Republic of the Philippines
DEPARTMENT OF AGRICULTURE
NATIONAL IRRIGATION ADMINISTRATION
REGIONAL OFFICE NO. VII (CENTRAL VISAYAS)

CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System

SOLAR POWER-DRIVEN PUMP IRRIGATION PROJECTS

BCSIMOCO-LMC-09-2K24

12 August 2024

TABLE OF CONTENTS

Glossary of Terms, Abbreviations, and Acronyms

ABC – Approved Budget for the Contract.

ARCC – Allowable Range of Contract Cost.

BAC – Bids and Awards Committee.

Bid – A signed offer or proposal to undertake a contract submitted by a bidder in response to and in consonance with the requirements of the bidding documents. Also referred to as *Proposal* and *Tender*. (2016 revised IRR, Section 5[c])

Bidder – Refers to a contractor, manufacturer, supplier, distributor and/or consultant who submits a bid in response to the requirements of the Bidding Documents. (2016 revised IRR, Section 5[d])

Bidding Documents – The documents issued by the Procuring Entity as the bases for bids, furnishing all information necessary for a prospective bidder to prepare a bid for the Goods, Infrastructure Projects, and/or Consulting Services required by the Procuring Entity. (2016 revised IRR, Section 5[e])

BIR – Bureau of Internal Revenue.

BSP – Bangko Sentral ng Pilipinas.

CDA – Cooperative Development Authority.

Consulting Services – Refer to services for Infrastructure Projects and other types of projects or activities of the GOP requiring adequate external technical and professional expertise that are beyond the capability and/or capacity of the GOP to undertake such as, but not limited to: (i) advisory and review services; (ii) pre-investment or feasibility studies; (iii) design; (iv) construction supervision; (v) management and related services; and (vi) other technical services or special studies. (2016 revised IRR, Section 5[i])

Contract – Refers to the agreement entered into between the Procuring Entity and the Supplier or Manufacturer or Distributor or Service Provider for procurement of Goods and Services; Contractor for Procurement of Infrastructure Projects; or Consultant or Consulting Firm for Procurement of Consulting Services; as the case may be, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

Contractor – is a natural or juridical entity whose proposal was accepted by the Procuring Entity and to whom the Contract to execute the Work was awarded. Contractor as used in these Bidding Documents may likewise refer to a supplier, distributor, manufacturer, or consultant.

CPI – Consumer Price Index.

DOLE – Department of Labor and Employment.

DTI – Department of Trade and Industry.

Foreign-funded Procurement or Foreign-Assisted Project – Refers to procurement whose funding source is from a foreign government, foreign or international financing institution as specified in the Treaty or International or Executive Agreement. (2016 revised IRR, Section 5[b]).

GFI – Government Financial Institution.

GOCC – Government-owned and/or –controlled corporation.

Goods – Refer to all items, supplies, materials and general support services, except Consulting Services and Infrastructure Projects, which may be needed in the transaction of public businesses or in the pursuit of any government undertaking, project or activity, whether in the nature of equipment, furniture, stationery, materials for construction, or personal property of any kind, including non-personal or contractual services such as the repair and maintenance of equipment and furniture, as well as trucking, hauling, janitorial, security, and related or analogous services, as well as procurement of materials and supplies provided by the Procuring Entity for such services. The term "related" or "analogous services" shall include, but is not limited to, lease or purchase of office space, media advertisements, health maintenance services, and other services essential to the operation of the Procuring Entity. (2016 revised IRR, Section 5[r])

GOP – Government of the Philippines.

Infrastructure Projects – Include the construction, improvement, rehabilitation, demolition, repair, restoration or maintenance of roads and bridges, railways, airports, seaports, communication facilities, civil works components of information technology projects, irrigation, flood control and drainage, water supply, sanitation, sewerage and solid waste management systems, shore protection, energy/power and electrification facilities, national buildings, school buildings, hospital buildings, and other related construction projects of the government. Also referred to as *civil works or works*. (2016 revised IRR, Section 5[u])

LGUs – Local Government Units.

NFCC – Net Financial Contracting Capacity.

NGA – National Government Agency.

PCAB – Philippine Contractors Accreditation Board.

PhilGEPS - Philippine Government Electronic Procurement System.

Procurement Project – refers to a specific or identified procurement covering goods, infrastructure project or consulting services. A Procurement Project shall be described, detailed, and scheduled in the Project Procurement Management Plan prepared by the agency which shall be consolidated in the procuring entity's Annual Procurement Plan. (GPPB Circular No. 06-2019 dated 17 July 2019)

PSA – Philippine Statistics Authority.

SEC – Securities and Exchange Commission.

SLCC – Single Largest Completed Contract.

UN – United Nations.

Section I. Invitation to Bid

INVITATION TO BID FOR

CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System

1. National Irrigation Administration - Regional Office 7 (NIA-RO7), through General Appropriation Act – ESTABLISHMENT OF GROUNDWATER PUMP IRRIGATION PROJECT (Solar Pump Irrigation Project) (GAA-EGPIP (SPIP)) for Fiscal Year (FY) 2024 intends to apply the sum of **Ninety-Seven Million Pesos (₱ 97,000,000.00)** being the Approved Budget for the Contract (ABC) to payment under contract for **CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System** with Contract No. **BCSIMOCO-LMC-09-2K24**. Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The NIA-RO7 now invites bid for the above Procurement Project. Completion of the Work is required **One Hundred Eighty (180) calendar days**. Bidders should have completed 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.

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

4. Interested Bidders may obtain further information from The National Irrigation Administration (NIA), **Bohol-Cebu-Siquijor IMO (Cebu Office)** and inspect Bidding Documents at the address given below from 8:00 AM to 5:00 PM except during declared (special & regular) holidays and weekends.

5. A complete set of Bidding Documents may be acquired by interested Bidders who were able to log-in in the Philippine Government Electronic Procurement System (PhilGEPS) wherein the name of the company will be reflected in the Documents Request List of the Bid Notice Abstract of the Procuring Entity, from **August 14, 2024 (8:00 A.M.) to September 4, 2024 (8:00 A.M.)** during office hour from the given address and website(s) below & upon presentation of the payment from **NIA Bohol-Cebu-Siquijor IMO (Cebu Office)** Cashier of nonrefundable fee of **Fifty Thousand Pesos (₱ 50,000.00)** only. The Procuring Entity shall allow the bidder to present its proof of payment for the fees in person, by facsimile, or through electronic means.

   Interested Bidders' representatives must also present a letter duly signed by the General Manager/Owner, if a Sole Proprietorship, or authorized Signatory if a Corporation, authorizing him/her to acquire the Bidding Documents.

6. The NIA-RO7, will hold a Pre-Bid Conference on **August 22, 2024, 9:00 AM** at **NIA Conference Room, NIA-Bohol-Cebu-Siquijor IMO, Cebu Office, Gov. M. Cuenco Ave., Banilad, Cebu City** and/or through videoconferencing/webcasting via Google Meet**,** which shall be open to prospective bidders.

   Bidders who will join for the first meeting of the year are encouraged to attend Face to Face.

7. Bids must be duly received by the BAC Secretariat through manual submission at the office address as indicated below on or before **September 4, 2024, 9:00 AM**. 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 18.

9. Bid opening shall be on **September 4, 2024, 9:00 AM**. at **NIA Conference Room, NIA-Bohol-Cebu-Siquijor IMO, Cebu Office, Gov. M. Cuenco Ave., Banilad, Cebu City** and/or through videoconferencing/webcasting via Google Meet. Bids will be opened in the presence of the bidders' representatives whochoose to attend the activity.

10. The NIA-RO7, 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 Implementing Rules and Regulations (IRR) of RA No. 9184, without thereby incurring any liability to the affected bidder or bidders.

11. For further information, please refer to:
    NIA-Bohol-Cebu-Siquijor IMO (Cebu Office)
    c/o BAC Secretariat
    Gov. M. Cuenco Ave., Banilad, Cebu City
    Email Address: niacebuimo.engineeringunit@gmail.com
    Telephone No.(032) 416 2757

12. You may visit the website (region7.nia.gov.ph and PhilGEPS) for downloading of Bidding Documents.

August 14, 2024

Sgd. **ENGR. NELSON L. DOLIENTE**
BAC Chairperson

Section II. Instructions to Bidders

1. Scope of Bid

The *National Irrigation Administration - Regional Office 7 (NIA-RO7) i*nvites Bids for the **CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System**, with Project Identification Number ***BCSIMOCO-LMC-09-2K24***.

[Note: The Project Identification Number is assigned by the Procuring Entity based on its own coding scheme and is not the same as the PhilGEPS reference number, which is generated after the posting of the bid opportunity on the PhilGEPS website.]

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

2. Funding Information

2.1. The GOP through the source of funding as indicated below for GAA – EGPIP (SPIP) FY 2024 in the amount of ***PhP 97,000,000.00***

2.2. The source of funding is:

a. NGA, the General Appropriations Act or Special Appropriations.

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

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

5.3. For Foreign-funded Procurement, the Procuring Entity and the foreign government/foreign or international financing institution may agree on another track record requirement, as specified in the Bidding Document prepared for this purpose.

5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.2 of the 2016 IRR of RA No. 9184.

6. Origin of Associated Goods

There is no restriction on the origin of Goods other than those prohibited by a decision of the UN Security Council taken under Chapter VII of the Charter of the UN.

7. Subcontracts

7.1. The Bidder may subcontract portions of the Project to the extent allowed by the Procuring Entity as stated herein, but in no case more than fifty percent (50%) of the Project.

The Procuring Entity has prescribed that:

a. Subcontracting is not allowed.

8. Pre-Bid Conference

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

9. Clarification and Amendment of Bidding Documents

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

10. Documents Comprising the Bid: Eligibility and Technical Components

10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in **Section IX. Checklist of Technical and Financial Documents**.

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 **Section IX. Checklist of Technical and Financial Documents**.

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:*

a. 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 *120calendar days from opening of bid.* Any bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

16. Sealing and Marking of Bids

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

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

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

17. Deadline for Submission of Bids

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

18. Opening and Preliminary Examination of Bids

18.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the **IB**. The Bidders' representatives who 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 16 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 Sheet

Bid Data Sheet

<table>
<tr><th>ITB Clause</th><th></th></tr>
<tr><td>5.1</td><td>Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.</td></tr>
<tr><td>5.2</td><td>The Bidder must have an experience of having completed a Single Largest Completed Contract (SLCC) that is similar to this Project, equivalent to at least fifty percent (50%) of the ABC adjusted, if necessary, by the Bidder to current prices using the PSA's CPI, except under conditions provided for in Section 23.4.2.4 of the 2016 revised IRR of RA No. 9184.
A contract is considered to be "similar" to the contract to be bid if it has the major categories of work stated
Irrigation and Flood Control, Pumps or Solar, Mechanical & Electrical, Drilling</td></tr>
<tr><td>7.1</td><td>Sub-contracting is not allowed</td></tr>
<tr><td>10.1</td><td>As specified on the Checklist</td></tr>
<tr><td>10.3</td><td>PCAB license for the following category:

at least "Medium B", license category "A" for "Irrigation and Flood Control"
at least "Medium B", license category "A" for "Well-Drilling Work"
at least "Medium B", license category "A" for "Mechanical Work"

All prospective bidders shall submit a valid Certificate of Well Driller Registration issued by the National Water Resources Board (NWRB) to be included in the Technical Component of their bid.</td></tr>
<tr><td>10.4</td><td>The key personnel must meet the required minimum years of experience set below:
<table>
<tr><th>Key Personnel</th><th></th><th>Relevant Experience</th></tr>
<tr><td>1 – Project Manager</td><td>-</td><td>Preferably Technical individual with at least eight (8) years' experience as Project Manager;</td></tr>
<tr><td>3 – Project Engineer</td><td>-</td><td>A licensed Civil Engineer with at least five (5) years' experience as Project Engineer in similar works;</td></tr>
<tr><td>1 – Safety Officer</td><td>-</td><td>With Training Certificate and with at least three (3) years' experience as Safety Officer;</td></tr>
<tr><td>1 – Health Officer (Nurse)</td><td>-</td><td>With at least three (3) years' experience as Health Officer</td></tr>
<tr><td>3 - Foreman</td><td>-</td><td>with at least five (5) years' experience as Foreman in similar works;</td></tr>
</table></td></tr>
</table>

1 – Electrical Engineer	-	with at least five (5) years' experience in similar works;
1 – Mechanical Engineer	-	with at least five (5) years' experience in similar works;
1 – Geologist		with at least five (5) years' experience in similar works;
1 – Office Engineer	-	With at least two (2) years' experience as Office Engineer and a graduate of any technical courses related to Engineering. Can handle a maximum of two projects;
1 – Materials Engineer	-	With at least five (5) years' experience as Materials Engineer duly accredited by the DPWH provided that the limits of:

1 - Materials Engineer - With at least two (2) years' experience as Materials Engineer duly accredited by the DPWH provided that the limits of

Classification	Max. No. of Projects	Max. Projects/ Aggregate Cost (Php)
Materials Engineer I	1	<500Million
	2	<450Million
	3	<400Million
	4	<350Million
	5	<300Million
Materials Engineer II	1	No limit
	2	<500Million
	3	<450Million
	4	<400Million
	5	<350Million

<table>
<tr><td>10.5</td><td>The minimum major equipment requirements are the following:

<table>
<tr><th colspan="2">Equipment</th><th>Capacity</th><th>Number of Units</th></tr>
<tr><td>1.</td><td>Drilling Rig (Rotary Type)</td><td></td><td>2</td></tr>
<tr><td>2.</td><td>Compressor</td><td>(160cfm)</td><td>2</td></tr>
<tr><td>3.</td><td>Generator Set</td><td>(≥ 25 kVA)</td><td>2</td></tr>
<tr><td>4.</td><td>Submersible Pump (for pump testing)</td><td>10HP/15HP</td><td>2</td></tr>
<tr><td>5.</td><td>Cargo Truck/Dump Truck</td><td>6x6 / 4cu.m.</td><td>2</td></tr>
<tr><td>6.</td><td>Welding Machine</td><td>300A</td><td>2</td></tr>
<tr><td>7.</td><td>Concrete Mixer</td><td>One-Bagger</td><td>2</td></tr>
<tr><td>8.</td><td>Concrete Cylinder Mould</td><td></td><td>12</td></tr>
<tr><td>9.</td><td>Bar Cutter</td><td></td><td>2</td></tr>
<tr><td>10.</td><td>Cut-off Machine (14” diameter)</td><td></td><td>2</td></tr>
<tr><td>11.</td><td>Butt Fusion Machine (2” diameter)</td><td></td><td>2</td></tr>
<tr><td>12.</td><td>Geo-resistivity Machine (Multi-electrode)</td><td></td><td>2</td></tr>
</table>
</td></tr>
<tr><td>12</td><td>None</td></tr>
<tr><td>15.1</td><td>The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts:
a. The amount of not less than 2% of the ABC, if bid security is in cash, cashier’s/manager’s check, bank draft/guarantee or irrevocable letter of credit;

b. The amount of not less than 5% of the ABC if bid security is in Surety Bond.</td></tr>
<tr><td>19.2</td><td>Partial bids are not allowed:</td></tr>
<tr><td>20</td><td>None</td></tr>
<tr><td>21</td><td>Additional contract documents relevant to the Project that may be required by existing laws and/or the Procuring Entity, such as construction schedule and S-curve, manpower schedule, construction methods, equipment utilization schedule, construction safety and health program approved by the DOLE, and other acceptable tools of project scheduling.</td></tr>
</table>

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

4.1. 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.

4.2. 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

Special Conditions of Contract

GCC Clause	
2	The Intended Completion Date is within **One Hundred Eighty (180)** calendar days from the receipt of Notice to Proceed.
4.1	The Contractor shall commence the works within seven (7) calendar days after receipt of the Notice to Proceed.
6	The site investigation reports are: None
7.2	Five (5) years.
10	a. Dayworks are applicable at the rate shown in the Contractor's original Bid.
11.1	The Contractor shall submit the Program of Work to the Procuring Entity's Representative within 7 days of delivery of the Notice to Award.
11.2	The amount to be withheld for late submission of an updated Program of Work is none.
13	As per Memorandum Circular No. 73 series of 2024 regarding the Streamlining the Processing of the 15% Advance Payment for Infrastructure Contracts signed by NIA Administrator on June 21, 2024, provides: 1. Full 15% Advance Payment shall be made directly, in lieu of the option of the two (2) installments; and 2. The mobilization of equipment and/or key personnel as a requirement for the release of the 15% Advance Payment shall be excluded since these are integral parts of the Implementation Program to be submitted.
14	Materials and equipment delivered on the site but not completely put in place shall not be included for payment.
15.1	The date by which "as built" drawings are required is ten (10) days after the completion date.
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 *[PHP 10,000.00]*.

Section VI. Specifications

CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System

SECTION I

TEMPORARY WORKS, CONSTRUCTION PLANT, MOBILIZATION OF CONSTRUCTION EQUIPMENT AND DEMOBILIZATION WORK

101 SCOPE

A) TEMPORARY WORKS

The Contractor shall furnish all materials, labor, equipment, tools and install such temporary works as are necessary for the successful completion of the Contract Work. The Contractor shall negotiate the site for his construction camp, office and work areas.

These temporary works and construction plant shall include but will not be limited to the following:

(1) Construction camp for housing, feeding and accommodating of all the Contractor's employees. The Contractor shall also, within close proximity of his camp, provide an office and sleeping quarter for NIA employees, complete with facilities (specified in item 2 below) and shall have a minimum floor area of 80 square meters.

(2) Facilities such as aggregate plant, concrete plant and potable water, drainage, lighting, sewage, disposal, sanitation, first aid and fire protection facilities.

(3) Workshops, warehouses, site offices, stockpile areas, storage areas for materials, equipment, slide gates, spare parts, fuel and oil.

(4) Construction of temporary access roads.

(5) All other temporary facilities not specifically listed but nevertheless required for the proper functioning of the camp set-up and construction activities.

Temporary works shall conform to all government standards and codes and shall meet the sanitary requirements of the Department of Health.

Contractor shall submit to the Deputy Administrator for Engineering and Operations for approval layout drawings, program of erection and specifications for the Temporary Works within 30 calendar days following the date of receipt of the Notice to Proceed. No construction or erection of Temporary Works shall be started without the approved layout drawings, program of erection and specifications. Contractor shall also submit for approval within the same period his Construction Program, Equipment Moving-in

and Utilization Schedule and names of key personnel to be employed in the Contract Work.

B. MOBILIZATION OF EQUIPMENT

The Contractor shall mobilize and move into the Project Site within (20) calendar days after receipt of Notice to Proceed the required initial equipment requirement as listed for “Initial Equipment”.

Notwithstanding the mobilization of the initial equipment requirement, the Contractor fails to mobilize to the Site the additional equipment requirement within 20 calendar days upon receipt of the approved Equipment Moving-in and Utilization Schedule. If for the reasons or causes other than "major calamities", the Contractor fails to mobilize fully the initial equipment required within said period, and all other equipment listed in his approved Equipment Moving-in and Utilization Schedule, at the discretion of the Regional Manager/Administrator, he may be given an extension of time to mobilize them fully but in no case shall it exceed 30 calendar days. Failure to fully mobilize the required construction equipment within said period will be a ground for contract recession. During said extension period liquidated damages equivalent to the daily operated ACEL rental rate of eight hours of the undelivered equipment per day of delay shall be imposed and collectible from any subsequent payment due the Contractor. If delays are caused by "major calamities", the corresponding number of calendar days caused by such calamities will not be counted. Delays shall be reckoned starting at 12:00 o'clock noon of the succeeding day after the date scheduled for the mobilization of the program equipment. The Project Manager shall certify to the date of actual mobilization of the programmed equipment to the Site.

The Engineer shall check and verify the number, type and actual condition of the equipment moved into the Project Site. The NIA reserves the right to order the removal of such equipment that are not in good working condition from the Project Site at the Contractor's expense and said equipment are not to be counted for as mobilized.

Construction equipment once moved into the Project Site, checked and accounted for by the Engineer shall not be permitted, prior to the completion of the Contract Work, to be moved out or transferred by the Contractor to another Project Site without the written approval of the Engineer.

The Contractor shall provide one (1) unit service vehicle to be utilized by NIA Representatives within the duration of the Contract inclusive of time extension, if any, for the close supervision/monitoring of the Contract activities. Fuel, oil, driver and maintenance of the vehicle shall be provided by Contractor.

C. DEMOBILIZATION

Demobilization shall include dismantlement and removal from the Site of Contractor’s Construction Plant, materials and equipment and all Temporary Facilities with the exception of some facilities which NIA shall consider to remain and which shall be handed over to NIA at the time of demobilization in a fully operational condition. Demobilization shall also include clean-up of the site after completion of the Contract Work as approved and accepted by NIA and transportation of Contractor’s employees from the site.

102 BASIS OF PAYMENT

Payment for furnishing of all materials, equipment and labor for the temporary works, mobilization of construction equipment including demobilization work, shall be made at the fixed lump sum price or lump sum bid price whichever is stated in the Bill of Quantities which shall not be subject to price escalation and adjustment.

(1) Twenty percent (20%) of the lump sum price or lump sum bid price will be paid upon complete mobilization of the initial equipment requirement.

(2) Ten percent (10%) of the lump sum price or lump sum bid price will be paid upon submittal and approval by the NIA of the Contractor's plan for temporary works including list of equipment requirement based on his equipment moving-in and utilization schedule.

(3) Twenty percent (20%) of the lump sum price or lump sum bid price will be paid upon completion of the construction and installation of Contractor's Temporary Works, Construction Plants and temporary access roads.

(4) Thirty percent (30%) of the lump sum price or lump sum bid price will be paid upon completion of moving-in of all the construction equipment approved under Equipment Moving-in and Utilization Schedule, duly certified by the Project Manager, the Project Auditor or their duly authorized representatives. Partial payment of this 30% may be given on a pro-rata basis after fifty percent (50%) of the approved equipment has been moved-in to the Project Site.

For purposes of computing the percentage of equipment moved-in, corresponding number of points for each equipment listed in the Equipment Moving-in and Utilization Schedule shall be provided by NIA to serve as the basis for any partial payment.

(5) The remaining twenty percent (20%) of the lump sum price or lump sum bid price will be paid to the Contractor upon final acceptance of the Contract Work.

103 TEMPORARY ACCESS ROAD AND DETOUR DURING CONSTRUCTION

Where no access to various working sites, in addition to the roads available within the project site for the construction of the Contract Work, the Contractor shall provide and maintain temporary access roads to working sites at such locations as approved by the Engineer.

In addition, the Contractor shall provide necessary facilities for crossing the rivers, streams or other existing water way or shall improve and reinforce such facilities to use them for access to the working sites, if necessity arises. The contractor shall maintain and repair access roads provided by NIA and any such rural public roads as the Contractor may use as access road to various working sites, during the construction period.

The contractor shall provide temporary detour roads for rural public roads where road

crossing structures will be constructed, and maintain such detour roads during the construction of said structures. After completion and acceptance of the road crossing structures, the Contractor shall remove such temporary detour roads in a manner satisfactory to the Engineer and to the authorities concerned.

No separate payment will be made for furnishing of all materials, equipment and labor for the construction of temporary access road and maintenance of temporary access roads and existing roads and subsequent removal of the same.

All cost incurred by the Contractor in complying with the requirements of this Article shall be deemed to be included in the lump sum price for the temporary works and maintenance of existing road (including construction, maintenance and subsequent removal of temporary detour) in the Bill of Quantities.

PROJECT BILLBOARD

The Project Signage/Billboard shall consist of two (2) signages/billboards. It shall be in the standard format of the signage of the Commission on Audit (COA) with a standard dimension of 8'x8' and of the Procuring Entity which is 8'x4'. The said signages/billboards shall be placed near the project site that is visible to the public.

CONSTRUCTION SAFETY AND HEALTH

BASIC PPE'S FOR WORKERS:

1. Helmet/Safety Hardhat
2. Safety Shoes
3. Rubber Boots
4. Working Gloves
5. Rain Coats

FIRST AID/EMERGENCY RESPONSE

1. Safety Kit
2. Fire Extinguisher
3. Safety Signages at Construction Site

SECTION IV

COMMON EXCAVATION

401 SCOPE

The work under this Section shall consist of excavating and removal of all classes of materials in canal prism including placing into canal embankments excavated suitable materials, disposal of unsuitable or surplus materials to designated waste disposal areas, stockpiling of excavated materials suitable for embankment and backfilling, and trimming of side slopes inside canal prism and canal beds except on portion of the canal where concrete lining is required (trimming of the foundation bed will be considered included under Section XV "Concrete Canal Lining" all in accordance with Drawings and these Specifications or as directed by the Engineer.

All excavations shall be true to lines, grades, slopes and profiles shown on the Drawings or as required by the Engineer.

402 CLASSIFICATION

All excavated materials under this Section will be classified as follows:

1. **Rock Excavation** - For purposes of classification of excavation, rock is defined as sound and solid masses or formation, layers or ledges of mineral matter in place of such hardness and texture that:

a) Cannot be effectively loosened or broken down by ripping in a single pass with a latest model tractor mounted hydraulic ripper equipped with one digging point of standard manufacturer's design adequately sized for use with and propelled by a crawler-type tractor above 300 HP.
b) In the areas where it is impracticable to classify the use of the ripper described above, rock is defined as sound and solid material of such hardness and texture which cannot be loosened or broken by a 2.72 kg. (6 pound) drifting pick.
c) Can only be loosened or broken by a special equipment such as jack hammer and pencil hammer attached to an excavator.

All formation of materials as defined above whose volume is one (1) cubic meter or more will be classified as rock.

2. **Common Excavation** - Excavation of any materials and boulders (whose volume is less than one cubic meter) that can be ripped to be loosened by, a dozer of equal or below 300 HP capacity.

403 CONSTRUCTION REQUIREMENTS

A. EXPLOSIVES AND BLASTING

(a) Explosives

Caps or other exploders or fuses shall in no case be stored in the same place in which dynamite or other explosives are stored, transported or kept. The location and design of power magazines, the methods of transporting explosives and the precautions taken to prevent accidents shall be in accordance with the provisions of all laws, orders, regulations and decrees that are in force in the Philippines or may be issued from time to time by the Government.

The Contractor shall maintain an inventory for storage and withdrawal of powder stocks and detonators. The NIA shall be notified immediately of any loss or theft of explosives. The Contractor shall provide such reasonable and adequate protective subversive action or sabotage to any property. Only reliable personnel shall be permitted to store and handle explosives.

Explosives, if used, shall be such quantity and power and shall be used in such locations so as to minimize opening of seams and disturbing of material outside the prescribed limits of excavation. As excavation approaches its final limits, the depth of holes for blasting and the quantity of explosives used for each hole shall be reduced so that the underlying or adjacent material will not be disturbed or shattered. Whenever further blasting might injure the surface of the final excavation, as determined by the Engineer the use of explosives shall be discontinued.

The cost of furnishing, hauling, storing and handling all explosives shall be included in the contract unit price of the work for which they are required.

(b) Blasting

Blasting will be permitted only when proper precautions are taken for the protection of persons, the works, and public or private property. The Contractor shall satisfactorily cover all shots in deep cut excavations and shall take extra precautions on all blasting work as maybe required by the NIA. The Contractor shall blast to the extent necessary and in such a manner that the excavation will not be unduly large or irregular, not shatter the rock, if encountered, upon or against which concrete is to be replaced or existing structures at the site or in the vicinity thereof. Whenever, in the NIA's opinion, the Contractor's operations are liable to result in unduly large excavations or unsuitable ground, as to injure the rock, concrete or structures, the Contractor shall drill shorter holes and use lighter charges. Approval by the NIA of any of the Contractor's blasting operations shall not relieve the Contractor of his responsibility under this paragraph.

The Contractor shall submit his drilling and blasting operations for approval of

the Engineer before commencing with his blasting works. No blasting operations shall be undertaken without the approval of the Engineer.

B. SECTION AND SLOPES

Excavation sections, profiles and slopes shall be cut true and straight in conformity with the lines and grades shown on the Drawings within the following tolerances, measured normal to the excavated surfaces.

Items	Tolerances
1. Side slopes above minimum elevation of operating roads	+ 30 cm
2. Profile of operating roads, access roads and protection dike	+ 9 cm
3. Profile of invert of channel	+ 3 cm
4. Side slopes inside channel prism	+15 cm
5. Side slopes outside channel prism	+15 cm

The extreme of the above tolerances shall not be continuous over a distance of 40 meters measured at any place, in any direction, parallel to the excavated surface.

C. EXCAVATION BEYOND ESTABLISHED LINES

Precautions shall be taken to preserve, in an undisturbed condition, materials beyond the designated limits of excavations as shown on the Drawings except unsuitable materials ordered removed by the Engineer. Materials loosened beyond the excavation limits as a result of excavation operations shall be considered defective work and shall be compacted or removed and replaced with compacted embankment at the Contractor's expense, as directed by the Engineer.

404 METHOD OF CONSTRUCTION

Canal excavation shall include all excavation works in the canal prism whether common, soft rock materials, except additional excavations at structure sites which are specified to be specified to be done and measured for payment under excavation for structure.

The Contractor shall only excavate after the area of operation is acceptably cleared and grubbed in accordance with Section II "Clearing and Grubbing". Excavation of all canals shall be in accordance with the cross section, lines and grades shown on the Drawings. On portion of the canal where concrete lining is required, canal excavation shall not extend beyond the neat lines of the underside face on the canal lining as shown on the Drawings. The Contractor must exercise care not to extend his excavation beyond the limits called for in the Drawings. Excavation operations shall be such that

all materials suitable for embankment or backfilling and filling shall be separated from objectionable materials which are to be wasted. All surfaces from excavation shall be trimmed to the required slopes and grades within the specified tolerances under Sub-paragraph 403B.

Canal excavation shall be carried out by the Contractor in dry condition during dry season from April to October. Canal excavation during wet season shall be subject to approval of the Engineer, and the cost for diversion and care of river and dewatering during wet season shall be borne by the Contractor.

The method of construction or excavation for canals shall be at the option of the Contractor whether by the use of manual labor shall be required for all canals having a bottom width up to 2.00 meters and cut up to 1.00 meter. For cut above 1.00 meter but less than 1.50 meters, if there is sufficient manual labor such that the time table for completion of the Project will not be adversely affected, and the work can be done with manual labor at a price not exceeding the price for mechanized work shall also be done by manual labor. These limits refer only to workable soil. If the soil is wet and sticky, the above limits may be reduced. If the soil is hard as to require picks for loosening, thereby impairing the efficiency of manual labor considerably, the cut section should preferably be ripped mechanically with the use of rippers towed by bulldozer.

In case no manual labor is available to meet project deadline, the Contractor shall be required to secure a certification from the Mayor of the locality concerned to support this request for exemption. On the other hand, if the availability of manual labor is more than enough to meet project deadline, the Contractor may be required to do manual excavation more than what is required under this paragraph.

In sections of deep cut in which the canal section is continuous with the roadway section and its side slopes, excavation for roadway shall be included under this Section. If slides occur on excavated slopes or if run-off flows deposit additional materials in excavations before the acceptance of the works, the removal of said slides and/or deposits shall be at the expense of the Contractor.

Large canals like main canals should preferably be excavated with the use of motorized scrapers or bulldozer with rippers, excavating in successive layers of about 30 centimeters followed consequently by trimming of the side slopes using a Grader. Medium sized canals like laterals should preferably be excavated by initially using a Bulldozer for the upper layers and then excavating the bottom layers and side slopes with the use of Backhoe. Should the Contractor propose to do excavation works by some other means, prior approval of the Engineer must be secured.

405 FINISHING CANAL AND ROADWAYS

Upon completion of all construction operations, the canal section, including slopes of canal embankments, and roadway embankments, shall be finished as specified and shown on the drawings. Canal beds, canal embankments and side slopes shall be trimmed and shaped to the finished cross-section to produce smooth surfaces and slopes, and uniform cross-sections.

Stockpiling of materials in finished canal sections, roadways and embankments shall not be permitted. All finished works and surfaces shall be cleared of all dirt and foreign

materials.

The Contractor shall also be required to clear the entire right-of-way and areas outside the limits of the right-of-way for all excess or objectionable materials, if such excess or objectionable materials are the result of the Contractor's operation as determined by the Engineer.

All woods and other objectionable growth, roots excess earth, debris, loosened rock larger than 7.5 centimeters shall be removed and disposed of in approved sites outside the right-of-way as specified or directed by the Engineer.

The entire canal sections including roadways, side slopes and structure approaches shall be left in a neat and presentable condition.

406 METHOD OF MEASUREMENT

Canal excavation will be measured for every cubic meter of material excavated from the canal prism. Measurement shall be made in its original position after undertaking clearing and grubbing including stripping operations and computed by the Average-End Area method for every 40-meter section of finished canal within the paylines or neat lines shown on the Drawings, acceptably excavated and formed into embankments or used for structure backfill, or wasted as directed.

Hauling of excavated materials within the free haul distance (200m) either for embankment or disposal to waste areas and trimming of side slopes in canal prism and canal beds except on portion of the canal where concrete lining is required, are considered subsidiary works under canal excavation, thus, shall be paid under this Section and the cost thereof shall be considered included in the contract unit price for Canal Excavation. Hauling beyond the free haul distance (for waste materials only) and spreading of excavated materials into canal and roadway embankments, and structure backfill be paid under Section VI "Overhaul" and Section X "Embankment Construction and Compaction", respectively. Hauling or overhauling for disposal of excavated materials into canal embankments is a subsidiary work for Section X "Embankment Construction and Compaction", thus, it will not be measured for payment and the cost thereof is considered included in the contract unit price for Section X "Embankment Construction and Compaction".

407 BASIS OF PAYMENT

The volume measured as provided above shall be paid at the contract unit price per cubic meter for the different classes of "Canal Excavation" which price and payment shall constitute full compensation or furnishing all materials, supplies, labor, equipment, tools and all incidentals necessary for the successful completion of the work described under this Section and for all subsidiary works except for hauling of excavated materials beyond the free haul distance of 200 meters for disposal to waste areas which shall be paid under Section VI "Overhaul" and except for trimming of side slopes on portion of canals where concrete lining is required which shall be paid under Section XV "Concrete Canal Lining".

SECTION V

STRUCTURE EXCAVATION

501 SCOPE

Structure Excavation includes the removal of all materials within the structure lines, including necessary dewatering operations not otherwise specified. It shall also include additional excavations within the vicinity of the structure in order to shape the ground as shown on the Drawings or as directed by the Engineer.

502 CLASSIFICATIONS

Structure excavation shall be classified in accordance with Paragraph 402.

503 CONSTRUCTION REQUIREMENTS

All excavation requirements described in Paragraph 403 are applicable under this Section.

504 METHOD OF CONSTRUCTION

A. EXCAVATION FOR STRUCTURES

All structures, where practicable shall be constructed in open-cut excavation. The method of construction or excavations shall be in accordance with the applicable provisions of Paragraph 404 and the following requirements.

Foundations shall be excavated according to the outline of the footings and floors of structure as shown on the Drawings or as directed by the Engineer, and shall be of sufficient size to permit free movement of workers.

On excavation of common materials, the foundation bed upon which structures are to be places shall be finished accurately to the established lines and grades after a thorough compacting and trimming of the foundation with the use of suitable tools and equipment. If at any point, material is excavated beyond the lines and grades of any part of the structure, the over excavation shall be filled with selected materials approved by the Engineer and shall be places in layers of not more than 20 centimeters thick, moistened and thoroughly compacted by special roller, mechanical tampers or by other approved methods. The cost of filling over-excavation ordered by the Engineer shall be borne by the Contractor.

On excavation of rock materials, the bottom and side surfaces of excavated rock excavation upon or against which concrete and weep holes are to be placed shall conform to the required grades and dimensions as shown on the Drawings or as established by the Engineer. If at any point, materials are excavated beyond the required limits, the over-excavation shall be filled with concrete at the expense of the Contractor

including the cost of all materials required.

When concrete is to be placed upon or against soft rock, the excavation shall be of sufficient depth to provide for the minimum thickness of concrete at all points and any deviation from the required minimum thickness of concrete shall be avoided as much as possible. The surface on which concrete will be laid shall be trimmed and thoroughly cleaned as directed by the Engineer.

The foundation of all the structures shall be excavated to such depths as may be necessary to examine bearing capacity of the foundations. Whenever the bearing capacity of the soil/foundations as uncovered is less than that called for on the Drawings or by the Engineer, pilings or appropriate spread footings will be used. The elevations of the bottoms of footings, as shown in the Drawings shall be considered as approximate, and the Engineer may order, in writing, such changes in elevations and dimensions of footings as may be necessary to ensure a satisfactory foundation. Bearing tests, upon written order of the Engineer, shall be taken to determine the allowable bearing capacity of the soil/foundation by the Contractor, the cost of bearing test shall be deemed to be included in the unit prices of structure excavations Type A and Type B.

505 METHOD OF MEASUREMENT

A. STRUCTURE EXCAVATION

Structure Excavation shall be measured by the cubic meter in its original position before being excavated in accordance with the Drawings, or as may be ordered by the Engineer. No excavation beyond the paylines shown on the Drawings will be measured for payment. For canal structures, the limit of measurement along the lines perpendicular to the flow of water shall be the vertical planes at the outer edges of the inlet and outlet cut-off walls. The upper limits of the solid measured for payment shall be the canal bottom for canal structures or the original ground surface in case of diversion structures. The lower limit shall be the canal bottom of the required excavation. Excavated materials not vertically above the boundaries as specified above shall not be measured for payment. The volume measured shall not include water and other liquids removable by pumping. Such materials as mud, muck, quagmire and other similar semi-solids not removable by ordinary pumping shall be considered pay quantities and shall be measured and paid for as “Structure Excavation”.

506 BASIS OF PAYMENT

a) Structure Excavation

The volume measured as provided above will be paid at the contract unit price per cubic meter for the following types of “Structure Excavation”:

Type A – Structure Excavation for Pump Station and Siphons
Type B – All other Structure Excavation

The unit price shall constitute full compensation for furnishing all materials, supplies,

labor, equipment, tools and incidents and subsidiary works necessary to complete the work described under this Section, including blasting, hauling for piling or disposal, slide prevention, erosion control and other work necessary to maintain the excavation in good order during construction.

Under Structure Excavation Type A, the cost of dewatering operation unless otherwise specified in the Bill of Quantities shall be paid under a separate item in the Bill of Quantities. Under Structure Excavation Type B, dewatering operations involved are considered subsidiary works and the cost thereof shall be considered included in the unit price for Structure Excavation Type B.

The Contractor shall be paid thirty percent (30%) of the pay quantities of the actual excavation acceptably accomplished. Another thirty percent (30%) will be paid upon pouring of concrete for the foundation or upon placing of riprap, gravel blanket or grouted riprap and the final payment of the remaining forty percent (40%) upon completion of the backfill in accordance with the Drawings and Specifications.

BACKFILL WITH COMPACTION

1. SCOPE

The work under this section shall include hauling (if necessary) and backfilling with suitable materials taken under from Canal Excavation , Side Borrow or Borrow Haul all spaces excavated and not occupied by the structure and spaces between the natural ground surface and the finish lines indicated to be filled and all other sections directed to be filled by the Engineer, all in accordance with these specifications and in conformity with the lines, grades and dimensions shown in the Drawings or as ordered by the Engineer. It shall also include the dewatering and removal of all suitable materials as ordered by the Engineer from the spaces to be backfilled or filled.

2. METHOD OF CONSTRUCTION

All spaces to be backfilled or filled shall be cleared of all rubbish and other objectionable matter. The excavation pit to be backfilled shall dewatered and all mud and loose materials shall be removed before backfilling. The filling materials, with the proper moisture content determined by the Engineer, shall be deposited loose and layers not exceeding 30 centimeters and then thoroughly compacted by ramming, rolling or by means of mechanical tampers or portable vibratory compactors to obtain at least 85% compaction behind bridge abutments, retaining walls, cut-off walls and immediately above pipes, box or barrel conduits and gradually increasing to at least 90% compaction p to the surface of the roadway in the case of approaches to bridges, road crossing or Culvert Structures. The time when to start backfilling operation shall be determined by the Engineer.

3. METHOD OF MEASUREMENT

Backfill with Compaction shall be measured by the cubic meter in its final compacted and uncompacted position within the limits of structure excavation paylines and surfaces of concrete in contact with the backfilled materials as shown on the Drawings or as directed by the Engineer. Volumes occupied by the structures and other features will not be included.

4. BASIS OF PAYMENT

Backfill with Compaction will be paid for at the contract unit price per cubic meter, which price and payments shall constitute full compensation for the side borrow, borrow haul and overhaul operations and for furnishing all labor, equipment, tools and all incidentals and subsidiary works necessary for the successful completion of the work under this Section.

SECTION IX

STRUCTURE BACKFILL

901 SCOPE

The work under this Section shall include hauling (if necessary), and backfilling with the suitable materials taken either from "Structure Excavation", "Side Borrow" or "Borrow Haul" all spaces excavated and not occupied by the structure and spaces between natural ground surface and the finish lines indicated to be filled and all other sections directed to be filled by the Engineer, compacting to the desired degree of compaction the said materials after placement, all in accordance with these Specifications, and in conformity with the lines, grades and dimension shown on the Drawings or as ordered by the Engineer. It shall also include the dewatering and removal of all unsuitable materials as ordered by the Engineer from the spaces to be backfilled or filled.

902 METHOD OF CONSTRUCTION

All spaces to be backfilled or filled shall be cleared of all rubbish and other objectionable matter. The excavation pit to be backfilled shall be dewatered and all mud and loose materials shall be removed before backfilling. The filling materials, with the proper moisture content determined by the Engineer, shall be deposited loose and in layers not exceeding 30 centimeters and then thoroughly compacted by ramming, rolling or by means of mechanical tampers or portable vibratory compactors to obtain at least 85% compaction behind bridge abutments, retaining wall, cut-off walls and immediately above pipes, box or barrel conduits and gradually increasing to at least 90% compaction up to the surface of the roadway in the case of approaches to bridges and road crossing structures. The time when to start backfilling operation shall be determined by the Engineer.

The compacted backfill above siphons, pipes, barrels and other conduits, shall be brought at least 60 centimeters, unless otherwise specified, before any compacting equipment utilized in embankment construction shall be used or allowed to pass. Additional layers above 60 centimeters can be completed by the use of roller type compacting equipment or other appropriate equipment employed in embankment compaction.

Materials for structure backfill shall be as described in Sub-paragraph 602C of Section VI "Overhaul".

903 METHOD OF MEASUREMENT

Structure backfill shall be measured in cubic meters in its final compacted position within the limits of structure excavation paylines and surfaces of concrete in contact with the backfilled material as shown on the Drawings or as directed by the Engineer.

Volumes occupied by the structure and other features will not be included.

904 BASIS OF PAYMENT

Structure Backfill will be paid for at the contract unit price per cubic meter, which price and payment shall constitute full compensation for side borrow, borrow haul and overhaul operations and for furnishing all labor, equipment, tools and all incidentals and subsidiary works necessary for the successful completion of the work under this Section.

For newly constructed drainage crossing, the volume between the original ground surface and the top of the canal embankments is part of the embankment construction operation and therefore shall not be included for payment under this Section (which payment shall be included under Embankment Construction and Compaction).

SECTION XII

CONCRETE

1201 GENERAL

This Section covers all the materials as cement, aggregates, water, admixture and proportioning, mixing, transporting, placing, finishing, curing and protecting of concrete, including supplies, equipment, tools and all other incidentals necessary for concrete works.

All the applicable provisions of the latest revision of the ACI Building Code (ACI-318-63) and American Society for Testing and Materials (ASTM) shall govern in all cases not specifically provided for herein.

1202 CONCRETE COMPOSITION

Concrete shall be composed of Portland cement, fine and coarse aggregates, water and if necessary, admixtures or agents approved by NIA. The design of concrete mixtures and consistency shall be as specified in this Section.

1203 CEMENT

A) GENERAL

The cement shall conform to the requirements of the standard specifications for Portland Cement (ASTM: C-150 Type 1). Special Cement may be used subject to the approval of the Engineer provided it meets the requirements of Portland Cement with respect to strength, soundness and setting time.

B) STORAGE

Contractor shall, immediately upon delivery of cement to the jobsite, store the same in a dry, weathertight and properly ventilated structure with adequate provisions for the prevention of absorption of moisture. All storage facilities shall be subject to the approval of NIA and shall be such as to permit easy access for inspection and identification. In order that cement may not become unduly aged after delivery, the Contractor shall use any cement of the same type which has been stored at the site for 60 days or more before using cement of lesser storage age. Any cement stored at the project site for over four months shall not be used unless retest proves it to be satisfactory. Sacked cement shall not be stocked higher than 14 sacks for storage for a period of not longer than 30 days and not higher than 7 sacks for longer period.

C) PAYMENT.

Payment for cement shall be considered included in the contract unit price for the various items of concrete, masonry works, mortar, grout, etc., in the Bill of Quantities for which cement is used.

1204 ADMIXTURES

A. GENERAL

In order to reduce the cement content and/or the amount of mixing water, and to improve the concrete workability, the Contractor may be allowed to use Admixtures and as such he shall submit to NIA for approval such Admixtures he proposes to use. The Contractor shall be required to submit manufacturer's brochures and data sheets for review together with detailed proposals on how the admixtures will be used in the works. This information should be supported with mix designs and the results of trial mixes. All admixtures shall be used strictly in accordance with the manufacturer's recommendations. However, no additional payment will be made by NIA to the Contractor in view of this as the cost thereof is considered included in the contract unit price for the different classes of concrete.

The following type of admixtures will be given consideration by the NIA provided that they conform to the provisions of this Paragraph:

(1) Air entraining agent
(2) Water reducing admixtures
(3) Water reducing and set retarding admixtures
(4) Water reducing and accelerating admixtures

Admixtures shall be furnished in a powder or liquid form. If furnished in a solution it shall contain at least 50% solids and mold inhibitor. The admixtures effect on the properties of Portland Cement concrete mixtures shall meet the requirements of ASTM: C-494.

B. MATERIAL

Admixtures will be accepted on manufactures certification of conformance with the specifications but permission to slip on certification shall in no way relieve the Contractor of responsibility for furnishing an admixture not meeting specification requirements. Where the NIA has reason to believe that testing is necessary to prove compliance with the requirements of these specifications, it may order these admixtures to be sampled and tested anytime. The Contractor shall provide facilities satisfactory to the NIA for readily procuring samples for test.

(a) Air Entraining Agent

Concrete produced with water reducing agents shall contain four to six percent (4% - 6%) of entrained by volume. The air entraining agent shall conform to the requirements of ASTM: C-260, and shall be tested in accordance with ASTM: C 233. The total calculated air content of the concrete as discharged from the mixer shall be as follows:

Coarse Aggregates Maximum Size	Total Air - Per cent by Volume of Concrete
2.0 cm. (3/4")	5 ± 1
3.8 cm. (1-1/2")	4 ± 1

The agent in solution shall be maintained at uniform strength and shall be added to the batch in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement. When a retarder dispersing agent

is used in the concrete, the portion of the mixing water containing the air-entraining agent shall be introduced separately into the mixer.

(b) Water Reducing Agent or Water Reducing and Set Retarding Agent

The Contractor may be allowed to use an approved water reducing agent, or water-reducing and set retarding agent in concrete. The ASTM designations for these admixtures are Type A and Type D, respectively. The agent used shall be either suitable calcium, sodium or ammonium salts of lignosulfonic acids or of the non-lignin, hydroxylated carboxylic and acid groups. The agent shall be of uniform consistency and quality within each container and from shipment to shipment.

The amount of water reducing, or water reducing and set retarding agent to be used in each concrete mix shall in general be within the following limits:

Lignosulfonic Acid Type	-	0.27% to 0.37% of solid crystalline lignin, by weight of cement
Hydroxylated Carboxylic Acid Type	-	0.25% to 0.50% of liquid, by weight of cement

(c) Water Reducing and Accelerating Admixture

The ASTM designation for this admixture is Type E. Water reducing and set accelerating admixture may be used by the Contractor for speeding up precasting and post-tensioning operations for precast and prestressed beams, girders, slabs and bearing pads, if approved.

C. PAYMENT

Payment for admixtures shall be considered included in the contract unit price for the various items for concrete in the Bill of Quantities for which admixtures are used.

1205 WATER

The water used in concrete, mortar and grout shall be free from objectionable quantities of silt, organic matter, alkali, salts and other impurities. The recommendation of the seventh edition of the U.S. Bureau of Reclamation (USBR) concrete manual for mixing water shall be followed.

1206 FINE AGGREGATES

A. GENERAL

The term "Fine Aggregates" is used to designate aggregates in which the maximum size of particles is 5 millimeters (3/16”). Fine aggregates for concrete, mortar and grout shall be provided by the Contractor and shall consist of natural sand, manufactured sand, or a combination of both. The different components shall be batched separately, or subject to the written approval of the Engineer, or blended prior to delivery to the batching plant.

As a means of providing moisture control, the Contractor may be required to stockpile the fine aggregates over porous storage to drain excessive water and to stabilize the moisture content.

B. QUALITY

Fine aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, tough, durable, uncoated rock particles. The Contractor shall exercise every possible precaution in transporting, washing and screening operations to prevent contamination of sand particles. Fine aggregates shall conform to the following requirements:

(a) Grading:- It is assumed that the sand available in natural deposits will require processing to provide a suitable gradation. Regardless of the source, the fine aggregates shall be well graded from fine to coarse and the gradation as delivered to the mixers shall conform to the following requirements unless otherwise approved:

Sieve Designation US Standard Square Mesh	Percent Passing Individual Sizes by Weight
3/8" (9.50 mm)	100
No. 4 (4.75 mm)	95 -100
No. 8 (2.36 mm)	85 – 95
No. 16 (1.18 mm)	60 – 85
No. 30 (600 µm)	25 – 60
No. 50 (300 µm)	10 – 30
No. 50 (300 µm)	2 – 10

In addition to the grading limits shown above, the fine aggregates as delivered to the mixer shall have the fineness modulus of not less than 2.30 or more than 3.00. The grading of the fine aggregates also shall be controlled so that the fineness moduli of at least 9 to 10 test samples of the fine aggregates as delivered to the mixer shall not vary more than 0.10 from the average fineness modulus of all samples previously taken. The fineness modulus shall be determined by dividing by 100, the sum of the cumulative percentages retained on US standard sieves No. 4, 8, 16, 30, 50 and 100. At the option of the Contractor fine aggregates may be separated into two or more sizes or classifications, but the resulting sand when combined before entering the concrete mixer shall be of uniform grading within the limits specified above.

(b) Particles Shape:-.The shape of the particles shall be generally spherical or cubical and reasonably free from flat or elongated particles. A flat or elongated particle is defined as a particle having a maximum dimension in excess of five times the minimum dimension. Rocks which breaks down into such shape, regardless of the type processing equipment used, will not be approved for use in the production of fine aggregates.

(c) Deleterious Substance:-The maximum percentages of deleterious substances in the fine aggregates as delivered to the mixer shall not exceed the following values:

Deleterious Substances	Percent by Weight
Materials passing no. 200 Screen (Designation 16)*	3.0%
Shale (Designation 17)*	1.0%
Clay Lumps (Designation 13)*	1.0%
Total of other deleterious substances (such as alkali, mica, soft, flaky particles and loam	2.0%

* The designation in ( ) refers to Method of Testing described in the Seventh Edition of the Bureau of Reclamation Concrete Manual and ASTM.

The sum of the percentages of all deleterious substances shall not exceed 5% by weight. Fine aggregates producing a color darker than the standard in the colometric test for organic impurity (USBR designation 14 or ASTM C 40) may be rejected.

Fine aggregates having specific gravity (USBR Designation 9 or ASTM C-128, saturated surfaces dry basis) of less than 2.60 may be rejected. The fine aggregate may be rejected if the portion retained on No. 50 (300µm) screen, when subjected to five cycles of sodium sulfate test for soundness (USBR designation 19 or ASTM C-88) shows an average loss of more than 18% by weight. Fine aggregates delivered to the batching plant may be rejected if it contains more than 0.15% soluble sulfate for any one sample or more than 0.10% for an average of at least 9 out of 10 consecutive test samples of finished sand, when samples are taken hourly. The percent soluble sulfate in fine aggregates shall be determined in accordance with the method of test prescribed in Sub-paragraph (d) below.

(d) Sampling: - Sampling of fine and coarse aggregates shall be done in accordance with paragraph 1209 and the appropriate requirements of Section 12 of ASTM C-33. The source from which fine and coarse aggregates is to be obtained shall be selected well in advance of the time when the materials will be required in the work. Unless otherwise specified, all test samples shall be taken under the supervision of the Engineer in sufficient time as approved to permit adequate testing and examination of results sufficiently in advance of the time for use in concrete. Routine control test and analysis of the fine and coarse aggregates at various stages in the processing operation shall be made. The approval of a source shall not be construed as containing approval of all materials from the source, and the Contractor will be held responsible for the specified quality of all such materials used in the work.

C. STORAGE

Fine aggregates shall be stored in such a manner as to avoid the inclusion of any foreign materials in the concrete. The storage or stockpile shall be constructed so as to prevent segregation. Depositing of materials in storage and its removal therefrom shall be done in such a manner as to result in increasing the uniformity of the grading insofar as this is practicable. All fine aggregates shall remain in free drainage storage for at least seventy-two (72) hours prior to use. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete.

D. MEASUREMENT AND PAYMENT

Fine aggregate will not be measured for payment. The cost of excavation, stockpiling, transporting, processing, blending, handling and other costs for providing fine aggregates shall be considered included in the contract unit price bid for the various items in the Bill of Quantities for which fine aggregates are used.

1207 COARSE AGGREGATES

A. GENERAL

The term "Coarse Aggregate" is used to designate aggregates of such sizes as to fall within the range of 0.5 cm (3/16”) to 7.5 cm. (3”) or any size or range of sizes within such limits.

The coarse aggregates shall be reasonably well graded within the nominal size ranges hereinafter specified. Coarse aggregate for concrete shall be furnished by the Contractor and shall consist of crushed rock or mixture of natural gravel and crushed rock as provided in paragraph 1208. Coarse aggregate, as delivered to the batching plant shall have a uniform and stable moisture content. Any rewashing found necessary to provide clean aggregate shall be

done prior to finish screening. Rewashing shall not be performed in finish screens.

B. QUALITY

Coarse aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, dense, uncoated durable rock fragments.

1. Grading - The coarse aggregates shall be well graded from fine to coarse. It shall be separated into the following specific size groups. The grading of the aggregates within the separated size groups as delivered to the mixer shall be as follows:

Sieve Size	Size Groups and Percent Passing Individual Sizes by Weight					
US Std. Square.Mesh	12.5 mm (1/2")	19 mm (3/4")	38 mm (1-1/2")	50 mm (2")	63 mm (2-1/2")	75mm (3")
4" (100 mm)	-	-	-	-	-	100
3" (75 mm)	-	-	-	-	100	90 -100
2-1/2" (63 mm)	-	-	-	100	90-100	35- 70
2" (50 mm)	-	-	100	95-100	35- 70	-
1-1/2" (37.5mm)	-	-	90-100	-	0 - 15	10 – 30
1" (25 mm)	-	100	20-55	35-70	-	0 – 5
3/4" (19 mm)	100	90-100	0-15	-	0 - 5	-
½" (12.5mm)	90-100	-	-	10-30	-	-
3/8" (9.5 mm)	40-70	20-55	0-5	-	-	-
No. 4 (4.75mm)	0-15	0-10	-	0-5	-	-

Coarse aggregates shall contain not more than 1.5% of materials passing the No. 200 sieve (75µm) by meshing, nor more than 5% of soft fragments.

It shall have an abrasion loss of not more than 45% at 500 revolutions.

Unless otherwise directed, the maximum sizes of aggregates to be used in concrete for the various parts of the work shall be in accordance with the following:

General Use	Maximum Aggregates Diameter
Concrete for reinforced concrete pipes	12.5 mm (1/2")
Concrete for reinforced concrete piles	19 mm (3/4")
Concrete for thin walls, slabs, beams, less than 0.22 m. thick and concrete for blockout (second concrete)	19 mm (3/4")
Concrete for canal lining	19 mm (3/4")
Reinforced concrete for thin walls, slabs, beams, piles between 0.22 and 0.75 m thick and concrete pavement for road	38 mm (1-1/2")
Lean concrete and other miscellaneous uses	38 mm (1-1/2")
Plain concrete of massive section or with light reinforcement	50 mm (2")

In all cases, the diameter of the aggregate shall not exceed ½ the distance between the bars of reinforcing steel of the members being placed.

2) Particle Shape - The particle shape of the crushed coarse aggregate shall be generally spherical or cubical and reasonably free from flat or elongated particles. A flat or elongated particle is defined as a particle having a maximum dimension in excess of five

times the minimum dimensions. Rocks which break down into such shape will not be approved for the production of aggregate.

3. Deleterious Substances - The deleterious substances in any size of coarse aggregate, as delivered to the mixer, shall not exceed the following values:

Deleterious Substances	Percent by Weight
Materials passing No. 200 Screen (Designation 16) *	0.5%
Shale (Designation 18)*	1.0%
Clay Lumps (Designation 13)*	0.5%
Other Deleterious Substances	1.0%

* The designation in ( ) refers to Methods of Testing described in the Seventh Edition of the Bureau of Reclamation Concrete Manual and ASTM.

The sum of the percentages of all deleterious substances in any size, as delivered to the mixer, shall not exceed 3% by weight. Coarse aggregate may be rejected if it fails to meet the following requirements:

i) Petrographic Examination - If more than 10% of poor aggregate particles can be identified in physical quality test and in case 20% of the particles would be classified with respect to the chemical quality (USBR Designation 7 or ASTM C-295).

ii) Sodium-sulfate test for soundness (USBR Designation 19 or ASTM C-88) - If the weighted average loss, after 5 cycles is more than 10% by weight.

iii) Specific Gravity (USBR Designation 10 or ASTM C-127) - If the specific gravity (saturated surface-dry basis) is less than 2.60.

iv) Sampling - All sampling of coarse aggregates shall be in accordance with Sub-Paragraph 1026 B (d) of this Section

.

C. STORAGE

Coarse aggregate storage or stockpiles shall be built in such a manner as to avoid the inclusion of any foreign materials in the concrete and to prevent segregation and excessive breakage. Water sprayers shall be installed to keep that portion of the coarse aggregate stockpiles saturated which is intended for immediate use in the concrete. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete.

D. MEASUREMENT AND PAYMENT

Coarse aggregates will not be measured for payment. The cost of excavation, stockpiling, processing, blending, handling and other cost of providing coarse aggregates shall be considered included in the contract unit price for the various items in the Bill of Quantities for which coarse aggregates are used.

1208 PRODUCTION OF FINE AND COARSE AGGREGATES

A. SOURCE OF AGGREGATES

Fine and coarse aggregates for concrete, and fine aggregate for mortar and grout may be

obtained by the Contractor from any approved source. Approval of deposit shall not be construed as constituting approval of all materials taken from the deposit, and the Contractor shall maintain the specified quality of all such materials used in concrete works.

If the aggregates are to be obtained from deposits or quarry sources not previously tested and approved by NIA, Contractor shall submit, for preliminary test and approval, a representative, 90 kg. (approximately 200 lbs) sample of the fine aggregate and of the 0.5 cm (3/16") to 2.0 cm (3/4") size of coarse aggregate, and a 45 kg. (approximately 100 pounds) sample of each of the other sizes of coarse aggregate proposed for use in the work, at least 90 days before the materials are required for used.

B. DEVELOPING AGGREGATE DEPOSIT

The Contractor shall carefully clear the area, from which aggregates are to be taken, of trees, roots, brush, sod, soil, unsuitable sand and gravel or aggregates, and other objectionable matter. The portion of the deposit used shall be located and operated so as not to detract from the usefulness of the deposit or of any adjacent property and so as to preserve, insofar as practicable, the future usefulness or value of the deposit. Waste materials removed from aggregate borrow areas shall be disposed of in approved locations.

C. PROCESSING RAW MATERIALS

The Contractor shall employ processing equipment which will ensure well shaped particle in all aggregate sizes and a minimum of particle which are flat or elongated. Processing of raw materials shall include screening, washing, and blending if necessary to produce fine and coarse aggregate meeting the requirements of Paragraphs 1206 and 1207. Processing of aggregates produced from any source shall be done at an approved site. Water used for washing aggregates shall conform to Paragraph 1205. To utilize the greatest practicable yield of suitable materials in the portion of the deposit being worked, the Contractor may crush oversize material and any excess materials of the size of coarse aggregate to be furnished, until the required quantity of each size has been secured, provided, that the crushed aggregates shall be blended uniformly with the uncrushed aggregates. Crushing and blending operations shall at all times be subject to approval by the Engineer.

Aggregates, as delivered to the mixers, shall consist of clean, hard and uncoated particles. When required, dust shall be removed from the coarse aggregate by adequate washing.

D. MOISTURE CONTROL

The free moisture control of the fine aggregate and smallest size group of coarse aggregate as delivered to the mixer shall be controlled so as not to exceed the value of 6.0 and 1.5, respectively, expressed as a percentage by weight of the saturated, surface dry aggregates. The percent variation of free moisture content in fine aggregate and the smallest size of coarse aggregate shall not exceed 0.5% and 2.0%, respectively, during any one hour of mixing plant operation. The free moisture of the other size of coarse aggregates shall be the least amount when delivered to mixers and variations shall be the least practicable under all job conditions. Sand shall have a uniform and stable moisture content. Under no condition shall the other sizes of coarse aggregate be delivered to the mixing plant bins dripping wet. The Contractor may accomplish the required moisture control by use of free drainage storage, mechanical dewatering devices, or any other satisfactory means of dewatering.

1209 AGGREGATE SAMPLING AND TESTING

Sampling of the aggregate materials approved for use in the work, shall be done by the Contractor in accordance with ASTM Sampling Method at 10 days in advance of the time when

placing of concrete is expected to begin. Aggregate studies and tests will be made by the Contractor at its own expense. It shall be the responsibility of the Contractor to designate the source(s) of aggregates early enough to give NIA sufficient time to obtain the necessary samples and have them subjected to test.

The samples of aggregates shall be obtained and tested in accordance with the following ASTM standard methods:

Items	ASTM
- Sampling Aggregate	D-75
- Sieve Analysis	C-136
- Amount of Materials Finer than 200 Sieve	C-117
- Organic Impurities	C-40
- Mortar Strength	C-87
- Soundness	C-88
- Soft Particles	C-235
- Abrasion	C-131
- Clay Lumps	C-142

No aggregate shall be used until official advice has been received that it has satisfactorily passed all tests, at which time written authority shall be given for its use. Material from source which has been previously tested and shown satisfactory compliance with all the requirements given herein may be used without further testing upon written permission of NIA. Test reports for previous tests must be available before approval can be given.

During construction, aggregates will be sampled as delivered to the mixer to determine compliance with specification provisions. Test shall be made in accordance with the applicable ASTM Standards. Routine control test and analysis of aggregates at various stages in processing, transporting, stockpiling, redraining, and batching if used shall be made by the Contractor. The Contractor shall provide such facilities as may be considered necessary for the ready procurement of representative test samples. All test shall e made by the contractor under the supervision of NIA.

1210 CLASSIFICATION AND PROPORTIONING OF CONCRETE MIXTURES

A. CLASSIFICATION AND PROPORTIONING OF CONCRETE MIXTURES.

The mixture for all classes of concrete shall be designed by the Contractor and approved by NIA to obtain the compressive strength at the age of twenty-eight (28) days as specified below:

Class	Minimum Compressive Strength	Maximum Aggregate Size	Minimum Cement Concrete	Maximum Water/Cement Ratio
	Kgf/cm^2 (psi eq.)	mm (inch)	Kg/m^3	
AA	300 (4,300)	19 (3/4)	375	0.55
A-1	210 (3,000)	12.5 (1/2)	350	0.60

A-2	210	(3,000)	19	(3/4)	325	0.60
A-3	210	(3,000)	38	(1-1/2)	300	0.60
B-1	170	(2,400)	19	(3/4)	250	0.50
B-2	170	(2,400)	50	(2)	250	0.70
-	170	(2,400)	75	(3)	225	0.70
-	140	(2,000)	75	(3)	200	0.85
C	100	(1,400)	38	(1-1/2)	175	0.85
- Blinding	70	(1,000)	38	(1-1/2)	150	no limit

Class	Work
AA	Concrete for pre-cast reinforced concrete piles
A-1	Concrete for pre-cast concrete pipes
A-2	Concrete for reinforced concrete members such as thin wall, slabs, beams, etc., less than 0.22m thick and concrete for block-out (second concrete)
A-3	Concrete for reinforced concrete members such as thin wall, slabs, beams, etc., more than 0.22m thick and concrete pavement of road
B-1	Concrete for canal lining
B-2	Concrete for plain concrete, massive section or with light reinforcement
C	Lean concrete

Design of mixture by the Contractor shall be completed and submitted for approval of the Engineer not later than 45 days prior to use of the representative class of concrete for the contract works.

Contractor shall at his own expense adjust mix proportion by trial mix depending on the physical properties of aggregates, moisture content, brand of cement, etc. subject to the direction of the Engineer.

B. AGGREGATE CONTENT

Coarse mixtures shall be designed to use the largest size and the maximum amount of coarse aggregate as practicable for the intended use of the concrete.

C. CONSISTENCY

The amount of water to be used in the concrete shall be regulated as required to secure concrete of the proper consistency and to adjust for any variation in the moisture content or grading of the aggregates as they enter the mixer.

It shall be of such consistency that it will flow around reinforcing steel bar but individual particles of the coarse aggregate when isolated shall have coating of mortar containing its proportionate amount of sand. The consistency shall be gauged by the ability of the equipment to properly place it and not by the difficulty in mixing or transporting. Addition of water to compensate for stiffening of the concrete before placing will not be permitted. Uniformity in concrete consistency from batch to batch will be required.

The slump of the concrete mix shall be the lowest possible that will permit thorough compaction with the equipment approved for the works, but in no case shall range in the values shown below, after the concrete has been deposited.

Class	Major Type of Construction	Range of Slump (cm)
AA	Concrete for pre-cast reinforced concrete piles	3 to 8

A-1	Concrete for pre-cast concrete pipes	5 to 10
A-2	Sloped portion of tradition	3 to 8
A-2	Wall, slabs, beams, and concrete for block-out	5 to 10
A-3	Pavement of road	3 to 8
A-3	Slabs, wall, beams, footing of wall abutment & Pier	5 to 10
B-1	Concrete for canal lining	2.5 to 5
B-2	Massive section or with light reinforcement	5 to 10
C	Lean concrete	5 to 10

NIA reserve the right to require a lesser slump whenever concrete of lesser slump can be considered readily into place by means of the vibration specified in Paragraph 1217.

D. Notwithstanding the approval by NIA of the design mixtures for different classes or gradation of aggregates, the Contractor shall be responsible that all the concrete meet the desired strength.

1211 MEASUREMENT OF MATERIALS

All materials from which the concrete will be manufactured shall be mechanically measured by weight, except as otherwise specified and/or authorized by the Engineer and admixture solutions which may be measured by volume.

Measuring devices shall be suitably designed and constructed for the purpose and shall be weighing separately the cement, fine and coarse aggregates. The accuracy of all weighing devices shall be such that successive quantities can be measured to one percent (1.0%) of the desired weights. Cement in standard bags (40 kg) need not be weighed. The water measuring devices shall be of such type and make to be readily controlled to obtain an accuracy of one-half percent (0.5%) of the desired quantity of water.

Whenever volumetric proportioning and measurement is permitted due to failure or malfunction of weighing devices, the equivalent volumetric proportions of weighted representative samples of the concrete ingredients shall be computed taking into consideration bulking effect of cement and variations of moisture content of the aggregates.

When sack or bag cement is used, the quantities of aggregates for each batch shall be for one or more full sack of cement. No batch requiring a fractional sack of cement will be tolerated.

1212 MIXING CONCRETE

A. GENERAL

The Contractor shall provide at his expense central plant(s) for aggregate stockpiling/screening/crushing/washing and concrete batching/mixing at the locations approved by NIA. Concrete shall be machined mixed. Hand mixing shall be allowed only in cases of emergency when there is machine breakdown or malfunction and in the construction of small structures where the total volume of concrete is less than two (2) cubic meters. A written consent of the Engineer must be secured by the Contractor in both cases.

B. MIXING AT SITE

Concrete shall be thoroughly mixed in a batch mixer of an approved capacity and type which will ensure a uniform and homogeneous mixing of the concrete materials.

The minimum mixing time for each batch, after all materials and water are introduced into the mixer, shall be as follows:

Capacity of Mixer	Mixing Rate
0.40 cu.m. or smaller	1.5 minutes
0.60 to 1.20 cu.m.	1.5 minutes
1.50 to 2.30 cu.m.	2.0 minutes
3 cu.m.	2.0 minutes

Overmixing, requiring the introduction of additional water to preserve the required consistency, will not be permitted. Overmixed concrete shall be wasted.

C. READY-MIXED CONCRETE/TRUCK MIXING

Ready-mixed concrete shall be mixed and delivered to the point designated by the Engineer by means of one of the following combination of operations:

(1) Mixed completely in stationary mixer and the mixed concrete transported to the point of delivery in a truck mixer operating at agitator speed or in non-agitating equipment when approved by the Engineer (Known as central-mixed concrete).

(2) Mixed completely in a truck mixer at the batching point or while in transit (Known as transit-mixed concrete).

(3) Mixed completely in a truck mixer at the point of delivery following the addition of mixing water (Known as truck mixed concrete).

Truck mixer and truck agitators shall be operated within a capacity not to exceed 63% or 80%, respectively of the gross volume of the drum and at a speed of rotation for mixing or agitating as designated by the manufacturer of the equipment. A truck mixer or truck agitator used for transporting concrete that has been completely mixed in a stationary mixer shall be operated within the limits of capacity and speed of rotation designated by the manufacturer for agitating, except that the agitator capacity shall in no event exceed 80% of gross drum volume.

When a stationary mixer is used for the complete mixing of the concrete, the mixing time for mixers having a capacity of 7.60 cu.m. (10 cubic yards) or less shall be not less than 60 seconds. For mixers or more than 7.60 cu.m. (10 cubic yards) capacity, the mixing time shall be determined by the Engineer. The time is valid provided mixer efficiency tests prove the concrete is satisfactory for uniformity and strength. Mixing time shall be measured from the time all cement and aggregates are in the drum. The batch shall be so charged into the mixer that some water will enter in advance of cement and aggregates, and all water shall be in the drum by the end of the first one-fourth of the specified mixing time.

When a truck mixer is used for complete mixing, each batch of concrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment on the metal plate on the mixer as mixing speed. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determination of the number of revolutions of mixing.

When a truck mixer or truck agitator is used for transporting concrete that has been completely mixed in a stationary mixer, mixing during transport shall be at the speed designated by the manufacturer of the equipment as agitating speed.

When a truck mixer or truck agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within one (1) hour after the addition of the cement to the aggregates. Each batch of concrete delivered at the job site shall

be accompanied by a time slip issued at the batching plant, bearing the time of charging of the mixer drum with cement and aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30ºC (85ºF) or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. When a truck mixer is used for the complete mixing of the concrete, the mixing operation shall begin within 30 minutes after the cement has been added to the aggregates.

- The concrete when discharge from truck mixer or truck agitators, shall be of the consistency and workability required for the job. The rate of discharge of the plastic concrete from the mixer drum shall be controlled by the speed of rotation of the drum in the discharge direction with the discharge gate fully open. If additional mixing water is required to maintain the specified slump and is added with the permission of the Engineer, a minimum of 20 revolutions of the truck mixer drum at mixing speed shall be required before discharge of any concrete.

When approved by the Engineer, central-mixed concrete which is designated for the purpose may be transported in suitable non agitating equipment.

When non-agitating equipment is used for transportation of concrete the following requirements shall apply.

- Bodies of the equipment shall be smooth, water-tight, metal containers equipped with gates that will permit control of the discharge of the concrete. Covers meeting the approval of the Engineer shall be provided for protection against the weather.

- The concrete shall be delivered to the site of the work in a thoroughly mixed and uniform mass and discharge with a satisfactory degree of uniformity. Slump tests of representative samples taken during the discharge shall not differ by more than 50 mm (2”). Discharge shall be completed within 30 min. after introduction of the mixing water to the cement and aggregates.

The volume of concrete mixed or transported shall not be less than 15% of the gross volume of the drum.

1213 RE-TEMPERING

Concrete, mortar and grout mixers which have developed initial set shall not be used. Concrete, mortar and grout which have partially hardened shall not be retempered or remixed.

1214 SAMPLING AND TESTING OF CONCRETE

The Contractor shall, at his expense, perform under direct supervision of NIA, sampling and testing for hardened concrete in accordance with ASTM Standard or equivalent designated by NIA. The Contractor shall provide without cost to NIA all available tools and labor as may be required for said sampling and testing. Concrete sampling shall be carried out during concrete operations at the rate of one standard sample for each 75 cu.m. of concrete or fraction thereof placed during each continuous placing operations but in no case shall there be less than one sample for each day of concreting. Each standard sample shall consist of three (3) standard cylinders of 15 cm (6”) diameter by 30cm. (12”) high. The Contractor shall keep a record of the samples and the samples for test and the portion of the structures and volume represented which shall be available to NIA on demand.

Sampling shall conform to ASTM Designations C-172, preparation, storage and curing to ASTM Designation C-31 and testing to ASTM Designation C-39.

Sampling with slump and consistency tests, curing of samples and compression test of hardened concrete samples shall always be made at the presence of the superintendent who shall be assigned by the Contractor and approved by NIA.

1215 TIME OF HAULING AND PLACING MIXED CONCRETE

Concrete shall be placed in its final position in the forms within 45 minutes after the introduction of the mixing water to the cement and aggregates, or the cement to the aggregates.

1216 DELIVERY

The rate of the delivery of concrete during concreting operation shall be such as to provide for the proper handling and placing of the concrete. The rate shall be such that the interval between batches shall not exceed 20 minutes. The method of delivering and handling the concrete shall be such as to facilitate proper placing with the minimum of rehandling and without damage to the concrete structure.

1217 CONVEYING AND PLACING CONCRETE

A. GENERAL

Approval of the Engineer shall be obtained before starting any concrete pour. Concrete placement will not be permitted when, in the opinion of the Engineer, conditions prevent proper placement and consolidation. Before concrete is placed, all saw dust, chips, and other construction debris and extraneous matters will be removed from the interior of forms, struts, stays, and braces, serving temporarily to hold the forms in correct shape and alignments, pending the placing of concrete at their location, shall be removed when the concrete placing has reached an elevation rendering their services unnecessary as may be. These temporary members shall be entirely removed from the forms and not to be buried in concrete. Surfaces of existing concrete left after partial demolition against which new concrete is to be placed, shall be cleared thoroughly of all loose concrete coatings or concrete dust by brushing or other effective means followed by thorough washing or jetting. Such surfaces shall be kept moist for at least 24 hours before pouring the new concrete.

Concrete shall be placed only in the presence of the Engineer or his duly authorized representatives. Any and all concrete placed in the absence of the Engineer or his duly authorized representatives will not be considered for measurement and payment, and shall be removed at the discretion of the Engineer with the Contractor assuming all losses.

Concrete shall be conveyed from mixer to forms, as rapidly as practicable, by methods which will prevent segregation, or loss of ingredients. In case of circular siphons, pump-crete shall be used. There shall be no vertical drop greater than 1.50 meters except where suitable equipment is provided to prevent segregation and where specifically authorized by the Engineer. Belt conveyors, clutch or similar continuously exposed flow, will not be permitted.

B. CONCRETE ON EARTH FOUNDATION

All concrete shall be placed upon clean and dump surfaces free from standing or running water. Prior to placing concrete, the earth foundation shall be satisfactorily compacted in accordance with these Specifications.

C. CONCRETE ON ROCK OR OTHER CONCRETE

Rock surface or hardened concrete upon or against which concrete is to be placed shall be clean, free from oil, standing or running water, mud, drummy rock objectionable coatings, debris, loose and semi-detached or unsound fragments. Fault, fissures and seams in rock shall be cleaned to a satisfactory depth and to firm rock on the sides. Immediately before concrete is placed, all surfaces shall be cleaned thoroughly by the used of high velocity, air water jets, wet sand blasting or other satisfactory means. When required by the Engineer, roughening by grooving with pneumatic tool, of existing concrete surfaces against which concrete is to be placed may be required. All surfaces shall be wetted before placing concrete and approximately horizontal surface shall be covered immediately, before the concrete is placed, with a layer of mortar not to exceed 15 millimeters in thickness and of the same cement-sand ratio as used in the concrete.

D. LIFT IN CONCRETE

The permissible depth of concrete placed in one lift will be as shown in detailed Drawings or as directed for each structure by the Engineer. Unless otherwise authorized or shown, lifts of mass concrete shall not exceed 1.5 meters in height, and a minimum of 72 hours shall elapse between the placing of each successive lifts. Lifts of three (3) meters will be permitted in piers and walls. Height of lift specified herein will not apply where the use of slip form has been approved. All concrete, when placed and vibrated shall be approximately horizontal layers not to exceed 50 centimeters in thickness unless otherwise specifically authorized. The placement of concrete surfaces shall not have reached their initial set before additional concrete is placed thereon. Slabs shall generally be placed in one lift unless the depth is so great that this procedure will produce objectionable results.

E. CONSOLIDATION OF CONCRETE

Consolidation of concrete shall be by the use of mechanical vibratory equipment. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and the power of each unit shall be capable to properly consolidate all concrete. The frequency of vibration shall not be less than 6,000 revolutions per minute. Form or surface vibrators shall not be used, unless otherwise specified in other Sections of these Specifications. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. In consolidating each layer of concrete the vibrating head shall be allowed to penetrate under the action of its own weight and revibrate the concrete in the upper portion of the underlying layer.

At least one spare vibrator in working order shall be available at any location where concrete is being placed.

F. FINISHING OF CONCRETE LIFT SURFACES

The manipulation of the concrete adjacent to the surface of lift in connection with completing lift placement shall be minimum necessary to produce not only the degree of consolidation desired in the surface layer of concrete but also a surface with desired degree of roughness for bond with the next lift. Surface vibration or excessive surface working will not be permitted. All unfinished top surface not covered by forms and which are not to be covered by additional concrete or backfill, shall be carried slightly above grade, as directed, and struck off by board finish.

G. PLACING CONCRETE THROUGH REINFORCEMENT

In placing concrete through reinforcement, care shall be taken so that no segregation of the coarse aggregate occurs. On the bottom of beams and slabs, where the congestion of steel near the forms makes placing difficult, a layer of mortar of the same cement-sand ratio as used in the concrete shall be first deposited to cover the surface.

H. DEPOSITING CONCRETE IN WATER

When specifically, authorized, concrete may be deposited in water. The methods and equipment used shall be subject to approval of the Engineer.

1218 FORMS

A. GENERAL

Forms shall be used whenever necessary to confine the concrete during vibration and to shape it to the required lines. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in position. The strength and rigidity of the forms shall be such that formed surfaces will conform to specification requirements relating to surface irregularities and tolerances for concrete construction. Forms shall be tight to prevent loss of mortar from the concrete.

Chamfer strips shall be placed in the corners of forms for exposed exterior corners so as to produce beveled edges. Interior corners and edges of formed joints shall not be beveled unless the requirement therefore is shown on the Drawings.

The tolerance limits specified in Paragraph 1223 and the surface irregularity limits specified in Paragraph 1221 are the maximum permissible limits of misalignment of irregularity surface which may occur despite workmanlike effort to construct and maintain the forms to the specified surfaces. These limits pertain only to inadvertent and occasional irregularities, even though these irregularities are within the maximum permissive limits, will be rejected. Accordingly, these limits, shall not be construed to be tolerances for aligning forms or determining acceptability of form materials.

Stub walls shall not be used, except that stub walls shall be used for walls having fillets at the bottom.

Concrete in such stub walls be revibrated after adjacent floor concrete is placed.

Forms for finishes F2 and F3 shall be constructed with grade strips at the horizontal construction joints, unless the use of groove strips is specified on the Drawings. Such forms shall be removed and reset from lift to lift, they shall be continuous from lift to lift. Sheathing of reset forms shall overlap the previous lift by not less than 25 mm (1”). Forms shall be tightened against the concrete so that the forms will not spread and permit abrupt irregularities or loss of mortar or paste. Supplementary bolts or form ties shall be used as necessary to hold the rest forms against concrete.

Forms for all wall openings shall be constructed so as to facilitate loosening.

B. FORM SHEATHING AND LINING

Wood sheathing and lining shall be of such kind of quality and shall be so treated or coated that there will be no chemical deterioration or discoloration of the formed concrete surfaces. The type and condition of form sheathing and lining, and the fabrication of forms for finishes F2, F3 and F4 shall be such that the form surfaces will be even and uniform. The ability of forms

to withstand distortion caused by placement and vibration of concrete shall be such that formed surfaces will conform with applicable requirements of these specifications pertaining to finish of formed surfaces. Where finish F3 is specified, the sheathing or lining shall be placed so that the joint marks on the concrete surfaces will be in general alignment, both horizontally and vertically.

Plywood used for sheathing or lining shall be high density overlaid plywood specially manufactured for use in construction concrete forms as approved. Materials used for form sheathing or lining shall conform with the following requirements, or other materials producing equivalent results as approved by the Engineer.

Required Finish Of Formed Surfaces	Wood Sheathing or Lining**	Steel Sheathing* or Lining
F1	Any grade, surfaced on two (2) edges (S2E) with no limits to defects except imposed by other requirements of these Specifications	Steel sheathing permitted Steel lining permitted
F2	Selected lumber, surfaces on side and two (2) edges (SIS2E) or plywood sheathing or lining	Steel sheathing permitted Steel lining permitted
F3	Selected lumber, surfaces on four (4) sides (S4S) or plywood sheathing or lining	Steel sheathing permitted Steel lining not permitted
F4	For plane, surfaces selected lumber surfaced on four (4) sides (S4S) T&G or plywood. For warped surfaces, the lumber shall be free from knots and other imperfections and which can be cut and bent accurately to the req'd. curvatures without splintering or splitting	Steel sheathing permitted

* Steel sheathing denotes steel not supported by a backing of wood boards.

** The lumber shall be free from warp and knotholes and shall have no knots larger than 5 cm. (2") in diameter. All knots shall be sound and tight. There will be no pitch pockets, barb or lack of wood on the face of the lumber against which concrete is to be placed.

C. FORM TILES.

Embedded ties for holding forms shall remain embedded and, except for F1 finish, shall terminate, within the concrete approximately two (2) diameters or twice the minimum dimensions of the tie from the formed faces of the concrete. Embedded ties for F1 finish shall terminate within the concrete or shall be cut-off flush with the faces of the concrete, at the Contractor's option.

The ties shall be so constructed that ends and end fasteners can be removed by unskilled workmen without causing spalling at the faces of the concrete.

D. CLEANING AND OILING OF FORMS

The surfaces of the forms in contact with the concrete shall be free from encrustation of mortar, grout or other foreign material when the concrete is placed. The surfaces of the forms to be in contact with the concrete shall be coated with an approved coating which will enable the ready release of the forms and will not contaminate the concrete surfaces. Except as provided below,

forms for surfaces which are to be painted shall be coated with straight, refined, pale, paraffin mineral oil, or other approved coating, and the coating for steel forms shall consist of refined mineral oil suitably compounded for the purpose.

E. FORMS OF CURVED SURFACES

Curved surfaces have been dimensioned at several sections. The Contractor shall interpolate intermediate sections as necessary and shall construct the forms so that the curvature will be continuous between sections. Where necessary to meet requirements for curvature, the form lumber shall be built up to laminated splines cut to make tight, smooth form surfaces. The forms shall be constructed so that the joint marks on the concrete surfaces generally will follow the line of water flow. After the forms have been constructed, all surface imperfections shall be corrected, and all surface irregularities at packing faces of form materials shall be dressed to the specified curvature.

F. FORMS FOR SLOPES OR BATTERED SURFACES

Forms for sloped or battered surfaces shall be built so that the sheathing can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration, and inspection of the concrete. The sheathing shall be built so that it can be removed board-by-board from the bottom to top.

G. FORMS FOR OPEN CHANNEL TRANSITIONS

When wrapped surfaces of transition are not backformed, natural or compacted earth shall be shaped to the specified surface and covered immediately with a plaster coat of cement sand mortar at least 1.0cm.(3/8") thickness.

Forms for warped surfaces shall be tied securely to the floor slab braced against spreading. In the upper surface, forms shall be butted and removed, as specified in the Sub-paragraph J below, so as to enable ready access for placement, vibration inspection, and repair and finishing of the concrete.

H. FORMS FOR BRIDGES

Forms for girders and slabs shall be cambered as specified by the Engineer.

Forms shall be constructed so that form marks will conform to the general lines of the structure. Column form marks shall be spaced symmetrically.

Form bolts or clamps shall be used to fasten forms. The use of ties consisting of twisted wire loops will not be permitted. Bolts or clamps shall be positive in action and shall be of sufficient strength and number to prevent displacement of the forms. They shall be of such type that they can be entirely removed or cut back 2.5 cm. (1") or more below the finish surface of the concrete leaving no metal within 2.5cm (1") of the concrete surface. All forms for the outside surfaces shall be constructed with the rigid wales at right angles to the studs and all form clamps shall extend through and fasten such wales.

Forms for exposed surfaces shall be constructed of plywood or material which will produce an equivalent surface. Form panels shall be furnished and placed in uniform widths of not less than 0.9 meter (3') and in uniform lengths of not less than 1.8 meters (6'), except where the dimensions of the member formed are less than the specified panel dimensions. Plywood panels shall be placed with the grain of the outer plies perpendicular to the studding of joists, unless otherwise permitted by the Engineer. Where form panels are attached directly to the studding or joists, the panels shall not be less than 1.6 cm (5/8") thick, and the studding or joists, shall

be placed not more than 30 cm. center to center. Form panels less than 1.6 cm (5/8") thick, which otherwise conform to the requirements specified in this Paragraph, may be used with a continuous backing of surfaced material 1.9 cm (3/4") thick. Form panels more than 1.6 cm (5/8") thick attached to studding or joists spaced at 30cm center to center may be used, provided the deflection of the panel between studding or joists does not exceed that of a 1.6 cm (5/8") panel attached to a studding or joists spaced at 30cm center to center. All form panels shall be placed in a neat, symmetrical pattern subject to the approval of the Engineer.

I. FALSEWORK FOR BRIDGES AND OTHER SUPERSTRUCTURES

Falsework for the support of a bridge or other superstructure including pumping station shall be designed and constructed to support the loads that would be imposed where the entire structure placed at one time.

Suitable jacks, wedges or camber strips shall be used in connection with falsework centering to set the forms to the required grade or camber and to take up any settlement in the form work either before or during the placing of concrete.

J. REMOVAL OF FORMS

Forms shall be removed as soon as possible to enable the earliest practicable repair of surface imperfections, but in no case shall they be removed before approval of the Engineer. Any needed repair of treatment shall be performed at once, and be followed immediately by the specified curing. Forms shall be removed with care so as to avoid injuring of the concrete and any concrete so damage shall be repaired.

In field operation that are not controlled by beam or cylinder test, the removal of forms and supports shall be governed by the following:

Type of Structure	Time of Removal After the Last Pouring
Arch, beam, girders and slabs	14 days
Slab in close span of less than three (3) meters	7 days
Side forms for beams, railings, parapets, balustrade, walls and columns	Not less than 12 hours and more than 48 hours

K. MEASUREMENT AND PAYMENT

Unless otherwise specified or stipulated in the Bill of Quantities, form works including falsework will not be measured for payment. The cost of furnishing of labor, materials and equipment, including the cost of form oil, erecting and removing the forms and falsework, and other costs of all incidentals, for form works shall be considered included in the contract unit price for the various items of the concrete in the Bill of Quantities for which form works are needed.

If the items for form works are stipulated in the Bill of Quantities, measurement will be made in square meter of only the areas of forms which have been used in accordance with the Drawings, as specified in this Paragraph or as directed by the Engineer. In such case, payment for square meter, bid therefore in the Bill of Quantities, which price and payment shall constitute full compensation for above mentioned cost for form works.

1219 CONSTRUCTION JOINTS

A. GENERAL

After the top surface of a lift is finally compacted, it shall be immediately and carefully protected from direct rays of the sun, pedestrian traffic, materials being placed thereon, running water, heavy rains, or any activity upon the surface that in any manner will affect the setting of the concrete. Unless otherwise specified, vertical and horizontal joints on exposed faces shall be chamfered as shown on standard detailed drawings and formed to produce a uniform and neat appearance.

B. CLEANING

Horizontal construction joints on lifts with relatively open and accessible surfaces may be prepared for receiving the next lift by either wet sand blasting or by cutting with an air water jet, as specified below. If the surface of the lift is congested with reinforcements, or is relatively inaccessible or, if for any other reason the Engineer considers it undesirable to disturb the surface of a lift before final set has taken place, surface cutting by means of air water jets will not be permitted and the use of wet sand blasting or light brush hammering will be required. After approved cleaning, the surface of the construction joints shall be kept continuously wet for at least 12 hours immediately prior to placing concrete. A mortar coating of approximately 1.0 cm. (3/8") in thickness shall be applied to all approximately horizontal surfaces immediately prior to the placing of the next lift of concrete. The mortar shall have the same cement sand ratio as the concrete. Any free water on the joint surface shall be removed prior to placing the mortar. The Contractor shall ensure that the surface of any horizontal joints (and the formwork in general) is completely clean of any dust, weed, wood showings or other deleterious material prior to the placing of concrete.

1. Air-Water Cutting. Air-Water cutting of construction joint shall be performed after initial set has taken place but before the concrete has obtained its final set. The surface shall be cut with a high-pressure air water jet to remove all laitance and expose clean, sound aggregate, but not to undercut the edges of the larger particles of aggregate. After cutting, the surface shall be washed and rinsed as long as there is a trace of cloudiness of the wash water.

2. Wet Sandblasting. When employed in the preparation of construction joints, wet sand blasting shall be performed immediately before placing the following lift. The operation shall be continued until all unsatisfactory concrete and laitance, coatings, stain, debris, and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose materials.

3. Cleaning Vertical Construction Joint. The vertical construction joints shall be cleaned by wet sand blasting or by brush hammer.

C. MEASUREMENT AND PAYMENT

Construction joint is a subsidiary work for concrete work; thus, it will not be measured for payment. All costs incurred for construction joint shall be considered included in the contract unit price of the items for concrete.

1220 REPAIR OF CONCRETE

No repair of work or plaster finish of formed concrete in structure will be permitted, unless otherwise provided in these Specifications or directed by the Engineer. All defective concrete

shall be removed and replaced with the Contractor assuming all expenses and looses. Plastering without permission will be assumed as defective works. If directed, the Contractor shall notify the Engineer of the start of the repair work at least 24 hours in advance thereof and shall repair concrete only in the presence of the Engineer or his authorized representative, unless inspection of such repair work is waived.

Dry pack shall be used for filling holes having at least one surface dimension little, if any, greater than the hole depth; for narrow slots cut for repair of cracks, for grout pipe recesses; and for tie-rod fastener recesses as specified. Dry pack shall not be used for filling behind reinforcement or for filling holes that extend completely through a concrete section. Mortar filling, placed under impost by use of a mortar gun, maybe used for repairing defects on surfaces designated to receive F1 and F2 finishes where the defects are too wide for dry pack filling and too shallow for concrete filling and no deeper than the far side of the reinforcement that is nearest the surface. Concrete filling shall be used for holes extending entirely through concrete sections; for holes in which no reinforcement is encountered and which are greater in area than 900 square centimeters and deeper than 20 cm.; and for holes in reinforced concrete which are greater in area than 400 square centimeters and which extends beyond reinforcement.

Workmanship methods, preparation of concrete for repair, materials, and curing shall be as directed. Only workmen skilled in the repair of concrete shall perform such work. Repairs of defective concrete shall be made within 48 hours after removal of forms.

Surfaces to which concrete is to be bonded shall be clean and dry when coated with epoxy.

Surfaces to which of concrete to be repaired with sealing compound method shall be cured by the water curing method for one (1) day before application of the sealing compound. All repair shall be sound and free from shrinkage cracks and drummy areas after they have been cured and have dried for 30 days.

Surfaces of repairs which will be exposed to view shall blend inconspicuously with surrounding concrete surfaces.

Fins and encrustation shall be removed from surfaces which will be exposed to view.

1221 FINISHES AND FINISHINGS

A. GENERAL

Allowable deviations from established lines, grades and dimensions are set forth in Paragraph 1223. These allowable deviations are defined as "tolerance" and are to be distinguished, from surface irregularities in finish as described herein. The class of finish and the requirements for finishing concrete shall be as specified in this Paragraph.

Finishing of concrete surfaces shall be performed only by skilled workmen. The Contractor shall advise the Engineer as to when concrete will be finished. Unless inspection is waived in each specific case, finishing of concrete shall be performed only in the presence of the Engineer. Concrete surfaces will be tested by the Engineer that surface irregularities are within the limits herein after specified.

Surface irregularities are classified as "abrupt" or "gradual". Offsets caused by displaced or misplaced form sheathing or lining or form sections or by loose knots in forms or otherwise defective form lumber will be considered abrupt irregularities, and will be tested by direct measurement. All other irregularities, will be considered to be gradual irregularities, and will be measured as the departure from the testing edge of an approved template held parallel to and in contact with the surface. The template shall consist of a straight-edge or the equivalent

thereof for curved surfaces.

B. FORMED SURFACES

The classes of finish for formed concrete surfaces are referred to by symbols F1, F2, F3 and F4 faces. Grinding will not be required on formed surfaces except as necessary to reduce protrusions to specified limits. Recesses from removal of form ties shall be filled with drypack or epoxy mortar at the Contractor's option: except, that filling recesses in Finish F1 surfaces will be required only if the recesses are deeper than 2.5 cm. (1") in walls, less than 30 cm thick or if unfilled, recesses would reduce the required cover over reinforcements.

The filled recesses shall blend inconspicuously with the surrounding concrete surfaces or concrete that will be exposed to view.

The classes of finish and their application are as follows:

Finish F1 - Finish F1 applies to formed surfaces where fill material or concrete is to be placed. The surfaces require no treatment after form removal except for repair of defective concrete and specified curing. Correction of surface irregularities will be required only for depressions which exceed 2.5 cm. (1"), when measured as described in Sub-paragraph A.

Abrupt irregularities on surfaces to which premolded joint filler is to be applied shall not exceed 0.30 cm. (1/8").

Finish F2 - Finish F2 applies to all formed surfaces not permanently concealed by fill materials or concrete, or not required to receive Finish F3. Surface irregularities, measured as described in Sub-paragraph A, shall not exceed 0.60 cm. (1/14") for abrupt irregularities and 1.20 cm. (1/2") for gradual irregularities.

Finish F3 - Finish F3 applies to formed surfaces of the stoplog guides, exposed faces of abutments, wing walls, girders, curbs, parapet, railings, and decorative features on bridges. Surface irregularities, measured as described in Sub-paragraph A, shall not exceed 0.60 cm. (1/4") for gradual irregularities and 0.30 cm. (1/8) for abrupt irregularities, except that abrupt irregularities will not be permitted at construction joints.

Finish F4 - Finish F4 applies to formed surfaces for which accurate alignment and evenness of surfaces are of paramount importance from the standpoint of eliminating destructive effects of high velocity flows. Formed surfaces to receive an F4 finish include formed surfaces exposed to high velocity flowing water.

Except as hereinafter provided, abrupt irregularities on surfaces to receive F4 finish, when measured as described in Sub-paragraph A, shall not exceed 0.60 cm (1/4") for irregularities parallel to the direction of the flow and 0.30 cm (1/8") for irregularities not parallel to the direction of the flow. Gradual irregularities on surfaces to receive an F4 finish shall not exceed 1.60 cm (5/8").

Abrupt irregularities on formed surfaces exposed to high velocity flows shall be eliminated by grinding on a level of 1:20 ratio of height to length.

The Contractor will be entitled to no extra payment for reducing or eliminating irregularities on formed concrete surfaces which do not meet specification limits.

C. UNFORMED SURFACES

The classes of finish for unformed concrete surfaces are referred to by symbols U1, U2, U3 or U4. Exterior surfaces will be sloped for drainage were shown on the Drawings or as directed by the Engineer. Exterior surfaces which otherwise would be level shall be sloped for drainage. Unless the use of other slopes or level surfaces is indicated on the Drawings or directed by the Engineer, narrow surfaces, such as tops of walls and barbs, shall be sloped approximately 3.0 cm per meter (3%) of width; broader surfaces, such as walks, roadways, platforms, and decks shall be sloped approximately 2.0 cm per meter (2%). These classes of finish and their applications are as follows:

Finish U1 - Finish U1 (screened finish) applies to unformed surfaces that will be covered by fill material or by concrete. Finish U1 is also used as the first stage of finishes U2 and U3. Finishing shall consist of sufficient leveling and screening to produce even uniform surfaces. Surface irregularities, measured as described in Sub-paragraph A, shall not exceed 0.60 cm (1/4").

Finish U2 - Finish U2 (floated finish) applies to unformed surfaces not permanently concealed by fill material or concrete, or not required to received finishes U3 and U4. Finish U2 is also used as the second stage of finish U3. Floating may be performed by use of hand or power-driven equipment. Floating shall be started as soon the screened surface has stiffened sufficiently, and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. If finish U3 is to be applied, floating shall be continued until a small amount of mortar without excess water is brought to the surface, so as to permit effective troweling. Surface irregularities, measured as described in Sub-paragraph A, shall not exceed 0.60 cm (1/4").

Finish U3 - Finish U3 (troweled finish) applies to inside floors of buildings. When the floated surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be started. Steel troweling shall be performed with firm pressure, so as to flatten the sandy texture of the floated surface and produce a dense uniform surface, free from blemishes and trowel marks. Surface irregularities, measured as described in Sub-paragraph A, shall not exceed 0.60 cm (1/4").

Finish U4 - Finish U4 applies canal lining which is constructed without using forms. The finished surface shall be equivalent in evenness, smoothness and freedom from rock pockets and surface voids to that obtainable by effective use of a long-handled steel trowel, light surface fitting and light trowel marks will not be considered objectionable. Surface irregularities, measured as described in Sub-paragraph A, shall not exceed 0.60 cm (1/4") for bottom and 1.20 cm (1/2") for side slopes.

D. MOISTURE CONTROL FOR UNFORMED SURFACES

In warm, dry or windy weather the moisture control measures specified herein shall be taken to inhibit loss of moisture from the surface of the concrete. Such surfaces shall be fog sprayed, covered completely with white polyethylene sheet, or otherwise treated as approved. The curing specified in Paragraph 1222 shall be started as soon as the concrete hardens, however, the surface of the concrete shall be kept wet during the change in curing methods.

If surfaces are fog sprayed, the fog spray shall maintain a sheet of moisture on the concrete but shall not displace cement or create a wet surface during finishing operations. Surfaces shall be fog sprayed during and immediately following finishing operations, and fog spraying shall be interrupted only to enable finishing operations. Such interruptions shall be of minimum

duration and shall occur only in the immediate area being finished.

Plastic shrinkage cracks which occur before the concrete hardens shall be closed. Shrinkage cracks, shall be closed by working; cracks shall not be sealed by troweling only.

1222 CURING

A. GENERAL

All concrete except interior surfaces, shall be cured for a period of not less than fourteen (14) consecutive days.

All horizontal slabs or surfaces shall be cured by water curing in accordance with Sub-paragraph C and all inclined or vertical surfaces of concrete shall be applied with membrane curing immediately after removal of forms to prevent dehydration in accordance with Sub-paragraph B except that membrane curing shall not be allowed for mass concrete and for construction joints. Contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready for use before actual concrete placement begins. The curing medium and method or the combination of mediums and methods used shall be subject to the approval by NIA.

(i) Floors, stair threads, and horizontal construction joints shall be cured for 14 days by a covering or damp sand or curing mats, except that curing of construction joints surfaces may be discontinued in less than 14 days when the surfaces are to be covered with fresh concrete. The sand or curing mats shall be removed after the expiration of the curing period.

(ii) Interior Surfaces - Concrete surfaces of interior walls, including ceilings and surfaces of construction joints and vertical construction joints will require no curing other than resulting from forms being left in place for at least two (2) days. Interior walls shall be washed during and after completion of concrete operations at higher elevations. The washing shall be sufficient to keep the walls free from drips or runs of material that would cause streaking or staining of the concrete. Stair risers and large repairs on interior walls shall be cured for at least four (4) days by damp mats but the mats shall not be wet enough to cause dripping of water on to completed concrete. Small repairs and filled core holes on interior walls shall be cured for at least four (4) days by masking tape or similar covering.

B. MEMBRANE CURING METHOD

The concrete shall be sprayed uniformly with sealing compound in accordance with the manufacturer's written recommendation, copies of which shall be furnished to the Engineer for approval in advance of the material being used. The sealing compound shall conform to AASHO Designation: M-148, Type II. The component shall be of uniform consistency and quality within each container of each shipment and from shipment to shipment. Sealing compound used in confined spaces shall not be toxic to workmen. The Contractor shall furnish a manufacturers certificate of compliance for the compound prior to its use on the work. The certificate shall identify the batch and include certified test results covering all requirements of the specifications for the sealing compound materials.

Sealing compound shall be applied to unformed concrete surfaces immediately upon completion of moisture control measures taken as specified in Paragraph 1221 D. Where such measures are not required, sealing compound shall be applied as soon as the concrete is hard enough to preclude damage from application of the sealing compound. The Engineer will require that the side slopes and bottom of the canal lining be sprayed separately unless the surfaces are ready, simultaneously, to receive the sealing compound.

Sealing compound shall be applied to formed concrete surface immediately upon removal of the forms as specified in Paragraph 1218. The moisture control measures shall be taken until the forms have been removed. Formed surfaces shall be sprayed with water immediately after the forms have been removed until the surfaces are saturated. The sealing compound shall be applied as soon as the surface film or water has disappeared but while the surface is still damp.

Sealing compound shall be applied in one coat to provide a continuous uniform membrane. Special care shall be taken to ensure coverage of edges, corners, and rough spots of formed surfaces. The compound shall be agitated continuously in the spray pressure tank.

Concrete repair work shall be performed after the sealing compound has been applied and is dry to touch. In the event that application of sealing compound is delayed or interrupted, water shall be applied, as approved, until application of sealing compound is started or resumed.

Any membrane that is damaged or is determined to be defective within 28 days after application shall be repaired or replaced without delay, as approved. If the Contractor's operations require traffic on coated surfaces, the membrane shall be protected from damage.

Payment for membrane curing shall be included in the contract unit price for concrete in the Bill of Quantities where they are required, unless otherwise specified in the Bill of Quantities.

C. WATER CURING

Water curing shall start as soon as practicable after placement of the concrete and shall continue until completion of the specified curing period or until covered with fresh concrete. Concrete, if cured by water, shall be kept wet by ponding method or by covering with an approved water saturated material, or by a system of perforated pipes, mechanical sprinkles, porous hose, or by any other methods approved by the Engineer, which will keep all surfaces to be cured continuously (not periodically) wet.

1223 TOLERANCES FOR CONCRETE CONSTRUCTION

A. GENERAL

Permissible surfaces irregularities for the various classes of concrete surface finish, specified in Paragraph 1221 are defined as "finishes: and are to be distinguished from tolerances that are consistent with modern construction practice, yet governed by the effect that permissible deviations will have upon the structural action or operational function of the structure. Deviations from the established lines, grades and dimensions will be permitted to the extent set forth herein.

Where tolerances are not stated in the Specifications or Drawings for any individual structure or feature thereof, permissible deviations will be interpreted in conformity with the provisions of this paragraph.

Concrete work that exceeds the tolerance limits specified will be rejected and shall be corrected or removed and replaced by the Contractor at his own expense, as ordered.

B. TOLERANCE FOR CANAL STRUCTURE

1. Concrete Canal Lining:

Departure from established profile grade - - - - - - - - - - - - - - - - - 5 cm on tangents
10 cm on curves

Departure from established profile grade - - - - - - - - - - - - - - - - - 2.50 cm

Reduction in thickness of lining: - - - - - - - - - - - - - -- - - - - - - - 10% of the specified thickness; provided that the average of all thickness measurements made in 40 m. of lining shall be not less than the specified thickness, provided further that the quantity of concrete actually used on 40 m lining shall be not less than the theoretical quantity, based on the lines shown on the Drawings.

Variation from specified width of section at any depth . . . . . 3.0 cm

Variation from established depth of lining . . . . 3.7 cm.

Variation in surface: Invert, in 3 meter . . . . . 0.6 cm.
Side slopes, 3 meter . . . . . 1.2 cm.

2. Siphon, Bridge, Road Crossing, Drainage Crossing and Other Related Structures:

Departure from established alignment - - - - - - - - - - - - - - - - - - - 1.2 cm

Departure from established grades - 1.2 cm

Variation from the plum or the specified batter in the lines and surfaces of columns, piers, walls and in arises:
Exposed in 3 meters . . . . . 1.2 cm
Backfilled in 3 meters . . . . . 2.0 cm

Variation in cross sectional dimensions of columns, walls, piers, slabs, beams and similar parts:
Minus . . . . . 0.6 cm.
Plus . . . . . 1.2 cm.

3. Bridge Slabs:

Variation in thickness of slabs:
Minus . . . . . 0.3 cm.
Plus . . . . . 0.6 cm.

Variation from special width over curbs . . . . . 0.60 cm

Variations from specified grade of top of curb in cambered position . . . . . .0.60 cm

4. Foundations:

Variation in dimensions in plan:
Minus . . . . .2.5 cm.
Plus . . . . . 5.0 cm.

Variations from established grade:
Minus . . . . 1.2 cm.
Plus . . . . 2.0 cm.

Misplacement of eccentricity: 2% of the footing width in the direction of misplacement but not more than 5.0 cm.

5. Bridge Seats:

Variation of any one bearing from established elevation . . . . . .0.3 cm.

Difference in elevations of bearings for adjacent spans, maximum . . . . . 0.6 cm

Difference in elevations of bearings for zone span on any one pier, maximum . . . . . 0.3 cm

Horizontal misplacement for any one bearing, maximum . . . . . 0.70 cm

Variations in the sizes and locations of slabs and wall openings . . . . . 1.2 cm

Sills and side walls for radial gates and similar watertight joints:
Variation from the plumb level not greater than 0.30 cm. in 3 meters.

6. Stop Log Slots:

Variation from a common plane between the sealing surfaces each pair of related stop log slots shall be no greater than . . . . . 0.15 cm
Minus . . . . . 0.3 cm.
Plus . . . . . 0.6 cm.

C. TOLERANCE FOR CAST IN PLACE CONCRETE PIPE

Departure from established alignment or from established grade . . . . . 2.5 cm

Variations in thickness at any point:
Minus . . . . . 2.5% or 0.60 cm whichever is greater
Plus . . . . . 5% or 1.2 cm whichever is greater

Variation from inside diameter 0.50%

Variation in surface invert in 3 meters . . . . . 0.6 cm.

D. TOLERANCES FOR PLACING REINFORCEMENT STEEL

Variations from indicated protective cover:
For 5 cm cover . . . . . 0.60 cm.
For 7.5 cm cover . . . . . 1.2 cm

Variation from indicated spacing. . . . . 2.5 cm

1224 FAILURE TO CURE

The Engineer shall have the authority to suspend the work whole or in part, by written order, for such period as he may deem necessary for failure on the part of the Contractor to perform

proper curing of the concrete work and to withhold payment for the corresponding work pending results of test, that shall subsequently be made on these concrete works. The Contractor shall immediately secure core samples of such members and from parts of the structure as shall be designated by the Engineer and shall have them tested in a Testing Laboratory approved by the NIA. If the results of tests are found satisfactory, payment of the concrete in question shall be made and the work ordered resumed, but if the results of test are unsatisfactory to meet the structural requirements, the Contractor shall remove, wholly or partly, the concrete work in question at the discretion and upon written order of the Engineer and the Contractor shall replace such parts at his own expense.

1225 FAILURE TO MEET CONCRETE REQUIREMENTS

NIA shall have the right to reject the concrete when the mixture does not comply with these specifications and strength not obtained after sampling and testing as specified in paragraph 1214.

All concrete designed, prepared and placed by the Contractor for all structure that fails to meet the specified strength shall be removed and replaced by the Contractor at his own expense.

1226 PROTECTION OF CONCRETE WORKS

The Contractor shall protect all concrete against injury until final acceptance by the NIA. Final acceptance shall be construed to mean acceptance of the whole work after the Contract has been completed or satisfactory terminated.

1227 MEASUREMENT AND PAYMENT

Measurement and payment of concreting works will be made separately for every class specified in the Bill of Quantities. Measurement for payment of concreting works for each class shall be made by volume in cubic meter for respective items of various works in the Bill of Quantities, unless otherwise stipulated. It shall be computed to the neat lines as if these works were constructed to the details on the Drawings or as established by the Engineer. In measuring concrete for payment, volume of all cavities, depressions, opening, embedded wood works and metal works, except reinforcement bar, anchor bolts and bars, and dowel bars, will be deducted.

Payment for concrete works measured as provided above shall be made at the unit prices per cubic meter, bid therefore in the Bill of Quantities, which price and payment shall include the cost of all labor, materials and equipment, furnishing and handling of cement, aggregates and admixtures, mixing, hauling, placing and finishing concrete, furnishing, placing and subsequent removal of form works and necessary falsework (unless otherwise stipulated), construction of joint (excluding furnish and placing such joint materials as water stops, dowel bars, etc., as specified in Section XVI “Concrete Joints and Joint Materials”) dewatering and keeping dry during pouring concrete, and all necessary therefore and incidental thereto for the successful completion of the work describe in the Drawings and these Specifications, except for payments for furnishing and placing reinforcement bars and joint materials which shall be separately made at appropriate unit prices therefore in the Bill of Quantities.

SECTION XIV

CONCRETE STRUCTURES

1401 SCOPE

The Contractor shall construct all concrete structures shown on the Drawings.

Concrete shall be proportioned, mixed, placed, finished and cured as specified in Section XII "Concrete", except as modified herein. The sequence of construction of the structures shall be subject to approval of the Engineer. Where the thickness of any portion of a concrete structure is variable, it shall vary uniformly between the dimensions shown. Cement mortar plastering is not allowed in the construction of structures, unless otherwise specified elsewhere in these Specifications.

1402 CONCRETE CONSTRUCTION

All concrete construction shall conform to the provisions of Section XII "Concrete" and to detailed requirements of the following paragraphs. Concrete finishes shall conform to Paragraph 1221 and/or shall be as noted on the Drawings.

All structures shall be built to the specified lines, grades and dimensions. The location of all construction joints shall be shown on the Drawings or as directed or approved by the Engineer. Construction joints shall be constructed as shown on the Drawings. The Contractor shall place and embed or attach to each structure all timber, metal or other accessories necessary for its completion as shown on the Drawings.

The dimensions of each structure shown on the Drawings will be subject to change as may be found necessary by the Engineer to adopt the structures to actual field conditions and conditions disclosed by excavation.

1403 METHOD OF MEASUREMENT

Measurement of payment of any and all classes of concrete will be by the cubic meter computed to the neat line of the structure, unless otherwise specifically shown on the Drawings or specified in these Specifications. No measurement for payment will be made for bid items on lump sum basis in the Bill of Quantities. In the event cavities resulting from careless excavation or from excavation performed to facilitate the Contractor's operations, as determined by the Engineer, these are required to be filled with concrete. Such refilling will be made by and at the expense of the Contractor. In measuring concrete for payment, the volume of all openings, embedded pipes, woodwork and metal work within the concrete will be deducted.

1404 BASIS OF PAYMENT

Payment for any and all classes of concrete in various parts of the work will be made

at the applicable contract unit prices per cubic meter, which price and payment shall include cost for furnishing all materials, equipment and labor, and all operations required in the construction as specified under Section XII "Concrete", except that payment for reinforcing bars and joint materials will be made at the applicable separate contract unit prices in the Bill of Quantities.

Payment of concrete structure will be made on the basis as follows:

(1) Eighty percent (80%) of the unit price will be paid after the concrete has been placed acceptably and completed in place.

(2) Remaining twenty percent (20%) of the unit price will be paid after the concrete structure has been completely backfilled as shown on the Drawing without any damage.

When any damage on the structure which has been caused due to filling and/or backfilling work is found, the remaining payment for the structure shall not be made until the damage has been repaired to the satisfaction of the Engineer.

If during the implementation of the project, the sources of aggregates differ from those selected by the Contractor, the Contractor shall not be entitled to any claim for unit price adjustment as a result of such alteration of sources.

1405 CONCRETE FOR STRUCTURES

A. GENERAL

The item "Concrete for Structures" in the Bill of Quantities include all concrete in canal structures and road structures such as siphons, drainage culverts, road crossings, control structures, drop structures, headgates and turnouts and all other structures not otherwise specified elsewhere in these Specifications. It shall be Class "A-2" concrete with a minimum compressive strength of 210 kgf/cm² (3,000 psi) in 28 days.

Small concrete structures, at the option of the Contractor, may be installed as precast units provided that precast structures installed in place are equal in all respect to cast-in-place construction as specified in these Specifications.

Concrete for canal structures and other structures will be measured and paid for as specified in Paragraphs 1403 and 1404, respectively. Structures not fully and acceptably completed will not be measured for payment. Precast structures acceptably installed and backfilled in place shall be paid for as specified in Paragraph 1404.

All materials used like cement, admixtures, aggregates and reinforcing steel bars shall conform to the provisions of Section XII "Concrete" and Section XVII "Reinforcing Steel Bars", respectively. Classes of concrete to be used shall be those specified in the Drawings.

B. CURING AND JOINTS

All concrete shall be cured in accordance with Paragraph 1222, except that concrete for canal siphon shall be cured until the concrete test cylinders shall have attained a strength of at least 210 kgf/cm² (3,000 psi).

The Contractor shall construct expansion and construction joints at sections specified on the Drawings, all in accordance with the provisions of Paragraph 1219 and Section XVI "Concrete Joints and Joint Materials" and elsewhere in these Specifications.

1406 PRECAST CONSTRUCTION

A. SCOPE AND DESCRIPTION

Pre-casting of reinforced concrete may be resorted to as an alternative to poured-in-place concrete for certain structures such as headwalls and collars, Parshall flume, turnouts, division boxes, and other structures. Should the Contractor choose to employ pre-cast construction on these structures, he must so inform the Engineer in writing, submitting in detail his proposed design, modifications of concrete sections, concrete specifications, reinforcements and schemes of construction of all pre-cast units. The NIA may further require the Contractor to submit all other additional information as may deemed necessary.

The NIA may approve the construction proposed on precasting of concrete with or without correction. The approval, however, does not relieve the Contractor of any responsibility if such work does not meet specified results.

Reinforced concrete pipes, plain concrete pipes, reinforced concrete piles and concrete hollow blocks are not considered precast construction, hence, are excluded under this Section.

B. TRANSPORTING AND PLACING

Extreme care should be observed in handling, storing, moving and erecting to avoid cracking, twisting or other distortions that would result to cracking or damage to the precast concrete. Precast concrete members shall be handled, transported and erected in an upright position and the points of support and directions of the reactions with respect to the members shall be approximately the same as when the member is in final position.

C. SAMPLING AND TESTING

The individual components of precast concrete structures, shall conform to the applicable provision of Section XII "Concrete" and will be subject to the usual test for reinforced concrete.

D. MEASUREMENT AND PAYMENT

Measurement of concrete in precast structures will be measured by the number of cubic

meters. It shall be computed to the neat lines as if these structures were constructed to the detailed shown on the Drawings.

The Contractor will be paid for all precast structures acceptably installed, completed and backfilled in place. He shall be paid for each precast unit as if the units were constructed to the details shown on the Drawings, regardless of the actual dimensions of the precast unit.

1407 LEAN CONCRETE

In the construction of siphons, road/thresher crossing, drainage crossing, and any other canal structures, the bottom of the cast-in-place concrete barrels will be exposed to seepage or wash out the cement in the concrete poured. To minimize, the effect of seepage, a Class "C" concrete with a minimum strength of 100 kgf/cm² (1,400 psi) shall first be poured to the lines, grades and dimensions, on which the concrete barrels will be constructed, as shown on the Drawings or as directed by the Engineer.

Lean concrete shall be measured and paid for as specified in Paragraphs 1403 and 1404 of this Section.

1408 GAUGING STAFF

The Contractor shall install gauging staffs in all Parshall flumes or any measuring devise, all headgates and turnouts with valve or gate structures, all checks and siphons, and other structures, as shown on the Drawings or as directed by the Engineer. The gauging staff shall be made of steel or aluminum plate whichever indicated on the Drawings conforming to the requirement in accordance with Paragraph 2811 "Staff Gauge".

Installation of gauging staff will be measured and paid in accordance with the provision set forth in Paragraph 2811 "Staff Gauge" thereof.

1409 LIGHT WEIGHT CONCRETE

A. GENERAL

In the reinforced concrete structures, If concrete with light weight aggregate, referred as "lightweight concrete" would be required, the Contractor shall furnish and complete concrete with light weight aggregate as specified below.

B. MATERIAL

Cement, Admixtures and Water: - shall conform to the requirements stipulated in Paragraphs 1203, 1204 and 1205.

Fine and Coarse aggregates: - shall conform to the requirements of ASTM (equivalent to JIS A 5002, MA 317 and MA 417) and shall consist of hard, tough, durable, uncoated particles and fragments manufactured in well quality controlled factory.

Grading and others shall conform to the requirements stipulated in Paragraphs 1206 and

1207.

Proportioning of Concrete Mixtures : - Mixture of lightweight concrete shall be as same as class “A-2” stipulated in Paragraph 1210.

C. MIXING AND PLACING

Mixing, placing, curing and all other requirement for lightweight concrete shall be executed in conformity to the requirements stipulated in Section XII “Concrete”, unless otherwise stipulated the Drawings or as directed by the Engineer.

D. MEASUREMENT AND PAYMENT

Lightweight concrete shall be measured and paid for as specified in Paragraphs 1403 and 1404 of this Section.

SECTION XVII

REINFORCING STEEL BARS

1701 SCOPE

All reinforcing steel bars required for the works as detailed in the Construction Drawings or as directed by the Engineer shall be furnished by the Contractor.

The work under this Section includes furnishing, cutting, bending and proper placing of all reinforcing steel bars required for the works, all in accordance with the Drawings and these Specifications.

1702 MATERIALS

All reinforcing steel bars shall be Grade 40 or PS 275 or equivalent, deformed type and conforming to the requirements of ASTM A-615 or equivalent. The nominal dimensions and unit weights of bar designation shall be in accordance with the following table:

Nominal Dimensions			
Bar Diameter	Unit Weight (kg/m)	Cross Section Area (sq.mm)	Perimeter (mm)
6 mm	0.222	28.27	18.85
8 mm	0.395	50.27	25.13
10 mm	0.616	78.54	31.42
12 mm	0.888	113.10	37.70
16 mm	1.579	201.10	50.27
20 mm	2.466	314.20	62.83
25 mm	3.854	491.90	78.54
28 mm	4.833	615.75	87.96
32 mm	6.313	804.25	100.53
36 mm	7.991	1,017.90	113.10

The nominal diameter of a deformed bar is equivalent to the diameter of a plain bar having the same weight per unit length of the deformed bar.

1703 CONSTRUCTION REQUIREMENT

Workmanship shall be at the highest grade and shall be in accordance with the latest standard practice of the industry.

(1) Cutting and Bending: - Cutting and bending of reinforcing bars may be done in shop or at the job site. All bending works shall be in accordance with the latest standard practice and by approved machine methods. Radii for bends and hooks will be specified on the approved detailed reinforcement Drawings in accordance with

sound design procedures.

(2) Placing: - Reinforcement shall be laid, anchored and embedded in the concrete as shown on the Drawings or as directed by the Engineer. Unless otherwise directed, the spacing of reinforcement bars shall be measured along the center line of the bars. Reinforcement shall be inspected for compliance with requirements as to size, length, splicing, position and number after placement based on the approved reinforcement drawings.

Before reinforcement is placed, the surfaces of the bars and the surfaces of any metal bar supports shall be cleaned of heavy flaky rust, loose mill scale, dirt, grease or other foreign substances which in the opinion of the Engineer are objectionable. Heavy flaky rust that can be removed by firm rubbing with burlap or equivalent treatment is considered objectionable. After being placed, the reinforcing bars shall be maintained in a clean condition until it is completely embedded in the concrete.

Reinforcing bars shall be accurately placed and secured in position so as to avoid displacement during the pouring of concrete. Special care shall be exercised to prevent any disturbance of the embedded reinforcement during the setting of concrete. Metal chairs, hangers, spacers or other approved supports may be used by the Contractor for supporting reinforcing bars. Metal supports shall be galvanized when they are to be exposed to view on completed concrete surfaces or where its use will contribute in any way to the discoloration or deterioration of the concrete.

(3) Relation of Bars to Concrete Surfaces: - The minimum covers for all reinforcement shall conform to the dimensions shown on the detailed reinforcement Drawings.

(4) Splicing: - All splices in reinforcement shall be as shown on the Drawings or as directed by the Engineer. The lapped ends to bars shall be either supported sufficiently to permit the embedment of the entire surface of each bar in concrete or shall be securely wired.

(5) Welding: - Welding of bars shall be performed only where shown on the Drawings or as authorized in writing by the Engineer and shall conform to the requirements of AWS: D12.1, latest revision. All welders employed shall show proof of their welding qualifications to the Engineer. All welding be done using metal arc welding, pressure gas welding, submerged arc welding or thermit welding. All electric shall be acceptable to NIA. Coverings of low hydrogen electrodes must be thoroughly dry when used. The surfaces to be welded shall be clean and shall be free from rust and dirt. All welds shall develop the full strength of the bar or the smaller bar when two different sizes are welded. Test will be required of not more than five percent (5%) of the welds. Approved testing equipment for testing welds shall be furnished by Contractor.

(6) Protection: - Reinforcement to remain exposed and intended for future concrete embedment shall be protected from corrosion or other damages in an approved manner where directed. The reinforcement protection shall be of such nature that it can be thoroughly cleaned without difficulty prior to encasement in concrete.

1704 PREPARATION OF REINFORCEMENT DRAWINGS

Contractor shall submit for the approval of NIA detailed reinforcement drawings. These drawings will include bar placing drawings, bar bending drawings, bar list, and any other reinforcement drawings as may be required to facilitate placement and checking of reinforcing bars. No work shall be done by Contractor until such approval has been given by NIA.

The reinforcement Drawings submitted shall show the name of the structure location by stationing where the reinforcement drawings is intended and all the necessary information required by the NIA. It shall likewise bear the stamp or seal of Contractor as evidence that the Drawings have been checked by Contractor.

Contractor shall be held responsible for any delay in the progress of the work occasioned by this failure to observe the requirements and the time for the completion of the contract will not be extended on account of his failure to promptly submit said drawings in strict adherence herewith.

1705 SAMPLING FOR TESTING AND ACCEPTANCE OF MATERIALS THAT FAIL TO MEET CONTRACT REQUIREMENTS

Sampling of reinforcing steel bars furnished by the Contractor for incorporation in the Permanent Works shall be carried out by NIA at the manufacturer's stockyard before delivery to the project site. The NIA authorized representative shall at random take two (2) representative samples of reinforcing steel bars per lot covered by the manufacturer's mill certificate. A lot shall consist of all steel bars of the same heat or blow as shown in the mill certificate, and the same nominal cross-section and grade. Samples shall be tested at the manufacturer's testing laboratory, if any, or to any approved Government testing laboratory at Contractor's expense. A lot or lots represented by samples tested which failed to meet specified requirements shall be rejected and will not be counted for delivery to the project site. Sampling and testing shall be in accordance with ASTM requirements. All deliveries shall be subject to prior approval of NIA.

The NIA reserves the right to accept steel bars that fail to meet the contract requirement provided that the deficiency is not more than nine percent (9%) of the requirement per each type of test and provided further that a corresponding reduction in the unit price will be made. The percentage of reduction equal to the percentage of deficiency based on the minimum requirement of the ASTM A-615 Standard. For example, if the value of the test result for one type of test is five percent (5%) below the minimum requirement, the unit price for payment will be reduced by 5%. If the non-compliance with the test requirement is on two or more tests, the price reduction will be the summation of the percentage of the deficiencies.

1706 METHOD OF MEASUREMENT

Measurement for payment of reinforcing steel bars will be made on the weight of reinforcing steel bars actually placed with the concrete structure in accordance with the

Drawings and Bar Schedule approved by NIA or as directed by the Engineer and weights will be computed based on the published manufacturer's weights or in the absence thereof, on the weights specified in the table presented in Paragraph 1702. Steel bars in laps or splices indicated in the approved reinforcement Drawings, so required by NIA will be measured for payment. Additional steel bars in laps which are authorized for the convenience of the Contractor and such items as wires, clips, chairs, or other devices for securing the steel bars in place will not be measured for payment. Where weld splices are specified on the Drawings, weld splices will not be measured for payment but the weight for its equivalent lap splices will be measured for payment instead. Where contractor chooses to weld reinforcement bars for his convenience and welding is not specified, no separate payment will be made for such welds. Where Contractor substitute welded splices for lapped splices, separate payment will not be measured for such weld, but instead the weight for the lapped splices shown in the Drawings will be measured for payment.

1707 BASIS OF PAYMENT

Payment for reinforcing steel bars shall be paid under Reinforced Concrete indicated in the Bill of Quantities which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, equipment, tools and all incidentals necessary for the successful completion of the work described under this Section.
Otherwise, if a separate pay item, payment for reinforcing steel bars measured as provided above, will be paid for at the contract unit price per kilogram or ton whichever is shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all reinforcing steel bars including all labor, tools, equipment and all incidentals and subsidiary works necessary for the successful completion of the work described under this Section.

Unless indicated as a separate pay item in the Bill of Quantities, payment per kilogram or ton of reinforcing steel bars (same measurement as provided above) shall be made separately for:

a) furnishing and delivery cost which shall include all labor, tools, equipment and supplies involved in the manufacture and delivery to the project site which includes loading, hauling, unloading and stockpiling at the delivery site;

b) installation cost which shall include all labor, tools and equipment involved in cutting, bending and placing into permanent structures and all incidentals necessary for the successful completion of the work under this Section.

Sixty percent (60%) of furnishing and delivery cost will be paid to the Contractor upon progress bill with the delivery certificate by the Engineer after delivery at the project site.

Remaining forty percent (40%) of furnishing and delivery cost and hundred percent (100%) of installation cost will be paid to the Contractor upon the progress bill after the completion of concrete works.

SECTION XXXVI
DEEPWELL

3601 SCOPE

The Contractor shall provide and operate sufficient drilling units required to complete the works. The Contractor shall furnish and install all materials, equipment, tools and labor and all other incidentals necessary for the completion of the works.

3602 CONSTRUCTION MEASUREMENT

1. The drilling together with all auxiliary equipment and personnel shall be defined as the Drilling Unit.

2. The drilling diameter, the bit screens shall be good enough for the construction of deepwell.

3603 MEASUREMENT AND PAYMENT

Measurement and payment for furnishing of all materials, equipment and labor for permanent structure shall be made at the lump sum price or lump sum bid price whichever is stated in the Bill of Quantities.

SECTION XLIV

PIPELINE SYSTEM

4401 SCOPE – (March 18, 1998)

The work under this Section shall include furnishing all materials, supplies, tools and equipment; installation and laying of pipes and fittings including all necessary materials in accordance with the Drawings and these Specifications or as directed by Engineer.

4402 MATERIALS – (March 18, 1998)

1. UPVC (Unplasticized Polyvinyl Chloride) Pressure Pipes.

   All uPVC pipes to be furnished and installed shall be Class 150 (150 psi Nominal working Pressure) in standard 6.00 meter effective length per piece with an integral push-on bell complete with elastomeric rubber ring on one end and plain bevelled on the other end. Made basically form class 12454-A or 12454-B virgin PVC compound as defined in ASTM D1784. For connection with corresponding uPVC pressure pipes. Conforming to International Standard Organization(ISO), Philippine National Standards (PNS 65), LWUA and MWSS Specifications.

2.UPVC (Unplasticized Polyvinyl Chloride) Fittings.

   All uPVC pipes to be furnished and installed shall be Class 150 (150 psi Nominal working Pressure) in standard 6.00 meter effective length per piece with an integral push-on bell complete with elastomeric rubber ring on one end and plain bevelled on the other end. Made basically form class 12454-A or 12454-B virgin PVC compound as defined in ASTM D1784. Conforming to International Standard Organization (ISO), Philippine National Standards (PNS 65), LWUA and MWSS Specifications.

3. Cast Iron Fittings

   All cast iron fittings to be furnished and installed shall conform with ASTM A126 Class B. Exterior surfaces shall be painted with black coal tar enamel while interior surfaces shall be lined with 3mm cement as per AWWA C-104. Fitting surfaces that are directly in contact with pipes and gasket shall be machine finished. Gasket shall be natural vulcanized rubber, bolt and nut as per galvanized steel ASTM A-284.

4. Galvanized Iron Pipes and Fittings

   All pipes and fitting to be furnished and installed by the contractor for galvanized pipes shall be Schedule 40, and shall be Conforming to International Standard Organization(ISO), Philippine National Standards (PNS 65), LWUA and MWSS Specifications.

4404 <u>METHOD OF CONSTRUCTON – (March 18, 1998)</u>

1. UPVC PIPES

Pipes shall be embedded on the ground by about 30 cms. Depth of cover to avoid exposure to too much sunlight, and its susceptibility to damage by objects it will come in contact with. The pipes are all push-on types, therefore, personnel should see to it that o-ring is in place before the pipes are pushed-on together. Laying of pipes shall follow a uniform slope on the ground or as specified in the plan and profile. No pipes shall be installed in a siphonic or sagging position.

2. G.I. PIPES

Pipes shall be embedded on the ground by about 30 cms. Depth of cover to avoid the possibility to damage by objects it will come in contact with. The pipes shall be threaded in both ends. Laying of pipes shall follow a uniform slope on the ground or as specified in the plan and profile. No pipes shall be installed in a siphonic or sagging position except for those locations where such positions cannot be avoided. However, elevations should be referred to the Project Engineer for evaluation and approval.

3. CAST IRON FITTINGS

Cast Iron Fittings are to be fitted on UPVC pipes joints with rubber o-ring and at least four (4) bolts and nut. Plumbers should see to it that rubber o-rings are put-on the pipes before tightening the bolts, otherwise, leaks will occur.

4. G.I. FITTINGS

G.I. pipes are fitted to each other using G.I. fittings. Pipes should be threaded properly to its desired depth and length, cleaned properly, and wrapped with teflon tape before being fitted into G.I. fittings.

4405 <u>METHODS OF MEASUREMENT – (March 18, 1998)</u>

Pipes shall be measured by linear meter or by the number of lengths installed based on the lay-out as shown on the Drawings. Fittings shall be counted on the number installed and fitted into pipes as per plan and specifications.

4406 <u>BASIS OF PAYMENT – (March 18, 1998)</u>

The quantity measured as provide above will be paid at the contract lump sum unit price per item, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, tools, equipment and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section.

SOLAR PANEL MONOCYSTALLINE

No. of Cells	:	110 - 120
Minimum Power	:	550 W
Maximum Power	:	600 W
Max. Power Voltage (Vmp)	:	34.60 V
Max. Power Current (Imp)	:	17.34 A
Open Circuit Voltage (Voc)	:	41.70 V
Short Circuit Current (lsc)	:	18.42 A
Module Efficiency	:	≥ 21.20%
Operating Temperature	:	40°C ~ 85°C
Max. System Voltage	:	1500V or 1000V
Module Fire Performance	:	Type 1 (UL 1703)
	:	Class C (IEC 61730)
Max. Series Fuse Rating	:	35 A
Application Classification	:	Class A
Power Tolerance	:	0+~5W
Dimensions/Measures	:	±120 x ±240 x ±4cm

TECHNICAL SPECIFICATIONS (CIVIL WORKS)

1. STRUCTURE
    a) The structure shall be made from prefabricated assemblies. There shall be no welding/cutting on site.
    b) All structure materials will be made of high-tensile steel (420 MPA and higher), pre-coated with anti-corrosion coating.
    c) All parts that are designated to be installed underground shall be coated with Hot Deep Galvanization in accordance with ASTM A123 Standard.
    d) All metal parts that are designed to be installed above group shall be coated with ZAM-375 coating in accordance with ASTM A1046 standard.
    e) All bolts that are used to fix electrical components or hydraulic components shall be made from stainless steel 304.
    f) All bolts that are used to fix mechanical components shall be made from steel 8.8 or 10.4 and shall be coated with IRON ZINC coating.
    g) The structure shall include the foundation. Structure shall be designed to withstand winds with minimum of 280 kph (80 m/s) in accordance with Eurocode III. Bidder shall submit static wind calculation in STRAP (or equivalent) analysis software.
    h) Modules shall be mounted at height of no less than 2 meters above ground.

TECHNICAL SPECIFICATIONS (GOODS/SUPPLY)

1. PUMP
    a) For Solar Pump Fertigation System 15 has. Surface Water
        i. Surface self-priming centrifugal pump
        ii. Make and model
        iii. Country of origin

iv. Capacity – 68 m3/hr (min.)
v. Total dynamic head – 25meters (min.)
vi. Efficiency – minimum 60 %
vii. Speed RPM – 1450-2900
viii. Impeller material-stainless steel or equivalent
ix. Discharge size diameter in inches – 4”

b) For Solar Pump Fertigation System 15 has. Submersible -10 m
i. Dynamic water level - 10 m. (min)
ii. Submersible borehole pump
iii. Make and model
iv. Country of origin
v. Capacity – 68 m3/hr. (min.)
vi. Pressure – 25meters above ground level
vii. Efficiency – minimum 60 %
viii. Speed RPM – 1450-2900
ix. Impeller material- pressed stainless steel
x. Discharge size diameter in inches-4”(min)
xi. Maximum pump/motor diameter – 6”

c) For Solar Pump Fertigation System 15 Submersible -30
i. Dynamic water level – 30 m (min)
ii. Submersible borehole pump
iii. Make and model
iv. Country of origin
v. Capacity – 68 m3/hr. (min.)
vi. Pressure – 25meters above ground level
vii. Efficiency – minimum 60 %
viii. Speed RPM – 1450-2900
ix. Impeller material- pressed stainless steel
x. Discharge size diameter in inches-4” (min)
xi. Maximum pump/motor diameter -6”

2. WATER MEASUREMENT
a) A water meter with a Data output will be installed downstream of the filter to monitor operations and accumulate the pumped water level for the duration of the growing season.

3. FERTILIZATION
a) A fertilizer tank with a volume of 30 liters (minimum) will be installed downstream of the system. The tank will be operated by means of a choke body (Pressure Reducer) that reduce that produces a pressure difference when entering the boiler and existing it. The fertilizer is dissolves inside the tank by the water passing through it and injected into the irrigation line through a chemically durable PVC line.

4. WATER SUPPLY
a) The water at the outlet of the head of the system will flow through a 110 mm (minimum) diameter LAYFLAT flexible pipe to the top of the area designed for flood irrigation

5. FLOOD POOL

a) Filling the Flood pool with 2 LAYFLAT 51 mm diameter perforated secondary lines each 50 meter long, those will branch off from the central 102 mm diameter main pipes.

6. EQUIPMENT NEEDED
    a) Well pump
    b) Delivery pipe
    c) Water meter
    d) Fertilizer tank
    e) Delivery pipe valve
    f) 150m 4”/102mm Layflat pipe
    g) 100m of 3”/78mm Layflat pipe
    h) 100 m of 2”/51mm Layflat pipe with outlets for flooding
    i) Fittings and connectors for Layflat piping

7. MOTOR
    a) Make and Model
    b) Country of Origin
    c) Type
    d) Continuous HP rating at pump rated capacity and speed at least 20% above the maximum power requirement to drive the pump.
    e) Synchronous speed 1500-2900 RPM
    f) Variable frequency Hz
    g) Built-in thermal control automatic shut-off protection
    h) 40-meter-long suitable submersible power cable with connectors
    i) Adequate sealing
    j) Magnetic starter controls

8. ELECTRICAL SYSTEM
    a) Solar Modules will be made of dual glass, bi-facial, using HJT technology with at least 15 years product warranty and 30 years output warranty.
    b) Solar modules will be from a manufacturer that is listed on Bloomberg Tier-1 list for at least 2 quarters before product submission and shall remain in Tier-1 for at least until the time of supply.
    c) Modules shall adhere to all applicable IEC standards including IEC-61215, IEC61730, IEC-60364.
    d) Module efficiency shall be no less than 22%.
    e) Total name plate capacity of the solar array shall be at least 200% of the name-plate power of the solar
    f) pump.
    g) Electrical distribution board shall be constructed from polyester and will have ingress protection level of IP-54 or higher. The electrical board shall have DC section and AC section, adequately separated, and clearly marked. The distribution board shall include water-proof SLD drawing.
    h) Solar pump shall be from designed working-point, considering water head, in-field required pressure, and other environmental
    i) Solar pump shall be designed such that the designed working point, considering water head in-field required pressure, and other environmental conditions, shall provide a flow of 1.6 l/s for each hectares of irrigation.

j) Solar irrigation inverters shall be from reputable European supplier with at least 10 years' experience in the development, manufacturing and service of variable frequency irrigation inverters.
k) The inverters' rated ambient temperature shall be -10 to 50 deg C and operating temp of -10 to 60 deg C.
l) Ingress Protection degree shall be at least IP54.
m) The Inverter shall have digital outputs, Motor run Signal, alarm, analog inputs (10 or 15 VDC). At least 4 digital inputs, configurable as N.O. or N.C. for motor run/stop.
n) Communication MODBUS RTU Bluetooth Smart (4.0)

9. DRAWINGS AND PERFORMANCE CURVES
    a) Cross Section Drawing
    b) Dimensional Drawing
    c) Performance Curve

    Note:
    "The Bidder shall supply with his bid the system and characteristics curves relating to pump head, capacity, efficiency and absorbed power."

10. ACCESSORIES PER UNIT
    a) Systems supplied will include all parts material and accessories needed to reach full operation

11. MOTOR CONTROLLER
    a) General Requirements
        i. Made by approved manufacturer, by EU/UK/USA brand
        ii. Country of Origin – EU/UK /USA
        iii. Reduced voltage combination circuit breaker and magnetic starter assembly
        iv. Three phases, 460V, 60Hz

12. MANUALS/CATALOGS AND WARRANTY PER SER
    a) One set operation, maintenance and repair manual
    b) One set parts catalog
    c) Standard brochures showing pump Performance curves for head, Capacity, efficiency and power
    d) Warranty - 12 months/2,000 hours

13. SATELLITE ASSISTED MONITORING SYSTEM
    a) A unique AI powered system using advanced algorithms will recommend methods of irrigation and fertigation, the system will analyze Data from climate sources, from satellites and daily water usage.
    b) Data integrated with proprietary dataset collected over 1500 growing seasons around the world to produce optimal recommendations.
    c) The system provides real time forecasted insights and fertigation recommendation based on plant stress, plant and fruit growth patterns, real time and forecasted weather conditions.

14. TRAINING, SKILLS DEVELOPMENT AND CAPACITY BUILDING

a) The bidder is required as part of the contract to supply a training and skills development package by an international training institution acceptable to NIA, that may include foreign AID, GOV development agency, in the fields of - water quality, plant nutrition, fertilizers, fertigation management etc.

Section VII. Drawings

[Insert here a list of Drawings. The actual Drawings, including site plans, should be attached to this section, or annexed in a separate folder.]

Section VIII. Bill of Quantities

BILL OF QUANTITIES AND BID PRICES

Contract No.: BCSIMOCO-LMC-09-2K24

Description of Contract: CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System

Location: Carmen CIS, Toledo City, Talavera PIS, Toledo City and Madridejos PIP, Daanbantayan, Cebu

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
CLUSTER I -A : CARMEN CIS , TOLEDO CITY, CEBU				ABC - Php 29,100,000.00	
I	SOLAR SITE # 1				
A	CONSTRUCTION OF ONE (1) UNIT 15HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 80M DEPTH				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	CONSTRUCTION SAFETY AND HEALTH PROGRAM	1.00	LS	₱	
C	WELL DRILLING	80.00	LN.M	₱	
D	WELL CASING AND WELL DEVELOPMENT				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.30	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
D.4	Installation of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
E	PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (15HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (15HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	SOLAR PANEL				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	32.00	PC	₱	
G.1.2	MC4 Connector	60.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm²)	188.00	M	₱	
G.1.4	AC Cable (8.0 mm²)	188.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	188.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	INVERTER & CONTROL PANEL				
H.1	Inverter and Control Panel				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	4.32	CU.M	₱	
I.3	Structure Backfill (Manual)	2.43	CU.M	₱	
I.4	Class "A" Concrete	2.16	CU.M	₱	
I.5	Gravel Blanket	23.02	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
1.7	Painting Works	4.50	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO 4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	74.00	PC	₱	
L.1.2	Installation	74.00	PC	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
M	**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1	Structure Excavation(Manual)	13.69	CU.M	₱	
M.2	Structure Backfill (Manual)	5.14	CU.M	₱	
M.3	Class "A" Concrete	6.28	CU.M	₱	
M.4	Reinforcing Steel Bar				
M.4.1	Furnishing & Stockpilling	501.61	KG	₱	
M.4.2	Cut, Bend and Place	501.61	KG	₱	
M.5	Masonry Works				
M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	34.28	SQ.M	₱	
M.6	Cyclone Chain Wire	103.05	LN.M	₱	
M.7	2" Ø G.I Pipe(sch. 40)	175.20	LN.M	₱	
M.8	Painting Works	10.64	SQ.M	₱	
M.9	Water Proofing	20.00	SQ.M	₱	
M.10	Gravel Blanket	3.31	CU.M	₱	
M.11	Red Oxide Metal Primer	0.27	SQ.M	₱	
N	**CONSTRUCTION OF CONTROL HOUSE**				
N.1	Structure Excavation(Manual)	3.22	CU.M	₱	
N.2	Structure Backfill (Manual)	1.17	CU.M	₱	
N.3	Class "A" Concrete	4.33	CU.M	₱	
N.4	Reinforcing Steel Bar				
N.4.1	Furnishing & Stockpilling	414.25	KG	₱	
N.4.2	Cut, Bend and Place	414.25	KG	₱	
N.5	Masonry Works				
N.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	25.48	SQ.M	₱	
N.6	Painting Works	71.69	SQ.M	₱	
N.7	Water Proofing	12.25	SQ.M	₱	
N.8	Gravel Blanket	1.07	CU.M	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
II	**SOLAR SITE # 2**				
A	**CONSTRUCTION OF ONE (1) UNIT 15HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 80M DEPTH**				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	**CONSTRUCTION SAFETY AND HEALTH PROGRAM**	1.00	LS	₱	
C	**WELL DRILLING**	80.00	LN.M	₱	
D	**WELL CASING AND WELL DEVELOPMENT**				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.30	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
D.4	Installation of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
E	**PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)**				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	**SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES**				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (15HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (15HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	**SOLAR PANEL**				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	32.00	PCS	₱	
G.1.2	MC4 Connector	60.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm^2)	188.00	M	₱	
G.1.4	AC Cable (8.0 mm^2)	188.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	188.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	**INVERTER & CONTROL PANEL**				
H.1	Inverter and Control Panel				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	4.32	CU.M	₱	
I.3	Structure Backfill (Manual)	2.43	CU.M	₱	
I.4	Class "A" Concrete	2.16	CU.M	₱	
I.5	Gravel Blanket	23.02	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
1.7	Painting Works	4.50	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	74.00	PC	₱	
L.1.2	Installation	74.00	PC	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
M	**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1	Structure Excavation(Manual)	13.69	CU.M	₱	
M.2	Structure Backfill (Manual)	5.14	CU.M	₱	
M.3	Class "A" Concrete	6.28	CU.M	₱	
M.4	Reinforcing Steel Bar				
M.4.1	Furnishing & Stockpilling	501.61	KG	₱	
M.4.2	Cut, Bend and Place	501.61	KG	₱	
M.5	Masonry Works				
M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	34.28	SQ.M	₱	
M.6	Cyclone Chain Wire	103.05	LN.M	₱	
M.7	2" Ø G.I Pipe(sch. 40)	175.20	LN.M	₱	
M.8	Painting Works	10.64	SQ.M	₱	
M.9	Water Proofing	20.00	SQ.M	₱	
M.10	Gravel Blanket	3.31	CU.M	₱	
M.11	Red Oxide Metal Primer	0.27	SQ.M	₱	
N	**CONSTRUCTION OF CONTROL HOUSE**				
N.1	Structure Excavation(Manual)	3.22	CU.M	₱	
N.2	Structure Backfill (Manual)	1.17	CU.M	₱	
N.3	Class "A" Concrete	4.33	CU.M	₱	
N.4	Reinforcing Steel Bar				
N.4.1	Furnishing & Stockpilling	414.25	KG	₱	
N.4.2	Cut, Bend and Place	414.25	KG	₱	
N.5	Masonry Works				
N.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	25.48	SQ.M	₱	
N.6	Painting Works	71.69	SQ.M	₱	
N.7	Water Proofing	12.25	SQ.M	₱	
N.8	Gravel Blanket	1.07	CU.M	₱	
	SUB-TOTAL (CLUSTER I-A: CARMEN CIS) AMOUNT OF BIDS *(IN WORDS AND IN FIGURES)*			₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
CLUSTER I - B : TALAVERA PIS , TOLEDO CITY, CEBU				ABC - Php 9,700,000.00	
A	**CONSTRUCTION OF ONE (1) UNIT 10HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 71M DEPTH**				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	**CONSTRUCTION SAFETY AND HEALTH PROGRAM**	1.00	LS	₱	
C	**WELL DRILLING**	71.00	LN.M	₱	
D	**WELL CASING AND WELL DEVELOPMENT**				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.15	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ uPVC Pipe x 6M	71.00	LN.M	₱	
D.4	Installation of 8" ⌀ uPVC Pipe x 6M	71.00	LN.M	₱	
E	**PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)**				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	**SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES**				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (10HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (10HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	**SOLAR PANEL**				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	26.00	PCS	₱	
G.1.2	MC4 Connector	48.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm^2)	150.00	M	₱	
G.1.4	AC Cable (8.0 mm^2)	150.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	150.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	**INVERTER & CONTROL PANEL**				
H.1	Inverter				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure (Hot Dip Galvanized)				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	3.46	CU.M	₱	
I.3	Structure Backfill (Manual)	1.94	CU.M	₱	
I.4	Class "A" Concrete	1.73	CU.M	₱	
I.5	Gravel Blanket	18.41	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
1.7	Painting Works	3.60	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO 4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	29.00	PCS	₱	
L.1.2	Installation	29.00	PCS	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	
M	**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1	Structure Excavation(Manual)	9.12	CU.M	₱	
M.2	Disposal of excess excavated backfill (overhaul)	4.19	CU.M	₱	
M.3	Structure Backfill (Manual)	4.93	CU.M	₱	
M.4	Class "A" Concrete	4.88	CU.M	₱	
M.5	Reinforcing Steel Bar				
M.5.1	Furnishing & Stockpilling	334.41	KG	₱	
M.4.2	Cut, Bend and Place	334.41	KG	₱	
M.6	Masonry Works				
M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	23.41	SQ.M	₱	
M.7	Cyclone Chain Wire	68.70	LN.M	₱	
M.8	2" Ø G.I Pipe(sch. 40)	116.80	LN.M	₱	
M.9	Painting Works	7.09	SQ.M	₱	
M.10	Water Proofing	20.00	SQ.M	₱	
M.11	Gravel Blanket	2.21	CU.M	₱	
M.12	Red Oxide Metal Primer	0.18	SQ.M	₱	
	SUB-TOTAL (CLUSTER I-B : TALAVERA PIS) AMOUNT OF BIDS *(IN WORDS AND IN FIGURES)*			₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
CLUSTER I -C : MADRIDEJOS PIP, DAANBANTAYAN, CEBU				ABC - Php 58,200,000.00	
I	SOLAR SITE # 1				
A	CONSTRUCTION OF ONE (1) UNIT 15HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 80M DEPTH				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	CONSTRUCTION SAFETY AND HEALTH PROGRAM	1.00	LS	₱	
C	WELL DRILLING	80.00	LN.M	₱	
D	WELL CASING AND WELL DEVELOPMENT				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.30	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ uPVC Pipe x 6M	80.00	LN.M	₱	
D.4	Installation of 8" ⌀ uPVC Pipe x 6M	80.00	LN.M	₱	
E	PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (15HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (15HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	SOLAR PANEL				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	32.00	PC	₱	
G.1.2	MC4 Connector	60.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm^2)	188.00	M	₱	
G.1.4	AC Cable (8.0 mm^2)	188.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	188.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	INVERTER & CONTROL PANEL				
H.1	Inverter and Control Panel				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	4.32	CU.M	₱	
I.3	Structure Backfill (Manual)	2.43	CU.M	₱	
I.4	Class "A" Concrete	2.16	CU.M	₱	
I.5	Gravel Blanket	23.02	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
1.7	Painting Works	4.50	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO 4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	74.00	PC	₱	
L.1.2	Installation	74.00	PC	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	

ITEM NO.		PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
M		**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1		Structure Excavation(Manual)	13.69	CU.M	₱	
M.2		Structure Backfill (Manual)	5.14	CU.M	₱	
M.3		Class "A" Concrete	6.28	CU.M	₱	
M.4		Reinforcing Steel Bar				
	M.4.1	Furnishing & Stockpilling	501.61	KG	₱	
	M.4.2	Cut, Bend and Place	501.61	KG	₱	
M.5		Masonry Works				
	M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	34.28	SQ.M	₱	
M.6		Cyclone Chain Wire	103.05	LN.M	₱	
M.7		2" Ø G.I Pipe(sch. 40)	175.20	LN.M	₱	
M.8		Painting Works	10.64	SQ.M	₱	
M.9		Water Proofing	20.00	SQ.M	₱	
M.10		Gravel Blanket	3.31	CU.M	₱	
M.11		Red Oxide Metal Primer	0.27	SQ.M	₱	
N		**CONSTRUCTION OF CONTROL HOUSE**				
N.1		Structure Excavation(Manual)	3.22	CU.M	₱	
N.2		Structure Backfill (Manual)	1.17	CU.M	₱	
N.3		Class "A" Concrete	4.33	CU.M	₱	
N.4		Reinforcing Steel Bar				
	N.4.1	Furnishing & Stockpilling	414.25	KG	₱	
	N.4.2	Cut, Bend and Place	414.25	KG	₱	
N.5		Masonry Works				
	N.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	25.48	SQ.M	₱	
N.6		Painting Works	71.69	SQ.M	₱	
N.7		Water Proofing	12.25	SQ.M	₱	
N.8		Gravel Blanket	1.07	CU.M	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
II	SOLAR SITE # 2				
A	**CONSTRUCTION OF ONE (1) UNIT 15HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 80M DEPTH**				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	CONSTRUCTION SAFETY AND HEALTH PROGRAM	1.00	LS	₱	
C	WELL DRILLING	80.00	LN.M	₱	
D	WELL CASING AND WELL DEVELOPMENT				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.30	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
D.4	Installation of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
E	PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	**SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES**				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (15HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (15HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	SOLAR PANEL				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	32.00	PCS	₱	
G.1.2	MC4 Connector	60.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm^2)	188.00	M	₱	
G.1.4	AC Cable (8.0 mm^2)	188.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	188.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	**INVERTER & CONTROL PANEL**				
H.1	Inverter and Control Panel				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	4.32	CU.M	₱	
I.3	Structure Backfill (Manual)	2.43	CU.M	₱	
I.4	Class "A" Concrete	2.16	CU.M	₱	
I.5	Gravel Blanket	23.02	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
I.7	Painting Works	4.50	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO 4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	74.00	PC	₱	
L.1.2	Installation	74.00	PC	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
M	**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1	Structure Excavation(Manual)	13.69	CU.M	₱	
M.2	Structure Backfill (Manual)	5.14	CU.M	₱	
M.3	Class "A" Concrete	6.28	CU.M	₱	
M.4	Reinforcing Steel Bar				
M.4.1	Furnishing & Stockpilling	501.61	KG	₱	
M.4.2	Cut, Bend and Place	501.61	KG	₱	
M.5	Masonry Works				
M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	34.28	SQ.M	₱	
M.6	Cyclone Chain Wire	103.05	LN.M	₱	
M.7	2" Ø G.I Pipe(sch. 40)	175.20	LN.M	₱	
M.8	Painting Works	10.64	SQ.M	₱	
M.9	Water Proofing	20.00	SQ.M	₱	
M.10	Gravel Blanket	3.31	CU.M	₱	
M.11	Red Oxide Metal Primer	0.27	SQ.M	₱	
N	**CONSTRUCTION OF CONTROL HOUSE**				
N.1	Structure Excavation(Manual)	3.22	CU.M	₱	
N.2	Structure Backfill (Manual)	1.17	CU.M	₱	
N.3	Class "A" Concrete	4.33	CU.M	₱	
N.4	Reinforcing Steel Bar				
N.4.1	Furnishing & Stockpilling	414.25	KG	₱	
N.4.2	Cut, Bend and Place	414.25	KG	₱	
N.5	Masonry Works				
N.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	25.48	SQ.M	₱	
N.6	Painting Works	71.69	SQ.M	₱	
N.7	Water Proofing	12.25	SQ.M	₱	
N.8	Gravel Blanket	1.07	CU.M	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
III	SOLAR SITE # 3				
A	**CONSTRUCTION OF ONE (1) UNIT 15HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 80M DEPTH**				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	**CONSTRUCTION SAFETY AND HEALTH PROGRAM**	1.00	LS	₱	
C	**WELL DRILLING**	80.00	LN.M	₱	
D	**WELL CASING AND WELL DEVELOPMENT**				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.30	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
D.4	Installation of 8" ⌀ u PVC Pipe x 6M	80.00	LN.M	₱	
E	**PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)**				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	**SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES**				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (15HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (15HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	**SOLAR PANEL**				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	32.00	PC	₱	
G.1.2	MC4 Connector	60.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm^2)	188.00	M	₱	
G.1.4	AC Cable (8.0 mm^2)	188.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	188.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	**INVERTER & CONTROL PANEL**				
H.1	Inverter and Control Panel				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	4.32	CU.M	₱	
I.3	Structure Backfill (Manual)	2.43	CU.M	₱	
I.4	Class "A" Concrete	2.16	CU.M	₱	
I.5	Gravel Blanket	23.02	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
1.7	Painting Works	4.50	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO 4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	74.00	PC	₱	
L.1.2	Installation	74.00	PC	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
M	**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1	Structure Excavation(Manual)	13.69	CU.M	₱	
M.2	Structure Backfill (Manual)	5.14	CU.M	₱	
M.3	Class "A" Concrete	6.28	CU.M	₱	
M.4	Reinforcing Steel Bar				
M.4.1	Furnishing & Stockpilling	501.61	KG	₱	
M.4.2	Cut, Bend and Place	501.61	KG	₱	
M.5	Masonry Works				
M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	34.28	SQ.M	₱	
M.6	Cyclone Chain Wire	103.05	LN.M	₱	
M.7	2" Ø G.I Pipe(sch. 40)	175.20	LN.M	₱	
M.8	Painting Works	10.64	SQ.M	₱	
M.9	Water Proofing	20.00	SQ.M	₱	
M.10	Gravel Blanket	3.31	CU.M	₱	
M.11	Red Oxide Metal Primer	0.27	SQ.M	₱	
N	**CONSTRUCTION OF CONTROL HOUSE**				
N.1	Structure Excavation(Manual)	3.22	CU.M	₱	
N.2	Structure Backfill (Manual)	1.17	CU.M	₱	
N.3	Class "A" Concrete	4.33	CU.M	₱	
N.4	Reinforcing Steel Bar				
N.4.1	Furnishing & Stockpilling	414.25	KG	₱	
N.4.2	Cut, Bend and Place	414.25	KG	₱	
N.5	Masonry Works				
N.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	25.48	SQ.M	₱	
N.6	Painting Works	71.69	SQ.M	₱	
N.7	Water Proofing	12.25	SQ.M	₱	
N.8	Gravel Blanket	1.07	CU.M	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
IV	SOLAR SITE # 4				
A	**CONSTRUCTION OF ONE (1) UNIT 15HP SOLAR PV SUBMERSIBLE PUMPING SYSTEM @ 80M DEPTH**				
A.1	Mobilization and Demobilization, Temporary Facilities and Construction of Safety and Health				
A.1.1	Mobilization and Demobilization	1.00	LS	₱	
A.1.2	Temporary Facilities				
A.1.2.1	Construction of Worker Shed/Bodega (5 x 4 meters)	1.00	LS	₱	
A.1.2.2	Construction of Project Billboard	2.00	UNITS	₱	
B	**CONSTRUCTION SAFETY AND HEALTH PROGRAM**	1.00	LS	₱	
C	**WELL DRILLING**	80.00	LN.M	₱	
D	**WELL CASING AND WELL DEVELOPMENT**				
D.1	Well Development	1.00	UNIT	₱	
D.2	Gravel Pack/Gravel Filter	1.30	CU.M	₱	
D.3	Supply and Delivery of 8" ⌀ uPVC Pipe x 6M	80.00	LN.M	₱	
D.4	Installation of 8" ⌀ uPVC Pipe x 6M	80.00	LN.M	₱	
E	**PUMPING TEST (Specification of pump to be procured is based on the result of pumping test)**				
E.1	Pump Test (Using 10hp Pump)	1.00	LOT	₱	
F	**SUPPLY, DELIVERY AND INSTALLATION OF SUBMERSIBLE PUMP, PIPING & ACCESSORIES**				
F.1	Supply and Delivery				
F.1.1	Submersible Pump (15HP)	1.00	SET	₱	
F.1.2	Flow Meter	1.00	ASSY	₱	
F.1.3	4" Hydraulic Control Valve	1.00	ASSY	₱	
F.1.4	Pipes and Fittings	1.00	LOT	₱	
F.2	Installation				
F.2.1	Installation of Submersible Pump (15HP), Flow Meter, Hydraulic Control Valve, and Pipes and Fittings	1.00	LOT	₱	
G	**SOLAR PANEL**				
G.1	Supply and Delivery				
G.1.1	PV Modules (Solar Panel 600watts)	32.00	PCS	₱	
G.1.2	MC4 Connector	60.00	PAIR	₱	
G.1.3	DC Cable from PV String (1x4 mm^2)	188.00	M	₱	
G.1.4	AC Cable (8.0 mm^2)	188.00	M	₱	
G.1.5	2" ⌀ RSC Conduit	188.00	M	₱	
G.1.6	Grounding	1.00	LOT	₱	
G.2	Installation				
G.2.1	Installation of PV Modules, Conduits, Cables and Accessories	1.00	LOT	₱	
H	**INVERTER & CONTROL PANEL**				
H.1	Inverter and Control Panel				
H.1.1	Supply & Delivery	1.00	LOT	₱	
H.1.2	Installation	1.00	LOT	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
I	**MOUNTING STRUCTURES**				
I.1	Mounting Structure				
I.1.1	Supply ,Delivery and Fabrication	1.00	LOT	₱	
I.1.2	Installation	1.00	LOT	₱	
I.2	Structure Excavation(Manual)	4.32	CU.M	₱	
I.3	Structure Backfill (Manual)	2.43	CU.M	₱	
I.4	Class "A" Concrete	2.16	CU.M	₱	
I.5	Gravel Blanket	23.02	CU.M	₱	
I.6	Reinforcing Steel Bar				
I.6.1	Furnishing & Stockpilling	333.96	KGS	₱	
I.6.2	Cut, Bend and Place	333.96	KGS	₱	
1.7	Painting Works	4.50	SQ.M	₱	
J	**AI SATELLITE ASSISTED MONITORING SYSTEM**				
J.1	AI Satellite Assisted Monitoring System				
J.1.1	Supply & Delivery	1.00	LOT	₱	
J.1.2	Installation	1.00	LOT	₱	
K	**FERTIGATION SYSTEM**				
K.1	Fertigation System & Accessories				
K.1.1	Supply & Delivery	1.00	LOT	₱	
K.1.2	Installation	1.00	LOT	₱	
L	**DISTRIBUTION PIPES**				
L.1	HDPE ISO 4427 SDR 21 2" DIA X 6M				
L.1.1	Supply & Delivery	74.00	PC	₱	
L.1.2	Installation	74.00	PC	₱	
L.2	Pipes and Fittings	1.00	LOT	₱	
L.3	4" Layflat Pipe(including end connectors)				
L.3.1	Supply & Delivery	3.00	ROLL	₱	
L.3.2	Installation	3.00	ROLL	₱	
L.4	3" Layflat Pipe (including end connectors)				
L.4.1	Supply & Delivery	2.00	ROLL	₱	
L.4.2	Installation	2.00	ROLL	₱	
L.5	2" Layflat Pipe (including end connectors)				
L.5.1	Supply & Delivery	2.00	ROLL	₱	
L.5.2	Installation	2.00	ROLL	₱	

ITEM NO.	PAY ITEM DESCRIPTION	QUANTITY AND UNIT		UNIT BID PRICE IN WORDS AND FIGURES	TOTAL AMOUNT IN FIGURES
M	**CONSTRUCTION OF PERIMETER FENCE,STILLING POOL AND NIA LOGO**				
M.1	Structure Excavation(Manual)	13.69	CU.M	₱	
M.2	Structure Backfill (Manual)	5.14	CU.M	₱	
M.3	Class "A" Concrete	6.28	CU.M	₱	
M.4	Reinforcing Steel Bar				
M.4.1	Furnishing & Stockpilling	501.61	KG	₱	
M.4.2	Cut, Bend and Place	501.61	KG	₱	
M.5	Masonry Works				
M.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	34.28	SQ.M	₱	
M.6	Cyclone Chain Wire	103.05	LN.M	₱	
M.7	2" Ø G.I Pipe(sch. 40)	175.20	LN.M	₱	
M.8	Painting Works	10.64	SQ.M	₱	
M.9	Water Proofing	20.00	SQ.M	₱	
M.10	Gravel Blanket	3.31	CU.M	₱	
M.11	Red Oxide Metal Primer	0.27	SQ.M	₱	
N	**CONSTRUCTION OF CONTROL HOUSE**				
N.1	Structure Excavation(Manual)	3.22	CU.M	₱	
N.2	Structure Backfill (Manual)	1.17	CU.M	₱	
N.3	Class "A" Concrete	4.33	CU.M	₱	
N.4	Reinforcing Steel Bar				
N.4.1	Furnishing & Stockpilling	414.25	KG	₱	
N.4.2	Cut, Bend and Place	414.25	KG	₱	
N.5	Masonry Works				
N.5.1	4" thk. CHB (Laying & Plastering of Both Sides)	25.48	SQ.M	₱	
N.6	Painting Works	71.69	SQ.M	₱	
N.7	Water Proofing	12.25	SQ.M	₱	
N.8	Gravel Blanket	1.07	CU.M	₱	
	SUB-TOTAL (CLUSTER I - C: MADRIDEJOS PIP) AMOUNT OF BIDS *(IN WORDS AND IN FIGURES)*			P	
	TOTAL AMOUNT OF BIDS *(IN WORDS AND IN FIGURES)*			P	

THE UNDERSIGNED BIDDER HEREBY CERTIFY THAT HE WAS FULLY INFORMED OF ALL CONDITIONS, LOCAL AND OTHERWISE, AFFECTING THE CARRYING OUT OF THE CONTRACT WORKS AND THAT THIS BID HAS BEEN PREPARED IN STRICT ACCORDANCE WITH THE TERMS AND CONDITIONS OF THE BID DOCUMENTS

NAME OF FIRM

NAME IN PRINT & SIGNATURE OF BIDDER

Section IX LOCAL CONDITION

LC-01 PROJECT LOCATION

CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System is located at Carmen CIS, Toledo City, Talavera PIS, Toledo City and Madridejos PIP, Daanbantayan Cebu.

LC-02 ACCESS TO THE SITE

The contract work is located at Toledo City and Daanbantayan, Cebu. Passing through different service roads by fairly to well graveled road which may deteriorate if used during rainy days. Maintenance and repair of these service roads by the contractor is necessary if so used by them. The cost of maintenance and repair shall be included in the unit bid price of the contractor.

LC-03 FUEL AND POWER SUPPLIES

The major fuel station outlets such as Petron, Caltex and Shell are found in the nearest city of the project and other surrounding municipalities.

The main source of energy is supplied by the National Power Corporation (NPC) and locally distributed by the respective electric cooperatives and is presently available at the above-stated address of the project site.

LC-04 CLIMATOLOGICAL DATA

Cebu is under the tropical rainforest type of world climate which is characterized by a uniform high temperature and heavy precipitation distributed throughout the year. In the northern portion, there is no pronounced maximum rain observed and neither is there a distinct dry season. On the other hand, in the central and southern part, a short dry season, about one to three months was observed but with no pronounced maximum rainfall. Nevertheless, the months of June to December are rainy while January to May are dry months.

LC-05 FIELD CONSTRUCTION CONDITION

The access to the proposed construction site as of this time is passable, however, it would be subjected to the following conditions: difficult access during rainy season and prone to flash floods at any time.

LC-06 TRANSPORTATION AND COMMUNICATION

The project area is accessible by land through concrete roads and highways as well as air

and water transportation through airport and seaport of Cebu.

LC-07 BANKING FACILITIES

Most rural banks are available at nearby cities and municipalities of the project area while major banking facilities are found in Cebu City like; Development Bank of the Philippines, Land Bank of the Philippines, Philippine National Bank and other private banks.

LC-08 COMMUNITY AND FIRST AID FACILITIES

The Contractor is advised that the NIA will take no direct part in providing community facilities such as churches, shops, community center and recreation facilities for Contractor's employees. The Contractor shall make his own arrangements for such as he considers being necessary for the approval of the NIA and shall meet all codes or regulations in effect. It shall be the responsibility of the Contractor to furnish and operate first aid for his personnel. Such facilities may be integrated with the NIA facilities, if any, upon mutual agreement.

LC-09 CONTRACTOR'S CAMP AND WORKING AREA

The Contractor shall negotiate and secure the site for his Construction Camp and Office, working area for storage, workshop, warehouse, etc., the cost of which is considered included in his bid price under Temporary Facilities in the Bill of Quantities. The Contractor shall submit within fifteen (15) calendar days after receipt of the Notice to Proceed a detailed plan showing the areas he has secured for his use for the duration of Contract Work. The area in square meters and proposed usage shall be indicated.

Except for payment of Contractor's Temporary Works and Mobilization of Construction Equipment provided in the Bill of Quantities, the Contractor shall at his own expense, operate and maintain areas, buildings, warehouses, shops and other facilities necessary for the execution of the contract work and for the safe storage of materials and equipment. Materials subject to deterioration from exposure to the weather shall be stored in weather-tight storage sheds or container having adequate capacity to enable the contract work to proceed in accordance with the construction program. Supplies of gasoline, fuel, oils or other petroleum products if stored above the ground in tanks of more than 500 liters in capacity, shall not be located within 100 meters of any structure.

The Contractor shall be responsible for all his construction equipment, materials, supplies and other incidentals and the cost incurred for their protection shall be borne by him.

The Contractor shall submit for approval by the NIA his detailed plans of the camp and working areas that he proposes to construct, including his proposals for water and power supplies and sewage facilities. The layout of such facilities shall consider the existing NIA installation, if any, and shall be properly connected to these, if so required, all to the satisfaction of the NIA. The Contractor shall comply with all laws, proclamation, decrees and regulations of the Republic of the Philippines, or any subdivision thereof which affect the building, maintenance or operation of the Contractor's Camp and shall be responsible for any damage or claim resulting from

inadequate or improper facilities.

Expensive or permanent type of construction will not be required but all buildings shall be substantial in construction and shall have a reasonably attractive appearance. No flimsy barong-barong or shanties will be permitted.

The Contractor shall provide his own security force to the extent he deems necessary for maintaining peace and order in the camp and work areas and for safeguarding materials and equipment at the site. Nothing under the provisions of this paragraph shall relieve the Contractor from full responsibility for the maintenance of peace and order and the protection of life and property in all areas wherein he operates. The cost for providing security shall be included in the bid prices for the various items of work in the Bill of Quantities.

No direct payment will be made to the Contractor for the operation and maintenance of the Camp and Office and the entire cost thereof shall be included in the bid prices for the various items of work in the Bill of Quantities.

LC-10 SITE INVESTIGATION

It is the responsibility of the Contractor to visit the work site to make their own investigation to satisfy themselves as to the existing conditions affecting the work to be done under these Specifications.

The Contractor shall assume all responsibilities for deduction and conclusions that he may obtain or arrive at from the site inspection.

INFORMATION AND DATA REFERRED TO IN THESE BID DOCUMENTS

PROJECT: **CLUSTER 1: Construction & Installation of Solar Powered Pump Irrigation Projects with AI Satellite-Assisted Monitoring and Fertigation System**

1. Site Visit and Inspection

   Register at NIA, Bohol-Cebu-Siquijor IMO (Cebu Office), Gov. M. Cuenco Ave., Banilad, Cebu City.

2. Wet Season Period, Article LC-04

3. Contract Duration, Article SCC 1.16, ITB

   180 calendar days

4. List of Officers/Offices to be furnished correspondence from the Contractor

   The Regional Manager
   NIA Regional Office 7
   Dao District, Tagbilaran City

5. Minimum Equipment Requirement for the Contract:

Equipment		Capacity	Number of Units
1.	Drilling Rig (Rotary Type)		2
2.	Compressor	(160cfm)	2
3.	Generator Set	(≥ 25 kVA)	2
4.	Submersible Pump (for pump testing)	10HP/15HP	2
5.	Cargo Truck/Dump Truck	6x6 / 4cu.m.	2
6.	Welding Machine	300A	2
7.	Concrete Mixer	One-Bagger	2
8.	Concrete Cylinder Mould		12
9.	Bar Cutter		2
10.	Cut-off Machine (14” diameter)		2
11.	Butt Fusion Machine (2” diameter)		2
12.	Geo-resistivity Machine (Multi-electrode)		2

6. List of Initial Equipment required to be mobilized within ten (10) calendar days after receipt of Notice to Proceed

Equipment		Capacity	Number of Units
1.	Drilling Rig (Rotary Type)		2
2.	Compressor	(160cfm)	2
3.	Generator Set	(≥ 25 kVA)	2
4.	Submersible Pump (for pump testing)	10HP/15HP	2
5.	Cargo Truck/Dump Truck	6x6 / 4cu.m.	2
6.	Welding Machine	300A	2
7.	Concrete Mixer	One-Bagger	2
8.	Concrete Cylinder Mould		12
9.	Bar Cutter		2
10.	Cut-off Machine (14" diameter)		2
11.	Butt Fusion Machine (2" diameter)		2
12.	Geo-resistivity Machine (Multi-electrode)		2

Section X. Checklist of Technical and Financial Documents

Checklist of Technical and Financial Documents

I. TECHNICAL COMPONENT ENVELOPE

Class "A" Documents

Legal Documents

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

Technical Documents

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

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

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

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

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

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

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

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

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

Financial Documents

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

Class "B" Documents

☐ (i) If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence;

or

duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.

II. FINANCIAL COMPONENT ENVELOPE

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

Other documentary requirements under RA No. 9184

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

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

☐ (m) Cash Flow by Quarter.

Section X. BIDDING FORMS

National Irrigation Administration
Boho-Cebu-Siquijor IMO (Cebu
Office)

STATEMENT OF THE BIDDERS OF ALL ITS ONGOING GOVERNMENT & PRIVATE CONTRACTS INCLUDING CONTRACTS AWARDED BUT NOT YET STARTED

Business Name : _____
Business Address : _____

NAME OF CONTRACT	CONTRACT DATE	CONTRACT PERIOD	CONTRACT AMOUNT	Amount or Value of Outstanding Works or Unperformed Portion
Government				
Private				

Submitted by : _____
(Printed Name & Signature)
Designation : _____
Date : _____

National Irrigation Administration
Bohol-Cebu-Siquijor IMO (Cebu
Office)

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

Business Name : _____

Business Address : _____

NAME OF COMPLETED CONTRACT	DATE OF CONTRACT	CONTRACT DURATION	CONTRACT AMOUNT
Government			
Private			

Note: This statement shall be supported with:

Owner's Certificate of Final Acceptance or a final rating of at least Satisfactory in the CPES

Submitted by : _____

(Printed Name & Signature)

Designation : _____

Date : _____

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

BID SECURING DECLARATION
Project Identification No.: BCSIMOCO-LMC-09-2K24

To: [Insert name and address of the Procuring Entity]

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid Securing Declaration.
2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any procurement contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of the written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1(f),of the IRR of RA No. 9184; without prejudice to other legal action the government may undertake.
3. I/We understand that this Bid Securing Declaration shall cease to be valid on the following circumstances:
   a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
   b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right; and
   c. I am/we are declared the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

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

[Insert NAME OF BIDDER OR ITS AUTHORIZED REPRESENTATIVE]
[Insert signatory's legal capacity]
Affiant

[Jurat]

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

LIST OF CONTRACTOR'S EQUIPMENT PLEDGE TO THE CONTRACT TO BE BID.

CONTRACT No. _____

NAME OF CONTRACT: _____

Name of Equipment	Unit	Plate No./Model	Motor No./Body No./Engine No.	Proof of Ownership	Present Location	Remarks

Submitted by :

_____

(Name of Contractor & Signature)

_____

(Name of Firm)

Date: _____

Omnibus Sworn Statement

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

AFFIDAVIT

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

1. [Select one, delete the other:]
   [If a sole proprietorship:] I am the sole proprietor or authorized representative of [Name of Bidder] with office address at [address of Bidder];

   [If a partnership, corporation, cooperative, or joint venture:] I am the duly authorized and designated representative of [Name of Bidder] with office address at [address of Bidder];

2. [Select one, delete the other:]

   [If a sole proprietorship:] As the owner and sole proprietor, or authorized representative of [Name of Bidder], I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached duly notarized Special Power of Attorney;

   [If a partnership, corporation, cooperative, or joint venture:] I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached [state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, whichever is applicable;)];

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

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

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

6. [Select one, delete the rest:]

[If a sole proprietorship:] The owner or sole proprietor is not related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

[If a partnership or cooperative:] None of the officers and members of [Name of Bidder] is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

[If a corporation or joint venture:] None of the officers, directors, and controlling stockholders of [Name of Bidder] is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

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

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

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

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

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

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

[Insert NAME OF BIDDER OR ITS
AUTHORIZED REPRESENTATIVE]
[Insert signatory's legal capacity]
Affiant

[Jurat]

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

BID FORM

Date : _____

Project Identification No. : BCSIMOCO-LMC-09-2K24

To: [name and address of Procuring Entity]

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

a. We have no reservation to the PBDs, including the Supplemental or Bid Bulletins, for the Procurement Project: [insert name of contract];

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

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

d. The discounts offered and the methodology for their application are: [insert information];

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

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

g. If our Bid is accepted, we commit to obtain a Performance Security in the amount of [insert percentage amount] percent of the Contract Price for the due performance of the Contract, or a Performance Securing Declaration in lieu of the allowable forms of Performance Security, subject to the terms and conditions of issued GPPB guidelines[12] for this purpose;

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

i. We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed; and

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

k. We likewise certify/confirm that the undersigned, is the duly authorized representative of the bidder, and granted full power and authority to do, execute and perform any and

all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for the [Name of Project] of the [Name of the Procuring Entity].

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

Name: _____
Legal Capacity: _____
Signature: _____
Duly authorized to sign the Bid for and behalf of: _____
Date: _____

DETAILED COST ESTIMATE

Contract No. :

Name of Project :

DERIVATION OF UNIT COST				Unit	
				Quantity	
Item No. :					
Work Description :					
DESCRIPTION	QTY	UNIT	UNIT COST	AMOUNT	
A. ESTIMATED DIRECT COST (EDC)					
1. MATERIAL COST					
TOTAL MATERIAL COST:					
2. LABOR COST					
TOTAL LABOR COST:					
3. EQUIPMENT COST					
TOTAL EQUIPMENT COST:					
TOTAL A (Estimated Direct Cost):					
B. MARK - UPS					
OCM					
Contractor's Profit					
TOTAL B (OCM and Contractor's Profit):					
C. VALUE ADDED TAX (VAT)					
TOTAL C (VAT) (12% of A and B):					
TOTAL COST OF WORK ITEM (Sum of A, B and C)					
UNIT COST (Total Cost of Work Item/Quantity)					

ESTIMATED DIRECT COST (EDC)	INDIRECT COST % FOR OCM AND PROFIT		TOTAL INDIRECT COST % FOR OCM AND PROFIT
	OCM (% OF EDC)	PROFIT (% OF EDC)	
Up to Php 5 Million	15	10	25
Above Php 5M up to Php 50M	12	8	20
Above Php 50M up to Php 150M	10	8	18
Above Php 150M	8	8	16

OCM - Overhead, Contingencies and Miscellaneous

VAT COMPONENT - shall be **12%** of the sum of EDC, OCM and Profit

Regional Irrigation Office 7
National Irrigation Administration

Contract No. :
Name of Contract :
Address :
Calendar Days :

CASH FLOW AND PAYMENT SCHEDULE

PARTICULAR	% WT.	QTR	1st QUARTER			2ND QUARTER			3RD QUARTER			4TH QUARTER		
		MO.	1	2	3	4	5	6	7	8	9	10	11	12
		CD	30	60	90	120	150	180	210	240	270	300	330	360
ACCOMPLISHMENT (%)														
CASH FLOW (P)														
CUMULATIVE ACCOMPLISHMENT (%)														
CUMULATIVE CASH FLOW (P)														

Submitted by:

_____
Name and Signature

Date:

_____
Name of Firm