Contractor, 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 specially 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 of pipe fastening elements, e.g., pipe clips, hangers, etc.
- installing and dismantling as well as providing all framework and scaffolds
- Making blackouts on concrete
- 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 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 CONCRETE MASONRY WORKS

AW-2.1 General

The work to be done under this section shall include the furnishing of all labor, materials, equipment, tools and other incidentals to complete the work.

Concrete masonry units of the type and thickness indicated shall be provided, and shall be properly coordinated with the work of other trades. The source of supply for material which will affect the appearance of the finished work shall not be changed after the work has started.

Masonry units shall be handled with care to prevent chipping and breakage. Storage piles shall be so located as to avoid being damaged by construction operations and traffic. Cement and lime shall be stored off the ground under watertight cover until ready for use. Damaged materials shall be rejected.

AW-2.2 Materials

Concrete Hollow Blocks shall be of standard manufacture, machine-vibrated, fine and even textured and well-defined edges.

Unless otherwise shown on the drawings, concrete hollow blocks to be used shall conform to the requirements of ASTM Specification C-129-39 Minimum Compressive Strength of not less than 4.48MPa average of the fine specimens.

Mortar Proportions

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

   1) Masonry grout for filling cells of concrete blocks shall consist of one (1) Portland cement, one-fourth (1/4) part lime, three (3) parts sand to which three (3) pea 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 be less than two minutes.

   2) Intersecting hollow blocks walls and partitions shall be bonded by overlapping units on alternative course or by the use of 6.3mm (1/4") diameter ties at 610mm (24") O. C. every second course (maximum) anchored in filled cells.

b) Concrete lintel beams shall extend 305mm (12") beyond both sides of the opening and reinforced with four 12.7mm (1/2") bars placed over and below window openings.

1) Concrete studs, reinforced with one 12.7mm (1/2") diameter bar, shall be placed at both sides of all window and door openings.

2) All horizontal reinforcement shall be tied to vertical reinforcement.

3) Reinforcement shall be as specified in Section "Structural Steel".

Cement shall be Portland cement of approved brand conforming to ASTM Specifications C150, Type I.

Lime shall be made with pulverized and quicklime or with hydrated lime.
Sand shall be clean, washed and free from deleterious substances.
Water for mixing shall be clean and potable.

AW-2.3 Installation

Laying of 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 the blocks are placed. All joints should be filled with mortar at the time it is laid. Any horizontal and vertical CHB wall reinforcements shall be anchored to concrete works by means of 10mm (3/8") by 609mm (24") long dowels. Embedding of anchor bolts, expansion shields, conduits, etc. shall be done as the erection progresses.

Cutting and patching of masonry required to accommodate the work of other trades shall be performed by masonry mechanics.
Finishing of all hollow block wall surfaces to be applied with cement plaster will be cleaned and evenly wet slashed with a wash of neat cement and sand followed by 1:2 cement mortar mix 10mm (3/8") thick which shall be applied with a wooden float.

AW-2.4 Concrete Lintel

Unless otherwise indicated, provide concrete lintels over all openings in concrete unit masonry walls. Lintels shall be cast-in-place and reinforced with longitudinal bars at the bottom, and of sizes as indicated on the plans. Concrete works shall conform to Concrete Works of these Specifications.

AW-2.5 Testing of CHB

Test samples from every 500 units shall be taken at random from the CHB to be used before installation. The testing shall be performed by a laboratory approved by the NPC Representative and the cost thereof shall be charged to the account of the Contractor. Concrete hollow blocks represented by such

samples, failing to meet the requirements under the latest edition ASTM 6129-70 shall be rejected.

AW-2.6 Measurement and Payment

Measurement and payment for **Concrete Hollow Blocks** including its reinforcing bars will be based on the area in place and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter 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 this work.

AW-3.0 PLASTERED PLAIN CEMENT FINISH

AW-3.1 General

The work to be done under this section includes furnishing of all labor, materials, equipment and other facilities and the satisfactory performance of all work necessary to complete all cement plaster finish.
Plaster mixture is applied in layers to masonry and reinforced concrete, surface to interior or exterior walls and ceilings.

AW-3.2 Materials

a) Portland cement conforming to the latest edition of ASTM Standards C-150

b) Lime - Slaked quicklime or hydrated lime to make lime putty

c) Sand - Natural sand, white or light grey, washed and cleaned, strong and free from injurious amount of dust and flaky particles.

d) Water - Clean and fresh contains no salt, potable and free from sulfur oil and other impurities that may cause discoloration of the finish.

Accessories for plaster work, includes nails, picture, moulds, casings, window stools, bases, etc.

AW-3.3 Application

The total thickness of masonry and plaster shall be 15mm (5/8"). For a three-coat plastering, the scratch coat and brown coat shall be at least 6.3mm (1/4") thick and the hard finish 3.2mm (1/8") thick with a minimum thickness of 1.6mm (1/16") at any point. For a two-coat work the base shall be 12.7mm (1/2") thick and the hard finish the same as for a three-coat work.

The lath for plastering shall be leveled, plumb and well secured to the backing material. The leveling elements installed would include grounds and screeds. For walls, a screed shall be installed at the base of the wall with its top about 102mm (4") above finish floor. The screed is run horizontally, leveled and set at the exact thickness of finished plaster. Around all openings and the intersection with the ceiling grounds are installed.

All anchorage for cabinets, furniture, stair, handrails, electrical outlets, etc., should be installed before plastering is started.

All internal corners should be reinforced by lapping wire lath.
Mixture for various coats should be checked to see that proportions are correct.

Installation. For hollow wood doors and frame, uniform application regardless of function completely reversible for R.H. or L.H. doors.

NOTE: All cement plaster finish shall be painted.

AW-3.4 Measurement and Payment

The measurement for payment for all **Plaster Plain Cement Finish** will be based on the area applied and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter for the pertinent item under architectural works in the Bill of Quantities. Payment shall constitute full compensation for all labor, material including metal lath, equipment, tools and incidentals necessary for the completion of this work.

AW-4.0 VITRIFIED TILE AND NATURAL STONE

AW-4.1 General

The work to be done under this section shall consist of furnishing all labor, materials and other facilities to complete all tile and natural stone works shown on the drawings and specified herein.

AW-4.2 Materials

- Floor tiles shall be vitrified unglazed and glazed ceramic tiles (toilet) using white clay.
- Wall tiles shall be vitrified glazed ceramic tiles using white clay.
- Listel tiles shall be vitrified glazed ceramic tiles.
- Marble countertops, splashboards and floor slabs shall be 20mm, Cebu variety of the best quality conforming to samples approved by the NPC Representative.
- Granite countertops, splashboards and floor slabs shall be non-porous, dark shade color, has a 98% gloss recovery on edge glazing.
- Granite floor tiles shall be non-porous granite dark color as specified in the bill of quantities.

AW-4.3 Samples

Sample of various types/kinds of tiles shall be submitted to the NPC Representative.

AW-4.4 Shop Drawings

Contractor shall submit shop drawings of works to be done. Details shall show sizes, section joints and other required details for the approval of the NPC Representative.

AW-4.5 Execution

All surfaces to receive tiles, shall be structurally sound, plumb level and true, free from dust, grease, calcimine water and other foreign matter.

Wall and floor surfaces with minor variations (1/8" or less) shall be true and smooth with a skim coat of adhesive applied with flat of trowel. Allow to dry before spreading more adhesive for setting the tile.

AW-4.6 Tile Preparation

Tiles - may be set dry or pre-soaked depending on grouting methods to be used. Wall tile may be prepared by soaking in clear water for not less than 15 minutes. If pre-soaked method is used, drain excess water on tile before setting.

Grouting - After floor on tile have been in place for not less than four hours, all joints shall be grouted and cleaned. Tile which becomes dry after setting shall

be soaked at the joints with a wet sponge, or sprayed with water before grouting to prevent cracking of the grouting compound, grout used with floor tile must be kept moist until properly cured.

Caulking - At completion of tile work, clean out joints between tile and other built-in fixtures and apply this bead of caulking compound tooled slightly below tile surface.

Clearing - Upon completion, clean all tile surfaces with warm water and a good washing compound and stiff brushes as recommended by tile manufacturer.

Protection - Before traffic is permitted over finished tile floor, cover floors with building paper. Lay board walkways on floor that are to be continuously used as passageway by workmen. Tile floor areas to be trucked over have suitably constructed continuous plank runaways of required width installed over building paper. Remove cracked, broken or damage tile and replace with new one.

AW-4.7 Measurement and Payment

Measurement and payment for **Vitrified Tile and Stone Work** will be based on the area in place and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter 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 this work.

AW-5.0 VINYL QUARTZ TILES

AW-5.1 General

The work to be done under this section shall consist of furnishing all labor, materials, equipment, tools and the satisfactory performance of all work necessary to complete vinyl quartz tile work shown and indicated in the drawings or herein specified.

AW-5.2 Materials

Vinyl Quartz Tiles shall be 300mm x 300mm (12" x 12") and 3mm thick. Tiles shall have a smooth surface, containing no sand or grit and shall be free from the lumps and unmixed coloring pigments. Materials shall consist of only the highest grade laboratory approved uPVC resin, plasticizer and stabilizers, pigments and quartz filler, which is used to insure abrasion resistance and dimensional stability.

Tiles must be equal or better than "British Standard 3250" in terms of squareness, gauge, stability, abrasion and indentation resistance. It must be fire-resistant.

Adhesive shall be water-resistant type and recommended by the tile manufacturer to be the best suited for tropical installation and for use with the particular type of floor. Adhesive shall be applied in accordance with the adhesive manufacturer's printed instructions unless directed otherwise by the NPC Representative.

Plastic emulsion (seal polish) shall be best suited for the particular type of floor as recommended by the tile manufacturer.

Metal edge strips shall be provided at all exposed edges of vinyl quartz tiles. Metal strips shall be extruded aluminum or brass, butt type and beveled at exposed edges. Top surface metal strips shall be finished flush with the tiles. Strips shall be secured at the ends and between at about 200mm apart with screws. Where two different floor finishes meet on the same level of the surface, the vinyl tile shall be provided with a metal edge strip. Brass metal strip edge nosing shall be provided between vinyl tile floor finish and ceramic tile floor finish.

AW-5.3 Sample

Samples must be submitted to the NPC Representative for approval as to color and quality.

AW-5.4 Installation

All concrete floors must be checked for even level and finish. All cracks, holes, depression, etc. must be filled or leveled with suitable fillers. They must also be free from dirt, dust, wax, oil, grease, or foreign matter that may affect properties of adhesive.

Preparation – Concrete sub-floors to receive the tile shall be clean, thoroughly dry, smooth, firm and sound; and they shall be free from oil, dirt, curing compounds, or other deleterious materials. Sub-floors shall be swept, vacuumed and damp-mopped when necessary to remove dust and oil. It shall be scrubbed with a strong detergent solution, thoroughly rinsed, and spot primed, when necessary to remove oil or grease stains. All edges shall be ground smooth and all holes and cracks less than 1.6mm shall be filled with an approved plastic emulsion. Large holes and depressions, if any, shall be filled and treated with underlayment mortar troweled on to smooth surface and shall be completely dried before the application of adhesive.

Tile-laying Design – Floor covering shall be applied in patterns selected by the NPC Representative for each area. Joint lines shall be parallel to wall lines. Where line patterns of tiles run perpendicular to lines of other tiles, they shall be laid truly at right angles. Tiles shall be neatly cut as required to form neat edges around permanent fixtures, built-in furniture and cabinets, pipes and other items attached to the floor or wall.

Adhesive – Recommended adhesives are neoprene, rubber based contact adhesive, rugby-type adhesive. The adhesive shall be applied in a thin film while it is still tacky and spread evenly both on floor and tile, allowing ten (10) minutes drying time prior to installation.

Application of Tiles – Tiles shall be laid cut from midpoint of the long axis of the area to be tiled so that opposite borders will be of equal width. Starting at established guidelines, the approved adhesive shall be spread over and under floor with a fine notched trowel covering approximately 4.0sq.m. per liter and immediately the tiles shall be embedded into the adhesive. Tiles shall be rolled in both directions with a 70kg roller to assure contact of tiles and adhesive and to bring edges of the tiles flush.

All junctions with vertical surfaces, tiles shall be carefully scribed so as to form a neat joint at this point. Tile shall never be placed or laid under pressure.

Cleaning and Waxing - Not earlier than five days after installation, floors shall be washed with an approved cleaning solution and rinsed thoroughly with clean cold water. Vinyl tiles shall be waxed with two coats of water emulsion wax, buffed to an even luster with an approved emulsion.

AW-5.5 Measurement and Payment

Measurement and payment for **Vinyl Quartz Tiles** will be based on the area installed and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter 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 this work.

AW-6.0 PEBBLE WASHOUT FLOOR FINISH

AW-6.1 General

The work to be done under this section shall consist of furnishing all labor, materials, equipment, plant and other facilities and the satisfactory performance of all work necessary to complete all pebble washouts shown on the drawings and specified herein.

AW-6.2 Materials

a) Portland Cement and Sand shall be used for scratch coat.

b) Pebble size and color shall be determined by the NPC Representative.

c) White Cement. - as approved by the NPC Representative.

AW-6.3 Samples

Samples of washouts in tile form shall be submitted to the NPC Representative. No washout 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 texture, color and finish.

AW-6.4 Application

Before commencement of the work, desired pitch for drainage should be provided in the concrete slab. Concrete must be rough and all loose particle or anything which would prevent bond should be thoroughly cleaned off with water. The concrete surfaces must be kept wet for at least four (4) hours before scratch coat is applied. The required scratch coat of cement mortar in the proportion of one (1) part Portland cement of two (2) sand, by volume, shall not be more than 19mm (3/4") in thickness.

Washout finish shall be applied with pressure to obtain solid adhesion to the concrete which shall not be more than 10mm (3/8") thick, composed of one (1) part Portland or white cement, and three (3) parts pebbles, troweled to a hard, smooth even plain, rodded, and floated to a uniform surface with clean water evenly with a spray machine to wash out all cement on the surface so that the pebble quarts shall be partly exposed, and by means of soft brush and water to remove and wash down the remaining cement paste, leaving the pebble in their natural textures and appearances.

AW-6.5 Cleaning

After all trades have completed their work, wash the surface with clean water and brush thoroughly to produce a clean and sparkling appearance.

AW-6.6 Measurement and Payment

Measurement for payment for **Pebble Washout Finish** will be based on the area in place and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter for the pertinent item under Architectural Works in the Bill of Quantities. Payment shall constitute full compensation for all labor, materials, equipment, tools and all incidentals necessary for the completion of this work.

AW-7.0 PLYWOOD CEILING BOARDS

AW-7.1 General

Consist of furnishing of all labor, materials and other facilities for the satisfactory of all work necessary to complete the marine plywood ceiling.

AW-7.2 Materials

Thickness of plywood boards shall be as indicated on the drawings, marine, rotary cut, tanguile or dao. Sheets shall be nailed to ceiling nailers/joists at 150mm (6") on center.

AW-7.3 Sample

Samples must be submitted to the Contracting Officer for approval as to quality.

AW-7.4 Miscellaneous

Fastener shall be smooth shank, zinc - coated, common wire nails of local manufacture.

Glue shall be resorcinol formaldehyde synthetic resin.

Putty shall be of the color to match wood finish where exposed and shall be subject to approval of the Contracting Officer.

AW-7.5 Construction

All rough carpentry work, ground centering, blocking, etc., shall be in accordance with detailed drawings or recognized carpentry standards.

The Contractor shall rigidly construct all wood framing true to lines, levels and dimensions. Nails and other anchorage shall be in accordance with good practice.

Miter external molded members and cope internal corners.
No hammer mark or any other unsightly marks shall be made on any exposed wood face.

All lumbers that will come in contract with concrete and masonry shall be coated with asphalt.

AW-7.6 Protection

The Contractor shall be held accountable for the damaged materials caused by negligence mishandling.

AW-7.7 Measurement and Payment

Measurement and payment for **Plywood Ceiling Boards** will be based on the area installed and accepted by the Contracting Officer.

Payment will be made at the corresponding contract unit price per square meter 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 the work.

AW-8.0 SUSPENSION SYSTEM

AW-8.1 General

The Contractor shall furnish all materials, labor and equipment necessary to install complete suspension system for plaster ceiling, acoustic board, perimeter for light diffuser and necessary anchorage.

The Contractor shall submit to the NPC Representative for approval, samples and shop drawings illustrating fully the construction and methods of installation. Work shall be performed only upon written approval of the samples and drawings by the NPC Representative.

AW-8.2 Materials

Components shall be manufactured from prime quality hot-dipped galvanized steel according to BS 2989 and JIS G3302 Standards with Z18 zero spangle zinc coating (180/m^2). The exposed flange is capped with pre-coated metal strip with polyester coating of 20-25 microns dry film thickness.

Main (1-1/4" x 1") and intermediate (1") runners for all suspension system, unless otherwise required, shall be galvanized steel Snap-On T-runners, satin silver color. The runner shall be installed 600mm on centers supported at every 1200mm by wire or steel strap hangers. The grid shall be leveled to within 1/500.

AW-8.3 Workmanship

The installation and workmanship shall be in full accordance with manufacturer's specifications and shall be made by workmen experienced in this kind of work. Acoustical tiles shall be clipped to the ceiling suspension system with galvanized spring clips. Tile shall fit closely to adjoining walled beams, columns, pilasters and cut neatly around all openings in the ceiling.

AW-8.4 Measurement and Payment

Measurement for payment for **Suspension Sys**tem will be based on the area in place and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter 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 this work.

AW-9.0 DOWNSPOUTS AND ROOF DRAINS

AW-9.1 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.

AW-9.2 Measurement and Payment

a) Downspouts

Measurement for payment will be based on the length installed and accepted.

b) 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.

AW-10.0 MOISTURE VAPOR BARRIER

AW-10.1 General

The work to be done under this section includes the furnishing of all labor, materials, equipment, and other facilities required to complete all moisture vapor barrier work as shown in the drawings and as specified.

All concrete floor slabs in direct contact with the ground shall be provided with moisture vapor barrier to stop movement of moisture from the ground through capillary action or osmotic pressure.

AW-10.2 Materials

a) Vapor Barrier – Vapor barrier shall be polyethylene sheeting with thickness as recommended by the manufacturers and as approved by the NPC Representative.

b) Adhesive and/or Tape – Adhesive or tape shall be as recommended by the manufacturers as approved by the NPC Representative.

AW-10.3 Physical Properties

a) Tensile strength (lb/2" width) is 260.

b) Moisture and vapor transmission (ASTM F. 96, Procedure E) Ungreased gm/sq.m/225 hours is 25. Perms shall be 0.125.

c) Greased (ASTM D1027) 6M/sq. meter/24hours is 8. Perms shall be 0.27.

AW-10.4 Application

Prior to placing the concrete, the hard core fill should be compacted to a smooth even surface, eliminating all sharp projections or irregularities which may puncture the moisture and vapor barrier. It is preferable in most cases to bring the fill to grade with a stiff mix of one part Portland cement and three parts sand so placed as to provide a smooth even surface for installing the membrane, or to blind the hard core with a layer of consolidated sand. The net thickness of consolidated sand above the gravel fill shall not be less than 6.3mm. Cover the entire area with a layer of moisture and vapor barrier extending past the perimeter of the slab and turning up against walls for the depth of the concrete. The moisture and vapor barrier shall be lapped and the exposed edges of polyethylene shall be sealed by either of the sealing set out below. Where pipes and conduits must pass through the barrier, the material should be carefully cross slit so that it fits tightly around the pipe, and then taped to the pipe with pressure sensitive tape.

Sealing

a) Tape Sealing - To obtain an effective seal, moisture and vapor barrier should be lapped 25mm (1") at all joints and sealed with 50 mm (2") pressure sensitive tape. A 50mm (2") width of polyethylene film is left

exposed on both edges for joining and it is important to ensure that both surfaces are free from moisture and dust, and that the tape is in contact with the polyethylene film on both sheets. If necessary, a firm base such as board can be placed under the joint and the tape applied with firm pressure by hand or by mechanical applicator.

b) Adhesive Sealing - Where adhesive sealing to be used, each alternate sheet must be inverted so that the exposed polyethylene strips of the alternate sheets of the barrier face downwards, ensuring that both surfaces are free from moisture and dust. The sheets shall be lapped 50mm (2") to ensure good adhesion and both surfaces shall then be coated with adhesive and the joint made in accordance with the manufacturer's instructions.

c) End Joint Sealing - End joint sealing should be effected by cutting the ends square, forming a continuous single interlocking fold and sealing on both sides with adhesives.

AW-10.5 Vapor Barriers Under Concrete Slab on the Ground Level

After consolidating the sand bed under concrete floors and edge beams and before placing the reinforcement, the whole of the sand bed shall be covered with a layer of vapor barrier laid in the longest lengths and widest available widths, lapped 25mm at all joints and intersections and sealed with the pressure sensitive tape. A 50mm width of polyethylene film shall be exposed on both edges of the moisture vapor barrier where sealed joints are to be made and the contractor shall ensure that the tape is in contact with a film on both sheets, all in accordance with the manufacturer's instructions. Alternatively, adhesive sealing may be used in which case each alternate sheet shall be inverted, so that the exposed strips of the sheets are in contact. The sheets shall be lapped 50mm and both polyethylene surfaces coated with the contact adhesive and firmly pressed together to form a moisture proof sealed joint. The moisture vapor barrier shall be carried down into trenches, turned up at the side edge and after concrete has set, turned across on top of concrete slab under cavity flashing.

AW-10.6 Measurement and Payment

Measurement and payment for **Vapor Barrier** shall be based on the area of material installed and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter for the pertinent item under Architectural Works in the Bill of Quantities. Payment shall constitute full compensation for all labor, materials, equipment, tools and all incidentals necessary for the completion of this work.

AW-11.0 GLASS AND GLAZING

AW-11.1 General

The work includes the furnishing of all labor and materials required to complete all glass and glazing as shown on the drawings and/or herein specified. Mirrors shall be provided and installed where indicated in plans.

The Contractor is responsible for the correct sizes and grades of glass to be used. Improperly set glass or glasses which does not meet the requirements of its grade and size will not be accepted. Such glass must be replaced to the satisfaction of the NPC Representative.

The size of glass indicated is approximate only and the actual size shall be determined by measuring the frame to receive the glass. Glazing rabbets shall be rigid true, plumb, square, properly primed, clean, dry and dust free, before glazing work is started.

Each piece of glass shall have the manufacturer's label showing the type, thickness and quality of the glass. Putty and glazing compound shall be delivered to the site in unopened containers, plainly labeled with the manufacturer's name and brand.

AW-11.2 Materials

a) Glass of all windows, doors, transoms shall be of the best quality of its respective kind and free from internal or surface defects. Thickness of glass shall be as mentioned in the plans. For other qualities and thickness refer to recognized standards.

b) Mirror. Where required on the drawings for various purposes, public spaces, etc., glass to be selected shall be 6.3mm (1/4") thick, polished plate glass with right of rejection. Silver to be deposited evenly on selected quality polished plate and protected with electro-copper backing, shellac, varnish and paint in an approved standard method.

Each mirror shall bear manufacturer's label guaranteeing quality and compliance with specifications guaranteed for ten (10) years to be free from any defects that impair full and complete reflection or that present on unsightly appearance. Upon receipt of notice from NPC Representative, Contractors shall repair and/or replace without cost to the NPC all defective material and workmanship.

All labor and other incidental materials such as glazing compound, shims, glazing clips, securement devices, felt, etc., not specifically referenced above but required to provide a complete satisfactory and approved installation. Prior to setting of any mirror on masonry or plastered wall surfaces, all such surfaces shall be damp-proofed.
Mirror with frames (in toilet rooms) with kinds, quality and finish as specified complete with "theft proof" frames shall be furnished and installed in all toilet rooms as indicated in the drawings. Mirror shall be 6.3mm (1/4") thick with aluminum or stainless steel frame on a

6.3mm (1/4") thick plywood backing. Space behind walls shall be insulated and damp-proofed. Check "flatness of wall plan" prior to setting. Perimeter for frame shall be set closely against wall surface in all cases. Renew plastering or surface back mirrors and report any irregularities to NPC Representative that will prevent mirror frames fitting closely to wall surface.

Note: Guarantee is required for all mirrors.

AW-11.3 Installation

a) The glass shall be prevented from all contact with metal or any hard or sharp metals by using resilient shims placed at quarter points.

b) Resilient sealant shall be used.

c) Use stops in size permitting a "good grip" on the glass.

d) Glass shall be installed only in openings that are rigid, plumb and square.

e) Allow sufficient clearance at edges of glass to compensate for some settlement of the building. Clearance shall be 6.3mm (1/4") from edge to frame and 3.2mm (1/8") for face.

f) Marking, banners, posters and other decor shall not be applied directly to glass surface as these could cause thermal stress.

g) Removal of putty or glazing compound smears from glass shall be performed by the glazing Contractor during the metal work life. Failure to do so may result in damage to the glass.

AW-11.4 Measurement and Payment

No measurement for payment for **Glass and Glazing** of doors and windows, the relevant cost being included in the contract unit price for the pertinent items for Doors and Windows under Architectural Works in the Bill of Quantities.

AW-12.0 GLAZING SEALANT

AW-12.1 General

The work to be done shall consist of furnishing all labor, materials and other facilities for the satisfactory performance of all work necessary to complete all glazing sealant work as shown on the drawings and specified herein.

AW-12.2 Materials

a) Silicone Rubber should comply with Federal Specifications for silicone building sealant and Federal Specifications for one (1) component building sealant. Packaging shall be supplied at least in fl. oz. (325 ml) cartridges and two (2) gallons (7.5 litters), bulk pails, net weight. The joint width shall not be less than 3.2mm. (1/8"). The joint depths shall allow a sealant depth of 3.2mm (1/8") to a maximum of 12.7mm. (1/2"). The silicone sealant bead depth shall be less than the joint width which is about 2.1mm.

b) Masking Tape. Areas adjacent to joint shall be masked to a sure line. Do not allow masking tape to attach clean surface to which the silicone sealant is to be adhere. Tooling shall be completed in one (1) continuous stroke immediately after sealant application and before a skin forms. Masking shall be removed immediately after tooling.

AW-12.3 Method of Application

Sealant shall be applied in a continuous operation. A positive pressure adequate to properly fill and seal the joints width shall be employed. Tool or strike the building sealant with light pressure to spread the material against the back-up material and the joint surfaces such as aluminum (sealant shall be applied above 40 °F). A tool with a concave profile is recommended to keep the building sealant with the joint. The sealant can be applied at outdoor temperature as low as 35 °F provided that surface is clean and dry. Excess sealant shall be cleaned from non-porous surfaces, before curing, before using a commercial solvent. On porous surfaces, excess sealant shall be allowed to cure and them be removed by abrasion or other mechanical means. The sealant shall not be disturbed for at least 48 hours.

AW-12.4 Guarantee

The Contractor shall guarantee the caulking work to be free from defects of materials and workmanship for a period of ten (10 years).

AW-12.5 Measurement and Payment

No measurement for payment will be made for **Glazing Sealant**, the cost of which shall be included in the contract unit price for the pertinent items where Glazing Sealant is required under Architectural Works in the Bill of Quantities.

AW-13.0 WEATHERSTRIPPING

AW-13.1 General

The work to be done shall consist of furnishing materials tools and equipment and perform labor required to complete all types of weather-stripping for all exterior doors and doors noted on the drawings to be light-proof, soundproof or dust-proof, install weather stripping in accordance with manufacturer's instructions. Fit tightly at corners to maintain continuity around periphery of doors.

AW-13.2 Samples

Sample of strips of weather-stripping elements shall be submitted.

AW-13.3 Materials

a) Extruded products shall be of aluminium alloy 6063 T5.

b) Extruded architectural bronze.

c) Flexible metal products shall be of (zinc, aluminium/bronze/ stainless steel).

d) Inserts shall be of vinyl and/or felt.

AW-13.4 Fasteners

All extruded weather-stripping and saddles shall be furnished complete with screws, color-matched to the items.

a) For fastening to wood, screws shall be of aluminium or bronze.

b) For fastening to metal, screws shall be of self- tapping plated steel.

c) For exterior applications to metal, stainless steel self-tapping screws, plated to match the items are recommended.

AW-13.5 Installation

Included products shall be installed level, square and in proper alignment and relationship to work of other trades. Attachments shall be by means of appropriate nails, screws, bolts, and/or anchors of corresponding materials.

AW-13.6 Measurement and Payment

No measurement for payment will be made for **Weather-stripping,** the cost of which shall be included in the contract unit price for the pertinent items for Doors and Windows where weather-stripping is required under Architectural Works in the Bill of Quantities.

AW-14.0 JOINERY AND CARPENTRY WORKS

AW-14.1 General

These regulations shall apply to all parts of work in which joinery (carpentry for permanent features, i.e. excluding formwork or shuttering, wood scaffolding, etc.) will be used.

All services shall comprise labor, equipment and the supply of the appurtenant materials and structural components including off-loading and storage at the site unless otherwise specified.

All materials and structural components to be supplied, erected or installed by the Contractor, and therefore, ultimately incorporated in the structure shall be new and unused unless otherwise specified. They shall be suitable for their intended purpose and appropriately matched to each other.

All materials and structural components covered by standards shall meet the quality and dimensional requirements thereof.

Early enough before the beginning of fabrication, the dimension of non-standardized structural components shall be checked by Contractor on the structure unless it is established, for instance, in the Specifications or by mutual agreement, that such checking can be dispensed with or will be replaced by the statement of specific dimensions, e.g., in drawings explicitly mentioned.

In particular, the Contractor shall verify that such conditions as the following do not exist:

- undue humidity of the structure
- Inadequate painting of the structural components intended to be installed.
- Lack of possibilities for fixing the structural components and sealing them against the respective part of the structure.

Other works which even if not specifically mentioned in the Bill of Quantities or Schedule of Price shall be included in the Contractual Works.

- Protecting the executed Works and the items handed over execution of same from damage and theft up to the time of acceptance.
- Providing small tackle and tools.
- Supplying consumable stores
- Transporting all materials and structural components, from the storing places at the Site to the points of destinations, and return transport if necessary.

- Removal of all contamination (refuse, building, rubbish and the like) arising from or in connection with the Contractor's work.
- Installing and dismantling as well as providing all false work and scaffolds.
- Making holes in masonry and light weight concrete.
- Supplying and fitting dowels.
- Chemical preservation of timber.

Prior to the start of his operations under this item, the Contractor shall verify that all conditions are suitable for the timely and effective carrying out of his work. Where unsuitable conditions are found, they shall be reported in writing to the NPC Representative and under the NPC Representative's direction immediately corrected.

AW-14.2 Quality of Lumber

Lumber indicated and required for various parts of the work shall be of the best grade available. It must be straight, sound, bright, of nature growth, well - seasoned and conditioned to suit the particular purpose for which it is to be used. The material shall be cleanly sawn, square edged, and free from injurious shakes, splits, warps, wanes and knots, soft spots and rot, incipient, decay and all other defects or imperfections impairing its strength, durability or appearance. All structural components shall be made so that when properly treated and used they will not warp or crack under any circumstances including stresses due to temperature humidity that will have to be expected. Their general conditions on lumber when not mentioned in the succeeding particulars are carried and shall apply.

AW-14.3 Fastening

Joints for cabinet work shall be glued aside from nails or other fastening device required. The type and strength of gluing shall suit the site of installation and intended application (of glues) must not cause any discoloration or other damage. Sealing compounds shall be resistant to atmospheric influences, shall not harden, and shall not be aggressive.

All nails on surfaces exposed to view shall have flush heads. They shall be countersunk. The use of nails with notched heads and screw nails in lieu of wood screws shall not be allowed.

All door frames shall be rabbeted and molded. Frames which are in contact with concrete shall be anchored by means of 102 mm (4") common wire nails spaced not more than 204 mm (8") apart the contact surfaces.
Anchors, connectors, fastenings, and any rough hardware necessary for the completion of the work but is not shown or indicated on the drawings and/or specified shall be provided. Such rough hardware shall be of the size and type to suit the conditions encountered. Bolts, nuts, washers, hangers, straps and other rough hardware is embedded in or in contact with exterior wall of concrete masonry or slab or exposed to weather shall be zinc coated unless

otherwise specified. Bolts head and nut bearing on wood shall be provided with standard steel washers.

AW-14.4 Wood Preservatives

All lumbers ultimately in contact with the outside air or permanently with particular humid air or connecting to masonry or concrete e.g. windows and doors, including lining and casing, shall before being inserted be treated on all sides with a suitable wood preservative, in the case of lumber sensitive to blue stain, also with a blue stain preventive agent, unless adequately protected in manufacture already, e.g. wood work items.

The Contractor shall in the choice and use of the wood preservative exercise the care required in the handling of poisonous substances. The wood preservative shall also be compatible with the paint and in interior applications the wood preservative shall be colorless.

If the NPC Representative has not specified the wood preservative to be used, the Contractor may make his own choice of a suitable preservative, subject to the NPC Representative's approval. Before leaving the workshop, the lumber components shall receive a coat of paint.

Lumber surfaces in contact with masonry shall be given two (2) brush coats of bituminous paint before installation.

AW-14.5 Materials

Materials for carpentry works shall conform to the following specifications and shall be used whenever indicated in the plans or noted in the Bill of Quantities:

a) Kinds of Lumber

1) S4S Yacal, Molave Guijo or approved equal

i) Door and window jambs, sills and mullions

ii) Any lumber in contact with concrete or masonry, such lumber mentioned above shall be treated with wood preservative treating solution.

2) Apitong or approved equal

i) Ceiling frames and hangers

ii) Wooden frames and shelves, cabinets and closet

3) Tanguile, Red Lauan or approved equal

i) Cabinet and closet framing, kiln-dried with moisture content not more than 10% when tested

ii) All mouldings, base boards and wood slats.

iii) Vertical and horizontal studs for interior partitions

iv) All T & G board, fascia boards, louvers shall be kiln-dried with moisture content not more than 10% when tested.

v) Door and window sash frames

4) Kiln-dried Narra

i) Mouldings and lattice works and base boards.

ii) Wood handrails, door panels and frames with moisture content not more than 10% when treated.

iii) All structural lumber to be used for truss members, purlins, cleats, wood plates, girder and rafters shall be as indicated in the Civil Design drawings.

AW-14.6 Shop Drawings

Shop drawings with essential dimensions and details for construction may be required by the NPC Representative in connection with carpentry and joinery work which will be submitted for approval before proceeding with the work.

AW-14.7 Measurement and Payment

Measurement for payment for **Carpentry Works** will be based on the unit of measure specified in the bill of quantities install and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per unit of measure specified in the bill of quantities for the pertinent items under Architectural Works.

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

AW-15.0 MILLWORK AND CABINET WORK

AW-15.1 General

The work to be done under this section shall consist of furnishing all labor and materials, and performing all operations temporary and permanent woodworks, finished treatment and building-in of all cabinet type items, complete in every respect, and incidental associated woodwork appurtenances, the application of all finish hardware in connection with finished woodwork in strict accordance with requirements of drawing and is specified herein subject to the terms and conditions of the Contract Documents.

All woodwork required to be furnished and installed in connection with finish treatment of exposed interior surfaces or spaces, that is cut, fitted, built-in and finished structure is hereby subject to the terms and conditions of the Contract Documents.

All finished millwork that is constructed, assembled and provided with surface finish treatments in a shop outside building structure is hereby classified as "Cabinet Work". Reference to "surface finish treatment" including the filling, staining, shellacking or waxing of all cabinet type woodwork unless noted to contrary.

AW-15.2 Work not Included

Woodwork and equipment items specifically indicated on drawing as being furnished by the Contractor.

AW-15.3 Materials and Workmanship

a) Lumber and Wood (Rough Carpentry Work) shall, unless approved otherwise, be new lumber, well-seasoned, air-dried, first quality or other specie conforming to requirements thereof of equivalent kind and quality. Wood for blocking, grounds nailing strips, and/or other woodwork incident to carpentry and joinery and/or for use of other trades unless specified otherwise, shall be second quality Apitong or approved equal perfectly sound and free from loose knots, cluster knots to surface knots that would interfere with or preclude the sound attachment thereof and/or securement to other work.

b) Wood for shelves and shelving in coat closets, supply closets, etc., shall be of K.D. Tanguile suitable for painting and varnishing, as approved by the NPC Representative.

c) Mill and Cabinet Work
Specie of wood shall be K.D. Tanguile for all items of finished wood and cabinet work required to have a natural wood finish, unless otherwise specified.

Quality and Workmanship. All wood for interior finished mill and cabinet work shall be thoroughly air-cured, kiln-dried stock,

satisfactory to NPC Representative. All materials specified herein shall be product of one mill in so far as practicable. Contractor shall submit for approval the name of subcontractor for mill and cabinet work called for on scale drawings. Only first-class cabinet type workmanship will be admissible an execution of this work, performed by artisans skilled in this trade so as to provide cabinet work of the highest trade, finish and installation as specified and required.

Care shall be exercised by careful screening to avoid strong contrast in color and graining of finished woods for all wood surfaces or trim, paneling, wall facing, etc., so that any one room or wall surface will present a reasonably uniform appearance. All cutting, framing and fitting shall be done as required for accommodation of work of other trades. Use of wood chips, shims or other shrinkable materials for leveling of plumbing will not be permitted in any form. Mortise and tendon joints set in an approved type of water and moisture proof glue with wedges and/or pinned. Shop mitres, 102mm (4") or more to be glued and doweled and/or locked with a metal ring. Mitres less than 102mm (4") shall have concealed spline.

No woodwork shall be installed until such time as plastering is entirely dry.

In so far as practicable, all millwork, panelling etc. assembled in shop shall be back-painted and finished throughout before delivery to building.

Running trim (chair rail), etc. of wood shall have minimum number of splices and in each instance bevelled and jointed over a solid bearing ground.

In addition to machine sanding, all interior trim, panelling and woodwork shall be smoothed by hand using "00" sandpaper to give all woodwork the required smooth surface for exposed finished treatment and free from machine and tool marks, abrasion, raised grain and other undesirable defects. All woodwork shall be fitted to plaster or other finished work in careful manner so as not to injure these surfaces in any way. Where plaster or other work is damaged or disturbed, it shall be restored to its original state and/or make good without cost to the NPC at the Contractor's expense.

d) Laminated Plastic Plywood or Particle Board. All horizontal surfaces where laminated plastic covered wood are indicated on drawings shall be cigarette-proof grade. Seconds of the laminate shall be used as a "backing veneer" where concealed.

e) Centring Blocking, Grounds and Furring. Furnished and installed for all above items of woodwork as specified.

f) Wood Finish Materials. In general, conform to minimum standard requirements for kind, quality, functions and characteristics of local standards specifications as approved for use and specified herein.

1) Stains, if required, shall be those approved by NPC Representative for various types of finishes.

2) Linseed Oil shall be pure, thoroughly settled and either raw or boiled as required.

3) White Lead shall be white carbonate of lead ground in pure linseed oil.

4) Beeswax shall be pure, unadulterated and of the highest quality product of approved manufacturers.

AW-15.4 General Construction, Workmanship, etc.

General. Provide all rough carpentry required and/or necessary for any construction works, ladders, staging, scaffolds, and the like. Provide the temporary protection for all masonry and other related items during period of construction, including temporary centres, stairs treads, etc.

Grounds, blocking, cants, nailing strips and other rough woodwork shall be provided for sheet metal work, fabric flashing, and interior woodworks required by drawings.

a) Cutting, Patching and Fitting. Perform all cutting and fitting or work of other trades as required to secure work herein specified including that for any plumbing, heating and electrical work and do all required patching after other trades.

b) Grounds and Blocking. All wood grounds, blocking, centres nailing strips, cants, all wood grids for framing, etc., provided as required to secure carpentry, millwork, acoustical and insulation work and of sizes required.

Grounds shall be sized and dressed to proper dimensions. Ground against masonry units shall be secured in place with expansion bolts. Grounds that are not satisfactory shall be taken down and approved grounds reset at Contractor's expense. Grounds shall be provided behind all wood trim in every instance.

c) Rough Hardware. All nails, bolts, screws and any other rough builder's hardware or securement devices required to securely fasten all work in place shall be furnished and installed for any work herein.

d) Miscellaneous Millwork

The foregoing items are only intended to represent the principal items under this section. The Contractor shall include and furnish all items of Carpentry and Millwork. These are generally indicated on the drawings and shop drawings of all items and shall be prepared and submitted for the NPC Representative's approval as previously specified.

1) Shelving. Generally, 19mm (3/4") plywood with solid stock tongued front edges, all edges, and supported on cleats, of some material secured to walls with expansion bolts in lead sleeves. Where hook strips are required, they shall be of similar materials and as detailed on drawings, with double pronged hooks secured in place by the Contractor.

2) Countertops. Except where metal countertops are required, 19mm (3/4") laminated plywood with 3.32mm (1/8") standard grade linoleum of approved color, cemented down with approved type of linoleum adhesive. Where metal edging is required, furnished smooth roll edge white metal alloy edging strips secured with oval header non-ferrous screws.

3) Drawers. Shall have metal slides with roller bearings, particle board or plywood bottoms, solid hard wood boxing, dove-tailed and glued. Drawer fronts of solid stock, of selected birch and/or as detailed otherwise on drawings and dove-tailed to slides and bottoms.

4) Cases and cabinet doors. Unless scheduled otherwise, or detailed on drawings, hinged doors for cases and cabinets required under work of this section included and provided with suitable and/or appropriate hardware supplied by the Contractor. Sliding door hardware shall be furnished and installed by the Contractor.

5) Miscellaneous interior cabinet work (cases, counters, equipment fixtures, and the like. The work included herein comprises all items of interior wood cabinet works indicated or required by drawings, including all miscellaneous metal supports, located throughout all public spaces where interior woodwork shall be supplied and built. These shall include all the equipment accessories, supports, draw slides, glass and glazing, shelves, counters, drawers, etc. complete in every respect, provided with beeswax finish and ready to operate.

General construction and quality of workmanship and materials is as specified herein. Office racks, interior cases and/or fixtures, supplied by NPC to be fitted into or between "built-in" case works shall be delivered to Cabinet Carpenter Contractor for in NPC and assembled with his work. In all instances, over-all length of such cabinets, cases, fixtures, shall be verified so as to fit in an approved manner when installed and/or assembled without disfigurement or cutting at job site.

Contractor shall thoroughly examine drawings and Schedules of Work and Finishes and shall be responsible for furnishing, installing and the surface treatment/finishing of all wood items.

AW-15.5 Wood Finish Treatment

The wood finish treatment for all exposed wood surfaces shall conform to the following, except where or when approved otherwise by NPC Representative.

Finish treatment in general applies to the finishing of Narra or Tanguile plywood panels. The intent of the surface finish requirements specified hereinafter are to simulate the best grade quality of workmanship and materials in local use, applied by skilled and experienced wood finishers and painters.

All exposed interior woodwork throughout building structure except laminated plastic covered plywood and woodwork specified to be painted shall be carefully prepared to receive the following finish treatments.

Preparation of wood surfaces

Prior to application of any finish treatment, all wood surfaces shall be thoroughly cleaned of all foreign matter, dirt, oil, grease, cement plaster stains, finger marks, and the like. Should badly disfigured or damaged surfaces be encountered that are unsuitable to receive finish treatment, attention shall be called to NPC Representative before proceeding and await his conclusion.

All exposed surfaces of any woodwork, either mill or cabinet shall be entirely smooth and unblemished when erected.

Smooth thoroughly using a fine grade of waterproof sandpaper. Sand a second time with sandpaper moistened with best quality refined linseed oil.

Where crevices, deep open wood pores and any other defective surfaces are present, that are "re-faceable", they shall be filled with "stopping wax", prepared as follows:

i) In an iron pot, put one cupful of common shellac, one teaspoonful of powder resin, one piece of base wax the size of half and average size walnut and a teaspoonful of powdered lemon chrome or other coloring matter to match color of wood.

ii) Heat and stir thoroughly until prepared compound is fully melted and mixed so as to be uniform in texture. Turn portions of melted compound out between two flat boards and roll to form cylindrical sticks while still plastic.

iii) As previously specified, thoroughly and tightly fill all holes, crevices, open pores in wood and minor defective areas in wood surface by first melting sticks on a hot iron or small benzene lamp, as if it were solder.

iv) Defective surfaces, where certain type of natural defects occur in wood that do not provide good seats to receive "stopping wax" shall be enlarged and slightly under-cut around edges so as to assure the forming of a solid key when crevice is filled.

v) To finish surface after stopping, strike off protruding stopping and smooth with glass paper, so as to leave all surface clean, perfectly smooth and ready for final finish treatment.

AW-15.6 Finish Hardware and Show Case Lighting

These items as they relate to all cabinet work, furnished and installed complete by this Contractor. Finish hardware for cabinet work and show case lighting fixtures shall be of the highest quality product as selected by NPC Representative. Contractor shall examine same, determining before application that items will perform the function and purpose for which they are intended and apply them in an acceptable manner.

When cabinet work shop drawings are submitted for approval by the Contractor, a detailed cabinet hardware schedule will be prepared by the NPC Representative.

AW-15.7 Prime Painting and/or Finishing

Contractor shall have option of finishing any portion of this work either on site and/or on a shop. All priming and back-painting shall be completed by the Contractor.

AW-15.8 Refitting and Checking

Immediately before building is occupied, the Contractor shall examine all doors and other movable part of all case and cabinet work to see that all are in perfect operating condition. Before and after refitting, all edges of doors shall be sealed with approved water resistant materials.

AW-15.9 Protection of Finish Products / Interior Woodwork, etc.

The Contractor shall be held responsible and accountable for the explicit protection of all finish cabinet work, interior trim and decorative treatment until Final Inspection and Acceptance. NPC Representative reserves the right to order replacement at no additional cost to contract sum, for any and all work so injured, and/or damaged as to be unsightly after repairing and/or refinishing. Authorization to repair and/or refinish shall not constitute a waiver of NPC Representative's right to require replacement of any item or work if unsatisfactory to him after such repairing and/or refinishing.

AW-15.10 Measurement and Payment

Measurement for payment for **Cabinet Works** will be based on the unit of measure specified in the bill of quantities install and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per unit of measure specified in the bill of quantities for the pertinent items under Architectural Works.

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

AW-16.0 WOOD DOORS

AW-16.1 General

The work to be done under this section include the furnishing of materials tools and equipment and performing labor required to complete flush type hollow core doors and other wood doors as shown on the drawings or as specified.

Doors shall be thoroughly seasoned, kiln-dried wood and pressure preservative treated. Wood doors shall be products of reputable, nationally known manufacturers approved by the NPC Representative.

All doors shall be of the type and size indicated in the drawings and as specified herein. The top and bottom edges of all wood doors shall be given a coat of water resistant coating after cutting and fittings, and prior to installation.

AW-16.2 Samples

Sample shall be submitted showing the corner sections of wood doors and jambs.

AW-16.3 Workmanship

The Contractor shall take special care in the manufacturing and assembly process of joint work. All joint works shall be done in accordance with accepted practices and shall be accurate and clean so as the joined elements fit perfectly together.

AW-16.4 Materials

Flush Type - Hollow Core Plywood shall be of first class quality marine plywood and the color shall be approved by the NPC Representative.

Framing shall be kiln-dried treated Tanguile for exterior framing and kiln-dried Tanguile for exposed edge framing.

Panel Type Tanguile, KD shall be used for panel doors, stiles and rails; grain and color suitable for natural finish.

Jambs shall be S4S Yakal, common to all doors.

AW-16.5 Installation

a) Each door shall be accurately cut, trimmed and fitted to its frame and hardware.

b) Allowance shall be given for painter's finish and possible swelling or

shrinkage.

c) Clearance shall not exceed 3.2mm (1/8") at lock and hanging stiles and at top; and, 6.3mm (1/4") at bottom.

d) All corners shall be rounded to 0.07mm (1/26") radius. Lock and rail edges shall be slightly bevelled.

e) The screws for hardware shall not be driven, but merely started by driving and then screwed home.

f) All doors shall operate freely and with all hardware properly adjusted and functioning.

g) Doors shall be installed complete with finishing hardware, e.g. doorknob with key, hinges, doorstop, etc.

AW-16.6 Measurement and Payment

Measurement and payment for **Wood Doors** will be based on the number of sets installed and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per set 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.

No measurement of payment for door jambs, payment being included in set.

AW-17.0 ALUMINUM DOORS AND WINDOWS

AW-17.1 General

The contractor shall furnish and install all aluminum doors and windows in accordance with the applicable drawings specification and manufacture's standards. Samples of aluminum sections shall be submitted by the Contractor to the Contracting Offices for approval before fabrication commences.

AW-17.2 Materials

Aluminum Glass Door

Aluminum glass doors shall be double swing, full glass and floor hinge type complete with transom; hardware and accessories as indicated in the drawings.

Aluminum Glass Windows

Aluminum glass windows shall be a combination of mixed and slide type or as indicated in the drawings.

Color for both doors and windows frames and accessories shall be anodized olive brown, preferably "Analok", "Kalcolor" or approved equal.

Members, sizes, extrusion processes and other characteristics of aluminum shall be referred to "ALUMINUM WORKS" and/or Drawings.

Glass Panels shall be (.006m-0.008mm) thick tinted bronze or as indicated on the drawing.

Aluminum glass doors and windows shall be products of reputable, national known manufacturers.

AW-17.3 Installation

Doors and windows shall be installed in strict accordance with the accepted manufacturer.

AW-17.4 Measurement and Payment

Measurement and payment for **Aluminum Doors and Windows** will be based on the number of sets installed and accepted by the NPC Representative.

Payment will be based at the corresponding contract unit price per set for the pertinent items under Architectural Works in Bill of Quantities.

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

AW-18.0 FINISHING HARDWARE

AW-18.1 General

This section includes furnishing and installing all finishing hardware, complete. The schedules in this section are intended to indicate the various hardware's but are not guaranteed as to quantity. The Contractor shall check the schedule and drawings for count and any item similar location elsewhere in the building.

In order to identify and establish each kind of hardware, genuine American, Japanese & European products shall be used.

AW-18.2 Packaging and Marking

Each item of finishing hardware shall be individually packed and delivered in the manufacturer's original container. Each package or box shall be clearly marked with the manufacturer's name, catalogue number and other markings required for easy identification of the hardware.

A packaging list should be furnished to clearly identify the quantity and type of hardware in every box numbered in accordance with this list.

All hardware shall have the required screws, bolts and fastening necessary for installation packed in the same package with hardware. All packages shall be legibly and adequately labeled indicating the part of the work for which it is intended.

AW-18.3 Qualified Supervision

Materials shall be procured from a source of supply approved by the NPC Representative as competent to correctly evaluate the plans, details, and specifications and be prepared at all times to promptly and satisfactorily service the hardware on the job. This supplier must be an established Contractor for builder's hardware who meets all above requirements and who operates an office in this field.

AW-18.4 Material Specification

a) Butt Hinges shall conform to U.S. Federal Specifications unless otherwise specified.

   1) For doors up to 914mm (3' - 0") wide or less, 90mm x 90mm (3-1/2" x 3-1/2") hinges shall be used.

   2) For closet doors, use long span hinges.

   3) Where the jamb trim projects to such an extent that the width of the leaf of butt hinges will not allow the door (in normal opening) to clear such trim, butt hinges with leaves of sufficient width shall be provided.

4) Finish and Material

i) Hinges used for doors to receive point shall be Bonderized and prime coating for painting.

ii) Hinges used for doors to receive natural finish shall be wrought steel highly finished, polished and plated.

iii) Use only non-ferrous material butt hinges for doors exposed to the weather.

b) Lock-sets shall conform to U.S. Federal Specifications.

c) Hardware Selection and Door Control. To obtain satisfaction and maximum services, consideration should be given to all of the following basic factors:

i) Proper lock selection. Depends on expected usage (lock, series, function), climatic conditions.

ii) Proper installation. The use of right installation tools is recommended.

iii) Proper door control. To protect locks and other hardware items, the use of door closers and other control devices is vital under certain conditions.

d) Keying and Key. Locks shall be keyed in sets and sub-sets to provide maximum expansion. All sets shall be grand master keyed, and all entrance locks shall be great-master keyed. Designation shall be by the NPC Representative.

Permanent cylinders with construction inserts are to be assembled with all locksets. Change keys are to be packed in cartons marked "packing list". On completion of the job, the NPC Representative will collect all construction keys, remove the construction inserts from the lock cylinders and distribute the lock change keys as directed. Retain Contractor and construction keys for future key system control.

Construction

a) Mechanism. Wrought steel zinc plated and dischromated with coil compression springs.

b) Exposed trim and parts. Wrought brass, bronze, aluminium or stainless.

Installation. For hollow wood doors and frame, uniform application regardless of function completely reversible for R.H. or L.H. doors.

Warranty. Locksets are engineered to meet or exceed applicable government and industry standards for strength, durability and performance. They are fully guaranteed against defects in materials for workmanship.

- Door Closers
- Push/Pull Handles
- Door Stops
- Door Catches

AW-18.5 Installation and Hardware

All hardware shall be installed in a neat, crafts manlike manner following the manufacturer's instruction. Fasteners supplied together with the hardware, shall be used to secure the hardware in place. Wood screws set in expansion shields, shall be used for securing hardware to concrete or masonry surfaces. Through-bolts shall be used where specified or necessary for satisfactory installation. After installation, hardware shall be protected from paint, stains, blemishes and damage until acceptance of the work. All hardware shall be properly adjusted and checked out in the presence of the NPC Representative to see that the hinges, locks, bolts and closers operate properly. Any error in cutting or fitting, or any damage to the adjoining work shall be replaced as directed.

AW-18.6 Measurement and Payment

No measurement for payment will be made for **Hardware**, the cost of which shall be included in the contract unit price for the pertinent items where hardware is required under Architectural Works in the Bill of Quantities.

AW-19.0 PAINTING AND VARNISHING

AW-19.1 General

The work to be executed under this section shall include the furnishing of all materials, labor, tools and ladders, scaffolding and other facilities necessary for the satisfactory performance of all work necessary to complete all painting and finishing of all surfaces throughout the interior and exterior of the building, except as otherwise specified.

The Contractors, providing the labor, materials or both for this project are specifically referred to the General Contract plans, to the General Conditions of the specifications, to all the Sections of the Specifications and to the various other sub-contract documents which may affect the completion of any sub- contract work. In the absence of a complete agreement between sub-contractors, supply dealers or others affected by the construction of this project, the General Contractor shall be held responsible for the co-ordination of all the work.

The Contractor shall examine all sections of this specification and perform all paintings called for therein.
All wood work in ceiling, partitions, handrails, cabinet work, grill work, moldings and others as specified by the NPC Representative shall be painted/varnished.

AW-19.2 Inspection of Surfaces

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

AW-19.3 Materials

All paint materials shall meet the requirements of the Philippine National Standard Specifications for Paintings.
Paints shall be brought to the Site in tightly closable, convenient, original containers, if nothing to the contrary is stipulated in the Specifications. The containers shall be marked in a durable manner with the following particulars:

- Maker
- Paint and relevant thinner
- Gross and net weights
- Date of supply by the maker's factory

The openings of the containers shall leave enough room for a stirring appliance.

All containers shall be kept tightly closed until the contents are to be used. Immediately prior to use of the contents and before pouring into smaller containers for working purposes, any skin shall be removed and the contents stirred thoroughly, if necessary with a stirring appliance.

Paints, thinners and filling cements which are not required for immediate use shall be protected against the action of frost and heat.
Only thinners supplied by the makers of the paint or those described by them as suitable shall be use for adjusting paints to working consistency. The instructions of the maker shall be followed in this respect.

Paint and filling cements shall be used in accordance with the maker's instructions.

The Contractor shall obtain from the manufacturer and shall submit to the NPC Representative a paint manufacturer's guarantee for the quality of each painting material and that each coat of paint is compatible with previous and subsequent coats.

Paints which do not have to be prepared by mixing several constituents just prior to use shall be brought to the Site in such a state of readiness that they need only be adjusted to brushing or spraying consistency to meet the relevant working conditions (e.g., temperature), by adding the particular thinners in accordance with the maker's instructions.
With the exceptions of ready-mixed materials in original containers, all mixing shall be done at the job site. No materials are to be reduced or changed except as specified by the Manufacturer of said materials.

The quality of the paints shall be such that they form no solid sediment and at most a slight skin in unopened original containers within 6 months - calculated from the marker's delivery date. A paint which has formed a solid sediment or more than just a slight skin in the unopened original containers by the time of use or which cannot be processed satisfactorily shall not be used. A sediment shall be regarded as solid if it cannot be dispelled quickly and completely by stirring.

The use of white zinc (lithophones) will not be allowed.

A place will be designated by the NPC Representative for the storage of paint materials and tools. Whenever it may be necessary to change the location of this storage place, the Contractor shall promptly move to the newly designated place. The storage space floor shall be adequately protected from damage and from paint. Paint shall be covered at all times, safeguards taken to prevent fire.

AW-19.4 Colors and Samples

All colors shall be subjected to the approval of the NPC Representative. Tinting of matching colors shall be done under the supervision of the NPC Representative. In all cases, a sample shall be applied on the job and the

NPC Representative must give his approval before work is commenced. If required, three panels, 200 mm x 250 mm (8" x 10") of each color and finish shall be prepared in advance, with the NPC Representative. "Of color selected" shall be understood as all coats specified herein.

AW-19.5 Workmanship

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

Paint shall be thoroughly stirred so as to keep the pigment evenly in suspension when paint is being applied.

No painting shall be done under conditions that are unsuitable for the production of good results. No oil painting shall be done in damp weather.

Application of succeeding coats shall strictly follow the over-coating times specified by the paint manufacturer. If no specific data are available, all coats shall be thoroughly dry before painting shall be applied. At least twenty-four (24) hours shall be allowed between coats. Exterior painting under damp/wet conditions is not allowed.

Painting coat as specified are intended to cover the surfaces perfectly, if surfaces are not fully covered, further coat shall be applied to attain the desired evenness of the paint application.

All parts of moldings and ornament shall be left clean and true to details.
All finish shall be uniform as to sheen, color and texture, except when glazing is required.

AW-19.6 Protection

The Contractor shall protect the work of all other trades against damage or injury by his employees, or by his materials, tools or utensils used in connection with this contract. Any damage done by him shall be repaired at his own expense, without additional compensation beyond the contract price.

The Contractor shall note that some damage to paint-work during shipment, storage, and building-in and particularly during grouting of the steel lining is unavoidable and the application of all protective treatment shall be programmed accordingly. Care shall be taken to remove salt crystal liable to become deposited during the sea transport and/or storage at seaport by thorough washing with clean fresh water. Before any coat of paint is applied, the surface shall be prepared as hereunder described, so that it is clean and free from all deleterious matter and completely dry.

The Contractor shall be responsible for the complete shop and field coats. Shop coats shall be checked for good quality and where necessary, before proceeding with the painting or coating operations at Site, the Contractor shall clean and repair, including smooth trowel, all shop coats which are defective or damaged.

Protect all parts of the building from paint drops by using clean drop cloths and remove all paint inadvertently placed or dropped on exposed surfaces without damage to same. Close various spaces while painting and exclude dust until finish is dry.

Plumbing systems shall not be used to wash paint brushes or containers.

Temporary or permanent welding shall not be permitted on areas where the welding will damage paint or other protective coatings, unless the areas of coatings which would be damaged thereby are accessible for repairing and inspection. Materials which have been painted shall be handled with care and protected as necessary to preserve the coating in good conditions.

AW-19.7 Paint Application

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

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

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

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

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

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

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

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

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

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

Surfaces so treated shall be tested to ascertain that alkalinity is removed; otherwise a second treatment with the same solution shall be applied. Within 24 hours after drying, all crystals on the surface must be brushed off applying the prime coat.

Metal works shall be kept clean and free from corrosion following installation. Abraded surfaces shall be retouched prior to finish painting, using the same type of paint as prime coat. Galvanized metals shall be weathered or pickled with the approved metal primer in accordance with printed instruction of the manufacturer.

Where components parts of steel or aluminum alloys meat, joints shall be sealed so that no moisture can penetrate between the contact surfaces.

Rivet and bolt heads, protruding corners, sharp section edges and places of difficult access shall be pre-treated.

The paint shall be applied in coats which are as uniform as possible.

The first priming coat shall be applied by brush. Further coats shall be applied by brush if nothing to the contrary is stipulated in the Specifications.

Smaller and specially shaped brushes shall be used for rivet and bolt heads, protruding corners, sharp section edges and places of difficult access.

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

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

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

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

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

AW-19.8 Painting Systems

All surfaces which are required by the Finish Schedules or specifications to be painted, or otherwise finished, shall be given coats of paints or varnish as specified herein. Individual directions printed on the label of the approved paint and varnish shall be strictly followed. Paint thinner or linseed oil of the same brand as the paint to be thinned shall be used.

All materials, supplies and articles furnished shall be the standard products of superior quality. All constituent materials shall conform to the applicable provisions of the latest edition of ASTM Specifications.

The following list indicates painting materials of special compositions considered suitable for various parts of the works.

Concrete and Plastered Surface

Any concrete, cement plaster exposed to high humidity 3 coats of a highly weather-resistant synthetic resin-based paint. The first coat shall contain from 5% to 20% thinner as the surface requires.

All concrete (walls, foundations, etc.) backfilled with soil or submerged.

- 1 coat of coal-tar epoxy.
- 2 coats of a mineral-filled water resistant coat-tar epoxy.

Concrete, cement plaster, etc. exposed to oil, surface shall be dry, if possible sandblasted, clean and slightly roughened.

- 1 coat with a plastic-modified hydraulic mortar.
- 2 coats of an oil-resistant synthetic resin based paint.

Concrete exposed to Mechanical and Chemical attack.

- 1 coat of colorless 2- pack epoxy based paint; this shall contain from 10% to 20% thinner as the surface requires.
- 2 coats of 2-pack epoxy-based paint.

Concrete flooring exposed to mechanical wear and oil.

- 3 coats of chlorinated rubber-based paint. The first coat shall contain 15% thinner.

Internal concrete, plastered walls exposed to abrasion.

- 3 coats of an oil-free, synthetic resin-based, dust-binding paint.

Concrete flooring subject to minor mechanical wall.

- 2 coats of an oil-free, synthetic resin-based, dust-binding paint.

Internal plastered ceilings and walls.

- 2 coats of a polyvinyl-acetate dispersion type, non-chalking paint. First coat shall contain up to 30% thinner of clean, fresh water as the surface requires.

Wooden Surfaces

a) Exterior Parts –

b) Surface shall be smoothed down with adhesive; if machine sanding is involved, a sanding is involved, a sanding sealer to bind the fibres shall be applied; the surface shall also be dry and free from dust.

- 1 coat of fungicide and bactericide ingredients after first coat.
- 2 coats of synthetic resin-based lacquer with white active pigments.

c) Interior Parts - Application of varnish on wooden interior walls, partitions, T&G ceiling panelling and closets/cabinets.

All materials, supplies and articles furnished shall be the standard products of a known manufacturer approved by the NPC Representative.

1) First Coat. Fill open grained wood with natural wood paste fillers, as is, or mixed with oil-wood stain to obtain desired shade. Apply along the grain within 30 minutes. Let dry overnight and sand lightly.

2) Second Coat. Apply any one (1) of the colors of oil-wood stain: oak, walnut, marble, and mahogany. Dry overnight and sand lightly.

3) Third Coat. Spray required coats of lacquer sanding sealer. Let dry for 30 minutes and sand to smooth.

4) Choice of any of the following topcoats:

- Clear flat lacquer - for standard flat effect.
- Clear dead flat lacquer - for complete flat lacquer.
- Super dead flat lacquer - for complete flat lacquer.
- Clear gloss lacquer - for standard gloss effect.
- Water white gloss lacquer - for brilliant crystal clear effect.
- Versatile spar varnish - for glossy thick coating also applicable for exterior wood surfaces.

When spraying under high humid conditions, add up to ten per cent (10%) by volume of lacquer thinner retarder to prevent blushing of lacquer products.

Steel Surfaces

Details are given General Technical Requirements.

AW-19.9 Measurement and Payment

Measurement of payment for **Painting and Vanishing** will be based on the area applied and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter 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 this work.

AW-20.0 CONCRETE FLOOR HARDENER

AW-20.1 General

The work under this section shall be undertaken by skilled tradesmen experienced with this kind of work. The work to be done shall consist of furnishing all labor, materials and provision of tools and equipment necessary to complete the application of Floor Hardener.

AW-20.2 Materials

Floor hardener shall be non-metallic a mixture of especially graded mineral aggregates crushed and sieved to produce sharp granules. It should be extremely hard and must be highly resistant to abrasion, impact, chemical and acid, attack and will not oxidize under any circumstances. It should be non-metallic and must be a mixture of graded Silicon Carbide and Aluminum Oxide Aggregates.

AW-20.3 Measurement and Payment

Measurement and payment for **Concrete Floor Hardener** will be based on the area placed and accepted by the NPC representative.

Payment will be made at the corresponding contract unit price per square meter 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-21.0 SOIL TREATMENT

AW-21.1 General

The work to be done under this Section shall include all labor, materials, tools and equipment necessary for soil treatment.

The Contractor shall treat the soil under the building and immediate surroundings to make it impervious and toxic to subterranean termites, often referred to as white ants or "anay" by application of soil poison solutions.

AW-21.2 Material

Material to be used shall be a solution commonly used by licensed companies or entities engaged in pest control or pest eradication. Banned solutions must not be applied.

AW-21.3 Application

The application of solutions follows the sequence of construction and the following are the order treatment:

a) Thoroughly saturate every linear meter of excavation for footings and other cement work.

b) After grading and leveling the soil in the ground and layers of gravel laid preparatory to the pouring of concrete, flood or soak every square floor area.

c) As soon as the building is constructed, just prior to the landscaping of the lawn and garden, saturate every linear meter perimeter of the building, about three (3) meters wide, with the termite proofing solution.

d) Treat earth fills thoroughly as they may carry termite colonies. As soon as the fill is packed and leveled, saturate every one square meter area with 4 litters of the termite-proofing solution.

An ordinary watering can (sprinkling can) can be used to saturate or saturate areas with the termite-proofing solution. However, for convenience and thorough and faster application, use a power sprayer with 3 to 5 gallons per minute capacity.

AW-21.4 Measurement and Payment

Measurement for payment for **Soil Treatment** will be shall be based on the unit of measure specified in the bill of quantities installed and accepted by the NPC Representative

Payment will be made at the corresponding contract unit price per unit of measure specified in the bill of quantities for the pertinent items under Architectural Works.

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

AW-22.0 PLUMBING FIXTURES AND FITTINGS

AW-22.1 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-22.2 Make

The model numbers herein given are 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-22.3 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-22.4 Fixtures

a) Water Closet – as shown in the drawings or as specified in the Bill of Quantities

b) Lavatory – as shown in the drawings or as specified in the Bill of Quantities

c) Urinal – as specified in the Bill of Quantities

d) Single Tub – Stainless steel sink

e) Bibbs – Nickel Plated Copper or Brass Alloy

f) Shower Heads – Nickel Plated Copper

g) Plated clips and 19mm (3/4") caps on wall or as indicated on the drawings.

h) Floor Drain – Stainless or Brass Alloy

i) Clean-outs – Brass alloy

AW-22.5 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 rigidly 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-22.6 Toilet Accessories

a) Soap Holders – white, vitreous China to match fixtures quality, brand and wainscoting color.

b) Tissue/Toilet Paper Holder - colored, to follow Water Closet brand and quality. Provide and fit, ready for use, on most convenient side of wall inside each water closet compartment, 750mm (30") above the finish floor.

c) Urinal and Toilet Partition and Cubicle Doors- Hard wood laminate phenolic boards. Provide polyester coated extruded aluminium framing, non-rusting connection accessories, door hinges and lock sets, toilet paper holder, grab handle and accessory hook, signage.

d) Towel Holder-stainless

e) Liquid Soap Dispenser

AW-22.7 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-23.0 WATERPROOFING

AW-23.1 General

The work includes the laying/ installation of waterproofing membrane at the roof deck of the building.

Waterproofing materials shall be delivered to the site in their original sealed containers or packages bearing manufacturer's name and brand designation.

The work shall be performed by the manufacturer's certified applicators and only the best quality of materials and workmanship shall be used in strict accordance with the standard practice for this type of work.

AW-23.2 Materials

The waterproofing material shall be a complete system of bitumen layers supplied by a manufacturer of reputable corporate existence.
Waterproofing materials shall be heat resistant preformed reinforced bituminous membrane which has good elongation and recovery characteristic when subjected to expansion and contraction movements.

AW-23.3 Surface Preparation

All concrete or masonry surfaces shall be cured for minimum of seven (7) days. It must be wood-trawled, smooth, firm, dry, clean and free from rubbish, lose or foreign materials and imperfections.

Installation of metal fittings and similar works shall be completed before application of waterproofing is done.

Surfaces shall be properly graded to drain water freely into drain lines. Drainage connections shall be set up to permit free flow of water. There shall be provisions for mortar cants in the angle formed by the area. If required, reglets of about 40mm deep and 40mm wide at 250mm above floor finish shall be provided along walls or parapet walls for the waterproofing system.

AW-23.4 Execution of Work

The waterproofing membrane shall be installed according to the manufacturer's instruction. Apply material "patching compound" reinforced with "patching fabric" on cracks and other surface imperfections.
The membrane application shall be commenced from the lowest point when applied on a surface to fall line to ensure weathered overlaps.

After installation of membrane, careful inspection shall be made for accidental damage. Damaged area shall be cleaned and patched with fresh membrane waterproofing (minimum patching material of 152mm x 152mm).

Prior to acceptance of the job, all waterproofed surfaces shall be given a 48-hour flooding and the Contractor shall remedy at once any evidence of leakage. Flooding test shall be done by plugging all drains, building

temporary dams at opening so that water will be 25.4mm (1") deep at high point of waterproofing.

Concrete topping to be used shall be 20.70MPa as per ACI specifications and 50mm (2") thick (minimum) excluding the finish and reinforced with welded steel wire fabric as per ASTM A185-73 specifications.

In particular, the Contractor shall verify conditions such as the following do no exist:

- extensive unevenness of the bed
- too rough, too porous, too smooth surfaces
- sharp edges of boarding and ridges
- variation from the horizontal or fall stipulated in the Specifications or dictated by circumstances
- incorrect level of the surface of the bed
- non-rounded corners, edges and channeling
- stress and settlement cracks, holes
- too moist surface
- non-sealing of voids (e.g. in concrete)
- inadequate firmness of the bed
- oily surface
- unsuitable type or portion of penetrating structural members
- lack of parts for connecting structural members which penetrate the waterproofing

AW-23.5 Guarantee

The Contractor shall guaranty that the work specified in this section will be free from defects of materials, workmanship and leakage for a period of five (5) years from the date of final acceptance. This obliges the Contractor to make good the defective work.

AW-23.6 Measurement and Payment

Measurement of payment for **Membrane Waterproofing** will be based on the area applied and accepted by the NPC Representative.

Payment will be made at the corresponding contract unit price per square meter 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 this work.

SECTION VI – TECHNICAL SPECIFICATIONS

CW – CIVIL WORKS

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TECHNICAL SPECIFICATIONS

CW - CIVIL WORKS

CW-1.0 GENERAL CONSTRUCTION FACILITIES

CW-1.1 Scope

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

CW-1.2 Moving-in

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

CW-1.3 Contractor's Camp Facilities

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

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

CW-1.4 Water Supply

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

CW-1.5 Sewerage Disposal and Sanitation

The Contractor shall, at his own expense, be responsible for the installation operation and maintenance of an adequate sewerage disposal and sanitation system and shall provide adequate toilet and wash-up

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

CW-1.6 Fire Protection

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

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

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

CW-1.7 Construction Power

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

CW-1.8 Camp Security

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

CW-1.9 Construction Material Storage

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

CW-1.10 Removal of Camp and Construction Facilities

After the completion of the work covered by the contract and prior to acceptance of the completed work, the entire camp facilities of the Contractor, including its water supply system, electric distribution system, quarters, warehouses, shops, dining halls, commissaries, temporary shed

and other facilities therein shall be removed by the Contractor. The site shall be cleared and cleaned as directed by the NPC.

CW-1.11 Measurement and Payment

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

CW-3.2 General Conditions

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

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

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

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

- Dispose of demolition and construction debris in a designated or NPC approved disposal area(s);
- Stockpile (and cover if possible) or haul to the designated and/or pre-developed dump sites (spoil disposal areas) that shall be provided with suitable drainage – equipped with sediment traps, stripped top soil, spoils from quarry/borrow sites and excavated materials;
- Segregate solid wastes, such as empty cement sacks, scraps of tin or wood, used wires and other domestic garbage, for recycling or storage in NPC-approved temporary storage areas and further disposal to LGU-designated disposal sites.
- Properly handle, store and dispose off, through DENR-accredited transporter/treater, hazardous wastes i.e. used oils, paints, thinner, etc.

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

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

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

g) Avoid unnecessary opening/clearing of areas outside construction sites or destruction of vegetative cover, especially cutting of existing trees; and to re-vegetate disturbed areas.

h) Implement biological control measures such as maintenance of vegetation buffers (i.e. sodding of grass, planting of creeping vines, herbs, shrubs and trees) to shield streams/rivers from sedimentation; planting of vegetative cover over erodible surfaces; and planting of exposed sloping areas with shallow-rooted species like grasses, herbs or creepers.

i) Locate fill slopes and spoil heaps away from drainage routes and properly remove/dispose the same as soon as practicable.

j) Preserve or replace, if practicable, natural drainage patterns (when disturbed by civil works) with appropriate drainage channels.

k) Convey oil-contaminated wastewater from workshops, garages, or gas filling stations through an oil trap (i.e. improvised oil-water separator) prior to discharge.

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

m) Provide PPEs and other safety provisions required by DOLE, for its project/site works.

n) Take all necessary steps to prevent the pollution of groundwater and/or water bodies in the vicinity of the project site.

CW-3.3 Measurement and Payment

No separate measurement and payment will be made for the Contractor's compliance to the foregoing. The entire cost thereof shall be included in the various pay items in the 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[1]. 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.

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.

[1] Site refers exclusively to the area affected by this project.

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 soil in 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 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 143 kPa. 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 remove 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, 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 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 Fill shall 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 stripping and 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
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:

a. Lean Concrete

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

b. Selected Materials

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

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

CW-5.2.4 Structural Backfill

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

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

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

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. Drainage and Sewerage Pipes and Cable Trench

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

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-4.3.1b.

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

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

CW-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 cm^2 of tamping area and weighing not less than 20 kg. The last layer shall be neatly brought up to the level of the adjoining finished grade surface.

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

2. Drainage and Sewerage Pipes

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

No separate measurement and payment will be made for structural excavation. Payment will be made at the corresponding pertinent pay items with 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.

No separate measurement and payment will be made for structural foundation fill. Payment will be made at the corresponding pertinent pay items with Sand and Gravel Fill/Base shown 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.

No separate measurement and payment will be made for special foundations. Payment will be made at the various pertinent pay items 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 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.

No separate measurement and payment will be made for structural backfill. Payment will be made at the corresponding pertinent pay items with 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

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 (ASTMC150).

Unless otherwise specified, cement shall be ordinary Portland Cement. Type I for general construction which concrete is not in contact with soils or ground water and Type II for concrete in contact with soil or ground water. However, the use of Portland Pozzolan Cement Type IP meeting the AASHTO/ ASTM requirements may be allowed, provided that trial mixes shall be done and that the mixes meeting the concrete strength requirements of the AASHTO/ ASTM provisions, pertaining the use of Portland Pozzolan Cement Type IP, shall be adopted.

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

CW-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-6.3.5 Formwork

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

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

CW-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 specifications for reinforcing steel.

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 Formwork Construction

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

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

Formwork for concrete placed underwater shall be watertight.

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

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

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

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

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

CW-6.5.3 Placing Reinforcement

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

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

CW-6.5.4 Mixing Concrete

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

CW-6.5.5 Placing Concrete

Concrete shall be conveyed from mixers to the forms or to the place of deposit as rapidly as possible and by methods that will prevent segregation or loss of ingredients. There shall be no vertical drop greater than 1.5 meters except where suitable equipment like metal pipe or tremie is used. The pipe or tremie 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-6.5.6 Finishing Concrete

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

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

CW-6.5.7 Removal of Forms

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

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

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

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

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

CW-6.5.8 Curing and Protection

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

CW-6.5.9 Sampling and Testing of Concrete

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

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

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

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

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

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

CW-6.5.10 Tolerances and Repair for Concrete Construction

Concrete structures shall be constructed to the lines shown on the drawings or where so required to suit actual field requirements. Any structure that does not conform to such lines shall be repaired or removed and made anew by the Contractor at no additional cost to the Corporation.

Repairs shall be made at surface imperfections due to faulty placing of concrete and cuts on the structures due to the removal of excess concrete on the lines shown on the drawings. Such repairs shall be made

immediately after early stripping of the forms, after the imperfections have been identified and the methods of repair appropriately established.

CW-6.5.11 Second Stage Concrete

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

CW-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.

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

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

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.

CW-7.2 Material Requirement

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

CW-7.2.1 Bar Reinforcement

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

CW-7.2.2 Sampling

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

CW-7.3 Construction Requirement

CW-7.3.1 Order List for Bent Bars

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

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

CW-7.3.2 Fabrication

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

Bars 6mmΦ to 20mmΦ inclusive	D=6d
Bars 25mmΦ and 28mmΦ	D=8d
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.

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.

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 solid slabs	±25mm
d.	Spacing bars in beams and footings	±6mm
e.	Height of top bars	±6mm
f.	Stirrup spacing:	
	(1) For any one stirrup	±25mm
	(2) For over-all group	±25mm of stirrup

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

CW-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 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:

Designation	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 related materials used for positioning and fastening the reinforcement in place as required by the NPC shall not be included in the weight-calculated payment under this item. If bars are substituted upon the Contractor's request and as 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

Shop Drawings of all structural steel in five (5) copies for approval prior to fabrication of structural steel with complete information necessary for the fabrication and erection of the component parts of the structure including the location, type and size of all bolts and welds, member sizes and lengths, camber & connector details, blocks, copes, and cuts. Include all welds by standard welding symbols.
Erection Plan consists of descriptive data to illustrate the structure steel erection procedure including the sequence of erection and temporary shoring and bracing, and written description of the detailed sequence of all welding, including each welding procedure to be performed.

Certificates of Conformance for the following:

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

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

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

CW-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,

scales or 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 (Soldier Piles):	ASTM A328

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

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 and coat all joints and crevices thoroughly. Prior to assembly, paint all surfaces that will be concealed or inaccessible after assembly.

Shop prime coat surfaces as soon as possible after cleaning. Apply one coat of inorganic zinc to a minimum dry film thickness of 100 microns.

- Field painting: When the erection work is complete, the heads of field bolts, all welds and any surface from which the shop coat of paint has become worn off or has otherwise become defective, shall be cleaned and thoroughly covered with one coat of shop coat paint. When the paint applied for touching up bolt heads and abraded surfaces has become thoroughly dry, apply two field coats of marine epoxy paint subject to the approval of NPC.

- Marking: Prior to erection, members shall be provided with a painted erection mark. In addition, connecting parts assembled in the shop for remaining holes in field connections shall be matched marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate erection markings in areas that will decrease member strength or cause stress concentrations.

CW-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 boltholes.

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

Visual Inspection of Welding: After the welding is completed, hand or power wires brush welds, thoroughly clean them before the inspector makes the check inspection. Inspect welds with magnifiers under strong, adequate light for surface cracking, porosity, and slag inclusions; excessive roughness; unfilled craters; gas pockets; undercuts; overlaps; size and insufficient throat and concavity. Inspect the preparation of groove welds for adequate throat opening and for snug positioning of backup bars.

Non-Destructive Testing[2]: In accordance with AWS D1.1 Twenty-five percent (25%) of the total number of joints, as selected by the NPC, shall be tested. If more than 20 percent of welds contain defects identified by testing, then all welds shall be tested by radiographic or ultrasonic testing, and to be approved by the NPC. When all welds made are required to be tested, magnetic particle testing shall be used only in areas inaccessible to either radiographic or ultrasonic testing. Retest defective areas after repair.

CW-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.

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

CW-9.0 REINFORCED CONCRETE FOUNDATION AND ASSOCIATED STRUCTURES FOR SUBSTATION EQUIPMENT AND ACCESSORIES (DESIGNED AND 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 works and associated structures as specified in the bill of quantities or as directed by NPC.

CW-9.2 Design and Construction

The design and construction of reinforced concrete foundation and associated structures for the substation equipment and other accessories to be furnished under this Contract shall be the responsibility of the Contractor. Reinforced concrete foundations shall be designed based on the actual weights and dimensions of the equipment and structures subject to NPC's evaluation and approval. No foundation and relevant structures shall be constructed unless its design is duly approved in writing by NPC.

The minimum design parameters to be considered by the Contractor are as follows:

1. Compressive strength of concrete shall be 20.7 MPa at 28 days
2. Reinforcing steel shall conform to Philippine National Standards grade DSB 275
3. Compacted sand and gravel bedding shall be 150 mm thick
4. Soil bearing capacity shall be subject to the Contractor's determination and verification at the site
5. Wind velocity shall be based on latest edition of NSCP.
6. Earthquake provisions shall be based on latest edition of the NSCP or the latest UBC requirements specified in EW 1.10 General Technical Requirement, whichever is applicable.
7. 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
8. Top of foundations/pedestals shall be 300 mm above the finished ground elevation
9. Anchor bolt materials shall be A325 with nuts and washers. Sizes and number of anchor bolts shall be designed to safely withstand all forces acting on the equipment/structures. Anchor bolts and other embedded items shall be properly and securely installed prior to the placing/pouring of concrete.

All works shall be constructed in accordance with the relevant sections of this Specifications and in 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 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-4.0.

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-4.0.

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.

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 20.70 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 Conc. 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 jointing the next pipe length to the last pipe already laid, the bottom of the trench shall be excavated to the shape, size and location of the collar below the joint. The next pipe section shall then be securely attached to the previously laid pipe seeing to it the correct alignment and grade is always attained. Same procedures shall be observed for the remaining pipes.

All pipe joints shall be filled with stiff mortar composed of one (1) part cement and two (2) parts clean sand and enough water. The inside part of the joint shall be plastered properly to bring the inside surfaces of jointed pipe ends flush even. Sufficient mortar shall be placed on the outside surface of joint to form a bead around the joint. Plastering work shall be as directed and approved by the NPC. After initial set, the mortar on the outside surface shall be protected from air and sunlight with a cover thoroughly wetted earth or burlap. Curing of the joint shall be done for a period of at least seven (7) days within which no backfill shall be placed on the installed pipeline.

CW-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 wick 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.

CW-11.0 STONE MASONRY / GROUTED RIP-RAP

CW-11.1 Scope

The work covers all works in connection with slope protection works or as directed by NPC. The works shall consist of construction of stone masonry walls or grouted riprap as shown in the drawings and as required by NPC.

CW-11.2 Materials

CW-11.2.1 Boulders

Boulders shall consist of hard, durable and selected stones, free from seams, weathered parts, dirt or any other injurious material that may prevent the proper adhesion of the mortar. Minimum size shall be 10 centimeter in diameter or 0.00055 cubic meters. Stones placed beside the boulders shall be equal or less than the size in volume with the exception that smaller rocks may be used for pinning and for filling the interstices or voids between them.

The stones shall be roughly squared where required. All shaping or dressing of stone shall be done before the stone is laid.

CW-11.2.2 Mortar for Masonry Works

A. Scope

This part deals with the proportioning, mixing and transportation of the mortars to be used for the grouted rip-rap and other relevant stone masonry works.

B. Materials

1) Portland Cement – Portland cement shall be furnished by the Contractor and provisions set forth in CW-6.0 (Concrete) shall govern.

2) Sand - Coarse and fine sand shall consist of hard, tough, durable, uncoated particles acceptable to NPC. All foreign materials and dust shall be removed by processing.

3) Water – Water for mortar shall be free from oil, acid, alkali, vegetable matter or other deleterious substances and shall be reasonably clear and clean.

C. Proportioning

The mortars shall be proportioned by volume as specified in the following table:

Class of Mortar	Portland Cement	Hydrated Lime	Sand
A	1 part	-	2 parts
B	1 part	-	3 parts
C	1 part	½ part	3 parts
D	1 part	1 ½ part	3 parts

The method of measuring materials for the mortar shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained during the progress of the work.

The quantity of water shall be the necessary one to obtain a satisfactory workability for the specific use of each mortar.

D. Mixing

The mortar shall be mixed for a minimum of 2 minutes in a mechanically operated drum type mixer or equivalent mixer approved by NPC.

The mixer shall be rotated at the speed recommended by the manufacturers and the total quantity of materials mixed in any batch shall not exceed the rated capacity of the mixer.

The gauged amount of water shall be gradually introduced into the mixer, partly before the loading of the dry materials and partly immediately after the loading of the same has been completed.

The entire content of the drum shall be discharged before a new cycle of batching is started, and at all times, the inside of the drum shall be kept free from build-up of materials. The mixer drum shall be thoroughly cleared-out prior to change of mix or on cessation of mixing.

Hand-mixing for small batches is permissible provided that the mortar is mixed up to the degree obtained with the mechanically operated mixer. If hand mixing of the mortar is permitted by NPC, the fine aggregates and cement shall be mixed dry in a tight box until the mixture assumes a uniform color, after which, water shall be added as the mixing continues.

E. Placing

Stones shall be thoroughly wetted before placing, and shall be laid by hand in full mortar beds, in courses approximately horizontal both in longitudinal and transverse directions. Stones will not be considered to be properly bedded until mortar exudes from the underside of the bedded stones. No voids in any part of the rip-rap will be permitted.

F. Transportation

The equipment and the tools for transportation and for placing batched mortar shall ensure that contamination or loss of ingredients do not take place.

Mortar shall be stirred or worked at frequent intervals to prevent separation. Any mortar that is not place within thirty minutes after the first water has been added to the batch shall be wasted. Except for necessary tempering on the mortar board, the retempering of the mortar shall not be permitted.

G. Payment

No separate payment shall be made for mortar, which shall be included in the stipulated price fully grouted riprap or stone masonry works.

CW-11.3 Measurement for Payment

Measurement for payment of the fully grouted riprap and/or stone masonry shall be based on the actual volume placed and accepted. Opening of less than 10 percent for each cross-sectional area shall not be deducted.

Payment hereof will be made at the unit price stipulated in the Bill of Quantities per cubic meter, which shall constitute full compensation for the furnishing of all materials, labor and equipment necessary for the rip-rapping/stone masonry works.

CW-12.0 PERIMETER AND SECLUSION FENCES

CW-12.1 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-12.2 Materials

CW-12.2.1 Cement and Reinforcing Steel

Cement and reinforcing steel shall conform to the requirements set forth in CW-6.0 – Concrete. Class of concrete shall be 20.7 MPa or as shown on the drawings.

CW-12.2.2 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-12.2.3 Fine and Coarse Aggregates and Water

Fine and coarse aggregates and water shall conform to the requirements stated in CW-6.0 – Concrete.

CW-12.2.4 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-12.2.5 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.

CW-12.2.6 Barbed/Razor Wires

1) Galvanized Barbed Wire

Barbed wire shall consist of three (3) strands of 2.7mmØ heavy galvanized wire with 2.2mmØ four-point barbs. It shall be of the coating class as specified in the drawings.

Individual wire specimen shall stand being bent cold through 180° without fracture on the wire and without flaking off of the zinc coating.

2) Galvanized Razor Wire

Razor wires shall be hot-dipped galvanized (line, single coil or cross coil) which, unless specified in the drawing, shall have the following properties:

- Wire Diameter : 2.5 mm
- Razor Length/Width : 12 – 21 mm / 13 – 21 mm
- Spacing : 26 – 100 mm

CW-12.3 Construction

CW-12.3.1 General

Excavation, backfilling and concreting work shall be in accordance with the applicable provisions of CW-5.0 – Structural Excavation, Fill and Backfill, CW-6.0 – Concrete and CW-7.0 – Reinforcing Steel and as prescribed hereunder.

CW-12.3.2 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.

CW-12.3.3 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.

CW-12.3.4 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-12.4 Measurement and Payment

CW-12.4.1 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 which payment shall cover all cost of furnishing all labor, materials, equipment and tools necessary for the construction of the fence.

CW-12.4.2 Seclusion Fence

Measurement for payment for seclusion fence will be based on the number of linear meters of fence constructed and accepted or as indicated in the Bill of Quantities which payment shall cover all cost of furnishing all labor, materials, equipment and tools necessary for the construction of the fence.

CW-12.4.3 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-12.4.4 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.

CW-13.0 GRAVEL SURFACING

CW-13.1 Scope

The Contractor shall furnish gravel surfacing in areas as required in the drawings or as directed by the NPC. The Contractor shall furnish all materials, labor, equipment and other necessary accessories so as to complete the work satisfactorily.

CW-13.2 Materials and Workmanship

All gravel surfacing as shown in the drawing shall consist of a base layer and finish layer. Material for base layer shall be natural or crushed stone of a clean, hard and durable quality. Before placing of the base course, the surface of the subgrade shall be cleaned of all objectionable substances and properly shaped and drained. The material for base layer shall not be more than 5 cm. in size, and placed and spread on the prepared subgrade to a thickness of 7.5 cm. Spread materials shall be compacted by means of rammer, tapping machine or approved equal equipment. The material for finish layer shall not be more than 2.5 cm. in size, and placed, spread, and compacted satisfactorily.

CW-13.3 Measurement and Payment

Measurement and payment will be based on the number of cubic meters of materials placed and compacted according to the drawings or as directed by NPC.

Payment will be made at the contract unit price for the item Gravel Surfacing in the Bill of Quantities. The unit price shall include all cost of subgrade preparation, materials, hauling, compacting equipment need to complete the item.

CW-14.0 ROADWORKS

CW-14.1 Scope

In accordance with the specifications contained herein and in conformance with the lines, slopes, grades and finished surface shown on the plans or otherwise directed by the NPC, the Contractor shall furnish all plant, labor, equipment and materials; shall perform required grading and shall construct or restore the roadways and/or other paved/gravel surfaced areas as may be required.

CW-14.2 Grading

The word "grading" as defined herein means bringing to the required grade all areas to be paved with concrete or asphalt and other areas required to be graded in accordance with the drawings.

CW-14.3 Sub-Grade Preparation

The sub-grade for the aggregate sub-base and aggregate base shall be prepared by bringing the sub-grade to a firm and unyielding surface by rolling the entire area with an approved roller weighing not less than ten (10) tons. The sub-grade shall be sprinkled, if necessary, to attain satisfactory compaction. All soft yielding material, which will not compact readily when rolled, shall be removed as directed. All holes or depressions shall be filled with suitable material and the whole surface compacted uniformly. In cut sections, the ground below the surface of the sub-grade shall not be plowed or disturbed, except as otherwise directed. When necessary, additional approved material shall be added to bring the sub-grade to the desired elevation and cross section, and the whole shall be rolled until compacted thoroughly.

CW-14.4 Aggregate Sub-Base/Base Course

CW-14.4.1 Aggregate Sub-Base Course

Aggregate sub-base material shall consist of pit run gravel, talus rock, disintegrated granite, sand, shale, cinders, coral or other similar materials, including additional filler for blending, selected under the direction of the NPC. The maximum dimensions of any particles shall not be greater than two thirds of the required thickness of the layer in which it is to be placed.

Oversized material, if present, shall be removed at the pit by screens, grizzliest, or by handpicking. When necessary to obtain proper uniformity, additional filler shall be blended by mixing on the roadway. The fraction of the aggregate sub-base material, including any additional filler passing the No. 40 sieve, shall not be more than two-thirds (2/3) of that passing the No. 40, sieve shall have a liquid limit not greater than 25 and a plasticity index of not more than 6.

CW-14.4.2 Aggregate Base Course

Aggregate base course material shall consist of hard, durable fragments of crushed gravel or crushed stone and filler and sand or other finely

divided mineral matter. The composite material for the aggregate base 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 requirement shown below. The portion of the material retained in a No. 4 sieve shall be known as filler.

The percentage passing the No. 200 sieve shall not be greater than 2/3 the percentage passing the No. 40 sieve.

The following gradation requirement shall apply to the completed base course:

Sieve Designation (Square Mesh Sieves)	Percentage by Weight Passing
50.8 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

The coarse aggregate shall have a percentage of wear of not more than 50% at 500 revolutions as determined by AASHO Method T-96 (Los Angeles Rattler Test).

That portion of the filler passing the No. 40 sieve including blended filler shall be known as "Soil Binder", and shall have a liquid limit of not more than 25 and a plasticity index of not more than 6 as determined by AASHO Method T-89 and T-90, respectively.

Not less than sixty (60) percent by weight of the coarse aggregate shall have at least one (1) fractured face.

If filler, in addition to that naturally present in the aggregate base coarse material, is necessary for meeting the grading requirement or for satisfactory blending of the material, it shall be uniformly blended with the base coarse material at the screening or crushing plant, or on the road. The material for such purpose shall be obtained from sources approved by the NPC, which shall be free from hard lumps and shall not contain more than 15 percent of material retained on the No. 4 sieve.

CW-14.4.3 Construction

Aggregate Sub-Base: The aggregate sub-base material shall be placed on the prepared and approved sub-grade. Depositing and spreading of the material shall be as directed. It shall start at the point farthest from the point of loading, and shall progress continuously without breaks. The materials shall be deposited and spread in a uniform layer and without segregation of size, to such a loose depth of not more than 15 cm each layer, making allowance for any filler to be blended on the road, that when compacted, the layer shall have the required thickness. Spreading shall be from spreader boxes or from moving vehicles, or by placing in a windrow followed by spreading to required depth and width by means of a blade grader.

After the base coarse material has been spread, it shall be bladed to a smooth surface conforming to the cross section shown on the drawings. A grader weighing not less than 3 tons and having a blade of at least 3 meters in length, and a wheelbase of not less than 4.5 meter shall be used for the blading.

When additional filler material is necessary for blending, the material shall be spread in a uniform layer over the loosely spread sub-base layer, in amounts as directed, and shall then be bladed thoroughly into the layer by blade mixing. The entire layer shall be bladed alternately to the center and back to the edges until a uniform mixture is attained. Additions to filler shall be such that the blend of added and original material shall meet grading and quality requirements in all respects.

The Contractor shall schedule his operations to assure completion of spreading within 48 hours after processing. Immediately following the final spreading and smoothing, all materials placed shall be compacted to the full width by rolling with a power roller weighing not less than 10 tons. The rolling shall start longitudinally at the sides and shall progress toward the center, overlapping on successive trips by at least one-half of the width of the roller unit. In confined areas the direction of rolling shall be as ordered by the NPC. Alternate trips of the rollers shall be slightly different in length. The rollers, unless directed otherwise, shall operate at a speed between 3 to 5 kilometers per hour. Rolling shall be accompanied by watering if necessary and as directed.

Crushed Stone Base Course: The manner of placing, spreading, blending, watering and rolling crushed gravel or crushed stone base course material shall be similar to that of the aggregate sub-base.

CW-14.5 Concrete Pavement

CW-14.5.1 Materials

Cement and reinforcing steel shall be furnished by the Contractor, subject to the approval of NPC. Unless otherwise indicated in the drawings and/or Bill of Quantities, concrete strength shall be at least 20.70 MPa.

Fine/Coarse aggregates and water shall conform to the applicable provisions of CW-7.0 (Concrete).

Preformed Expansion Joint Filler: The preformed expansion joint filler for the concrete pavement shall be 19 mm (3/4") in thickness, non-extruding type, shall conform to the requirement of ASTM D1752-67, "Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction, Non-extruding and Resilient Non-bituminous Type", Type II.

Slab Reinforcement: All dowel bars except at the expansion joints, shall be deformed steel bars and shall conform to PNS: 49:2002, Grade 275.

Joint Sealer: Concrete joint bituminous sealer for all joints shall conform to ASTM D1850-57, "Specifications for Concrete Joint Sealer, Cold Application Type".

CW-14.5.2 Construction

Forms and Form Setting: The concrete pavement shall be constructed one lane at a time. The side forms for the concrete pavement shall be made of shaped steel sections which shall be of sufficient strength when staked down to resist the pressure of the concrete mixer and finishing machine, or finishing tools, without springing. They shall be straight and on a depth equal to the thickness of the pavement at the edge and free from warps or bends at all times. Flexible or curbed forms of proper radius shall be used for curves 30 meters radius or less. The form base shall not less than twenty (20) centimeters wide for forms twenty (20) centimeters or more in height. Flange braces shall extend outward on the base not less than two-thirds (2/3) of the height of the form. The use of wooden side forms may be permitted upon written approval by the NPC, provided the Contractor satisfactorily establishes the fact that the steel forms cannot be obtained in time to bring the work to completion within the required time.

Joints: The ***longitudinal joint*** running at the centerline of the pavement shall be formed in accordance with the section and dimension shown on the drawings. Before concreting the next lane, the longitudinal joint shall be painted with two (2) coats of RC-0 liquid asphalt applied at a temperature of 65° to 35° Fahrenheit. The asphalt should be completely dry before any pouring on the next lane starts.

The ***transverse joints*** consisting of the expansion and contraction joint shall be formed at intervals shown on the plans, a 19 mm (3/4") pre-molded non-extruding expansion filler, as specified, shall be set at all contractions joints when concrete is still soft. This strip shall be removed when concrete has attained its initial set. Care shall be taken in removing the strips to avoid chipping off the edge of the concrete at the joint, such joint shall be provided with dowels of the same length, size and spacing used in expansion joints.

Dowels furnished and placed for this purpose by the Contractor shall be without additional cost to NPC.

Dowels: Dowel assembly of the length, size and spacing shown on the drawings shall be provided at longitudinal and expansion joints. Dowel bars shall also be provided at contraction joints of slab on fill. The remaining half of the dowel bars for the expansion joint shall be painted, greased, and wrapped with wax paper before concreting the next monolith.

Mixing: Unless given the written approval by NPC, hand mixing of concrete will not be permitted. Machine mixer, if used, shall have a standard mixer of an approved type with a capacity of at least 0.76 m^3. (1 cubic yard) unless specified otherwise by the NPC. Truck mixer, if used, shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to insure uniform distribution of materials throughout the mass.

Placing: Concrete shall be placed only on aggregate sub-base that has been prepared as herein before prescribed and approved. Concrete shall

be deposited in such a manner as to require as little handling as possible, and shall be immediately distributed or spread by shoveling or by other approved methods, to such dept, above grade, that when consolidated and finished, the finished grade of pavement will be attained correctly. Vibrators of approved type with the capacity for the purpose intended shall be used to sufficiently compact the concrete.

Finishing: 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 machines shall be of the screeding 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 a 3-meter straight edge and any variation of the surface from the desired crown or cross-section shall be properly corrected.

Removal of Form: All forms for concrete shall remain in place undisturbed for not less than twenty-four (24) hours after the concrete is placed, after which the forms may be removed. In the removal of forms, care should be taken so as not to break the edges of the pavement. In case portions of the concrete are spalled, they shall be immediately repaired, at the expense of the Contractor, with fresh mortar mixed in the proportion of one (1) part cement to two (2) parts clean sand. Major honeycombed areas will be considered as defective work and shall be removed and replaced at the expense of the Contractor. Any area or section removed shall not be less than 3 meter in length or less than the full width of the lane involved.

Curing: As soon as the concrete has sufficiently set, and to prevent the marring of the surface, the pavement shall be covered with burlap or canvass which shall be kept wet with clean water for a period of not less than twenty-four (24) hours. After removing the burlap, the pavement shall be covered immediately with either a layer of earth or sand four (4) centimeters in thickness and shall be kept wet for a period of not less than fourteen (14) days. Ponding of the surface of the pavement shall be kept under water during the same length of time.

Opening of Traffic: From the start of curing, the pavement will be closed entirely to traffic until twenty-eight (28) days have elapsed after the concrete was poured.

Cleaning and Sealing Joints: After completion of the required curing and before opening the pavement to traffic, all joints shall be thoroughly cleaned of all concrete or aggregate fragments, earth, or other foreign material. Longitudinal, expansion and contraction joints shall be poured with bituminous sealer to the depth shown on the drawings. Only after the joint sealant has thoroughly hardened shall the pavement be opened to traffic.

CW-14.6 Bituminous Concrete Surfacing

CW-14.6.1 Materials

a) Liquid Asphalt

The liquid asphalt for the bituminous prime coat shall be Cut-Back Asphalt, Medium Curing Type, MC-70 conforming to the properties, test and other applicable requirements.

b) Asphalt Cement

The asphalt cement for the bituminous aggregates shall have a penetration grade of 85-100 and shall conform to the properties, tests, and other applicable requirements.

c) Aggregates

The coarse aggregates shall consist of angular fragments and crushed or hand-broken stone, crushed gravel, or crushed boulders and shall have abrasion loss of not more than 50 % at 500 revolutions when tested in accordance with AASHO Method T-27, the Aggregates shall meet the following grading requirements:

GRADING REQUIREMENTS				
US Standard Sieve Size	Percentage by Weight Passing			
	CourseAggregate	Keystone Aggregate	Cover Aggregate	Seal Coat Aggregate
63.5 mm (2 – 12)	100	-	-	-
50.8 mm (2")	90-100	-	-	-
19.1 mm (3/4")	0-5	100	-	-
12.7 mm (1/2")	-	85-100	100	100
9.5 mm (3/8")	-	25-70	85-100	90-100
4.76 mm (No. 4)	-	0-20	-	10-30
2.38 mm (No. 8)	-	-	-	0-8
2.00 mm (No. 10)	-	0-7	0-10	-
0.074 mm (No. 200)	-	-	-	0-2

CW-14.6.2 Application Temperatures for Liquid Asphalt and Asphalt Cement

Type and Grade of Asphalt	Mixing	Spraying
- Liquid Asphalt (MC-70) - Asphalt Cement.(AC-85/100)	95-140°F 275-325°F	95-140°F 285-350°F

CW-14.6.3 Weather Limitations

Asphalt cement shall be applied only when aggregate is dry for its entire depth and the atmospheric temperature is above 55°F. No work shall be started if rain within 24 hours is predicted officially or if local conditions indicated that rain is imminent.

CW-14.6.4 Equipment

Equipment shall include aggregate spreading equipment, spray distributor, heating equipment for liquid asphalt and asphalt cement, blade grade, brooms, and rollers, all as approved. The roller shall be a 3-wheeled or tandem type roller, 8 tons or heavier and shall be propelled at a rate not greater than 3 kilometer per hour while rolling the pavement.

CW-14.6.5 Preparation and Priming of Previously Constructed Base

All loose or foreign material shall be removed. Any rut of soft-yielding portion that appears on the base shall be corrected and rolled until firm.

After the base course has been brought to grade, thoroughly cleaned of all loose materials, checked and approved, the base shall be primed. The bituminous prime coat shall be applied at the specified temperature. The liquid asphalt shall be applied with a pressure distributor or a hand spray bar. The hot asphalt shall be applied uniformly at the rate of 1.0 to 2.0 liters per square meter, as directed. The primed surface shall be allowed to cure for 24 to 48 hours before further construction begins. If excessive amount or primer remains on the surface at the end of this time, a blotter coat of sand shall be applied. The paving shall begin immediately after the prime coat has cured.

CW-14.6.6 Placing and Rolling Coarse Aggregate

Ninety (90) kilos per square meter of dry coarse aggregate shall be spread to a uniform depth and through to cross section, alignment and profile by means of approved stone spreaders or by shovels, forks, and rakes.

Any thin, flat or oversize aggregate that appears on the surface shall be removed. All patches or areas of fine or undersize aggregate shall be removed and replaced with suitable aggregate. Rolling shall start at the edge, parallel with the centerline of the road, and shall progress toward the center. Where no curb exist, the aggregate shall be placed between well-compacted shoulders with vertical faces and one-half the width of the outer roller wheels shall overlap the shoulder sufficient time to compact the shoulder firmly against the pavement. Each trip of the roller shall overlap the previous trip by at least 25 percent. Rolling shall be continued until aggregate is well keyed, does not creep ahead of the roller and the surface is form, even, and true to line, grade and crown. Places inaccessible to the roller shall be compacted by mechanical or hand tamping. The compacted aggregate shall possess firm, even surface, true to the grades and cross-sections shown on the drawings, and shall present a texture, which will permit uniform penetration on the asphalt cement. The surface shall not vary more than one (1) centimeter in three (3) meters from the true profile and cross-section.

CW-14.6.7 Application of Asphalt Cement on Coarse Aggregate

Upon the rolled coarse aggregate, hot asphalt cement, at the specified temperature, shall be applied uniformly at the rate of 4.0 liters per square

meter, as directed. The asphalt cement shall be applied with a pressure distributor or a hand spray bar. In no case shall asphalt cement be applied unless the coarse aggregate surface is clean and dry and has been previously checked and approved.

CW-14.6.8 Spreading, Brooming and Rolling First Course of Keystone Aggregate

Immediately after the asphalt cement has been applied to the coarse aggregate and while it is yet warm, thirteen (13) kg per square meter of clean, dry keystone aggregate shall be uniformly spread, as directed, to fill all voids. Keystone aggregate shall be broomed into voids and rolled. Scattering keystone aggregate and brooming shall continue until the voids are completely filled. The surface shall then be rolled until the stone is thoroughly embedded into the asphalt cement and anchored in place and the surface is firm and thoroughly completed. The rolling shall be done carefully to prevent waves on the surface. Diagonal rolling may be required; and in hot, sunny weather, it may be necessary to discontinue rolling during the hottest period of the day. No excess aggregate shall remain on the surface.

CW-14.6.9 Application of Asphalt Cement on First Course of Keystone Aggregate

After the first course of keystone aggregate has been rolled, the surface shall be swept clean of all dirt and loose material. The surface shall be clean and dry when the asphalt cement is applied.

The hot asphalt cement shall be applied uniformly at the rate of 1.8 liter per square meter in the same manner as for the coarse aggregate. In no case shall asphalt cement be applied unless the keystone aggregate surface has been previously checked and approved.

CW-14.6.10 Spreading, Brooming and Rolling Second Course of Keystone Aggregate

Immediately following the application of asphalt cement on the first course of keystone aggregate, eleven (11) kg per square meter of keystone aggregate shall be spread uniformly over the surface as directed. A portion of the keystone aggregate may be reserved and then added as required while brooming and rolling are in progress. The spreading of keystone aggregate shall be followed by thorough rolling and brooming of the surface. Rolling and brooming shall continue until all interstices in the coarse aggregate are filled and until the whole surface is of uniform texture throughout.

CW-14.6.11 Application of Asphalt Cement on Second Course of Keystone Aggregate

After the second course of keystone aggregate has been rolled, the surface shall be swept clean of all dirt and loose material. The surface shall be clean and dry and shall have been checked and approved prior to application of asphalt cement. No asphalt cement shall be applied uniformly at the rate of 1.4 liter per square meter, as directed.

CW-14.6.12 Spreading, Brooming and Rolling Cover Aggregate

Immediately after the asphalt cement has been applied to the second course of keystone aggregate and while it is still warm, eight (8) kg per square meter of clean, dry cover aggregate shall be uniformly spread, as directed, to cover the surface completely, then rolled and broomed until the cover aggregate is bonded thoroughly and uniformly over the full width of the surface. When the work is completed, there shall be no loose aggregate on the surface.

CW-14.6.13 Bituminous Seal Coat

At the end of thirty (30) days or earlier, if the surface is thoroughly compacted by traffic or by rolling, but never in less than ten (10) days, the surface shall be swept clean of all loose or foreign material and 0.9 to 1.8 liters per square meter of hot asphalt shall be applied, as directed. The surface shall be checked and approved prior to application of asphalt cement. Clean dry seal coat aggregate shall be immediately and uniformly spread over the surface at the rate of approximately 0.004 to 0.007 cubic meters per square meter. The exact amount shall be as directed by the NPC. Spreading shall be performed by aggregate spreader only so that an even and accurate distribution shall be obtained. The tires of the aggregate trucks shall at no time come in contact with the uncovered and newly applied asphalt. Rolling shall be done by an approved power roller weighing not less than 3 tons or more than 6 tons, until a uniform and smooth surface is obtained. Under no circumstance shall small pockets, holes or depressions appear on the surface of the finished pavement.

CW-14.6.14 Tolerance

The surface shall be true to establish grade. The finished surface shall not vary more than three-fourth (3/4) centimeter from the true profile and cross section.

CW-14.6.15 Protection of Adjacent Construction

Any adjacent construction such as concrete pavement, curb and gutter, stone masonry and handrails shall be protected by shields, covers or other means. If asphalt cement is applied to adjacent construction either by accident or because of inadequate protection, the Contractor shall remove such materials as directed at his expense.

CW-14.6.16 Maintenance

The Contractor shall be responsible for the maintenance of the surface for a period of thirty (30) days or until such time as the NPC may direct, after which the work shall be accepted in writing by the NPC. The maintenance work shall consist of keeping any excess seal coat material evenly spread over the asphalt surface by approved sweeping devices. It will also consist of keeping all holes or failures which may occur promptly repaired by use of additional asphalt and necessary aggregate and keeping of all fate or bleeding surface so covered with approved cover or seal coat

material so that the asphalt will not adhere to or be picked up by the wheels of vehicles.

No extra compensation will be made to Contractor for any maintenance work required as specified herein. All costs attendant thereto shall be included in the item, Bituminous Surfacing, in the Bill of Quantities.

CW-14.7 Measurement and Payment

CW-14.7.1 Grading

No separate measurement and payment will be made for grading work for the construction of concrete and asphalt pavements. Payment for grading work for the construction of concrete and asphalt pavements will be included in the unit bid price for the item, Aggregate Sub-base and/or Aggregate Base Course, in the Bill of Quantities.

CW-14.7.2 Aggregate Sub-Base/Base Course

Measurement for payment for aggregate sub-base and aggregate base course will be based on the number of cubic meters of materials satisfactorily placed and compacted in accordance with the detailed drawings. Pavement in the Bill of Quantities which payment shall include the cost of preparing, cleaning and/or repair of the previously constructed sub-grade; and furnishing, shaping, compacting and finishing the aggregate sub-base or aggregate base course.

CW-14.7.3 Concrete Pavement

Measurement for payment of concrete pavement will be based on the number of cubic meters of pavement constructed and accepted. Payment will be made at the contract unit price for the relevant item in the Bill of Quantities, which payment cover all cost of furnishing all materials including forms, joint bituminous sealer and non-bituminous preformed joint filler, dowels, labor, equipment and tools necessary to complete the item.

CW-14.7.4 Bituminous Surfacing

Measurement for payment for bituminous surfacing will be based on the number of square meter of bituminous surfacing satisfactorily placed and accepted. Payment will be made at the Contract Price for the item Bituminous Surfacing, in the Bill of Quantities, which payment shall cover all costs for furnishing all materials, labor, equipment and tools necessary to complete the item.

CW-15.0 CONCRETE CURB, GUTTER AND SIDEWALK

CW-15.1 Scope

In accordance with the plans and these specifications, the Contractor shall furnish all materials, labor, equipment, tools and construct complete the combination curb and gutter, parking and sidewalk as required.

CW-15.2 Materials

CW-15.2.1 Bedding

Bed course for concrete curb and gutter, parking and sidewalk shall be aggregate sub-base as similarly used in roadworks.

CW-15.2.2 Concrete

Concrete shall be 20.70MPa or as indicated on the drawings.

CW-15.2.3 Reinforcing Steel

Reinforcing Steel Bars shall conform to the requirements of PNS 49:2002 for Grade DSB-275.

CW-15.3 Construction

CW-15.3.1 Foundation Preparation

Prior to placing the bedding for the concrete curb, gutter, parking and sidewalk, the foundation shall be prepared by compacting and bringing it to unyielding or firm surface. Compaction shall be attended by either wetting or drying, as the case may be, to attain satisfactory compaction of the foundation.

CW-15.3.2 Bedding

The bedding upon which the curb, gutter, parking and sidewalk rest, shall be compacted to a firm, even surface.

CW-15.3.3 Placing Concrete

Mixing, placing, finishing and curing concrete shall conform to the requirements of ACI Code for Concrete Construction.

The curb, gutter, parking and sidewalk shall be constructed to the section and dimensions shown on the drawings. The curb and gutter shall be constructed in uniform sections and, unless otherwise directed, each section shall not be more than five (5) meters in length except where shorter sections are required for closure, but no section shall be less than two (2) meters long. The sections shall be separated by sheet templates set perpendicular to the face and top of the curb and gutter. The templates shall be approximately 3 mm in thickness, of the same.

CW-15.4 Measurement and Payment

CW-15.4.1 Concrete

Unless otherwise specified in the bill of quantities, measurement for payment will be based on the number of cubic meters of the concrete curb and gutter combination, parking and sidewalk, completed and accepted. Payment will be made at the contract unit price for the item, Concrete Curb and Gutter, Parking and Sidewalk, in the Bill of Quantities.

CW-15.4.2 Bedding

Measurement for payment will be based on the number of cubic meters of bedding materials, placed, compacted and accepted. Payment will be made at the contract unit price for the item, Aggregate Sub-base, in the Bill of Quantities.

CW-15.4.3 Reinforcing Bars for Sidewalk and Parking

Measurement for payment for Reinforcing Steel (except reinforcing steel, which shall not be measured for separate payment) will be based on the number of kilograms placed and accepted.

Payment will be made at the corresponding contract unit price for the various items of Reinforcing Steel in the Bill of Quantities, which payment shall constitute full compensation for furnishing, scheduling, cleaning, cutting, bending and placing reinforcing steel.