

**REPUBLIC OF THE PHILIPPINES  
NAVAL WATER DISTRICT  
Castin Street, Naval, Biliran**

## **Procurement of**

**“DESIGN AND BUILD” CONTRACT FOR  
THE CONSTRUCTION OF WATER SUPPLY SYSTEM  
PROJECT FOR ALMERIA, BILIRAN AND CAIBIRAN  
(BILIRAN) FOR NHA PERMANENT RESETTLEMENT  
SITES IN YOLANDA AFFECTED  
WATER DISTRICTS AND MUNICIPALITIES**

**BIDDING DOCUMENTS  
(Volume I)**

**November 2021**

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# ***Glossary of Terms, Abbreviations, and Acronyms***

**ABC** – Approved Budget for the Contract.

**ARCC** – Allowable Range of Contract Cost.

**BAC** – Bids and Awards Committee.

**BDS** – Bid Data Sheet

**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.

**DBS** – Design and Build Scheme

**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])

**IB** -Invitation to Bid

**ITB**- Instruction to Bidders

**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.

**SCC**- Special Conditions of the Contract

**SEC** – Securities and Exchange Commission.

**SLCC** – Single Largest Completed Contract.

**UN** – United Nations.

**Section I. Invitation to Apply for Eligibility and to Bid (IAEB)**



**NAVAL WATER DISTRICT**  
Castin Street, Naval  
Province of Biliran, 6560  
Tel. No. (053) 500-9910 / (053) 500-9031

PROJECT REFERENCE NO. NWD INFRA – 2021-01

## Invitation to Apply for Eligibility and to Bid (IAEB)

### *Procurement Of*

#### **“DESIGN AND BUILD” CONTRACT FOR THE CONSTRUCTION OF WATER SUPPLY SYSTEM PROJECT FOR ALMERIA, BILIRAN AND CAIBIRAN (BILIRAN) FOR NHA PERMANENT RESETTLEMENT SITES IN YOLANDA AFFECTED WATER DISTRICTS AND MUNICIPALITIES**

##### **PROJECT DESCRIPTION/OBJECTIVE:**

The Naval Water District through the Republic Act (R.A.) No. 10633 (FY 2014 GAA) and appropriation for LWUA under R.A. No. 10717 (FY 2016 GAA), to finance the water supply needs of NHA Permanent Resettlement Areas in Yolanda Affected Water Districts and Municipalities from the Government of the Republic of the Philippines. The Design and Build Scheme work items are the preparation of design/specifications, supply, delivery, installation, testing and commissioning of reinforced concrete intake box, installation of pipelines (valves, fittings, appurtenances and break pressure chamber), storage facilities (reinforced concrete ground reservoir), treatment facilities and water meters. The Naval Water District, intends to apply the sum of **Thirty Million Sixty Five Thousand Eight Hundred Thirty & 97/100 Pesos (PHP 30,065,830.97)** being the Approved Budget for the Contract (ABC) to payments under the contract for the procurement of **“Design and Build” For The Construction of Water Supply System For Almeria, Biliran, and Caibiran (Biliran) For NHA Permanent Resettlement Site in Yolanda Affected Water Districts and Municipalities.** Bids received in excess of the ABC shall be automatically rejected at bid opening.

1. The Naval Water District now invites bids for the above Procurement Project. Completion of the Works is required in **Two Hundred Forty (240) 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 (Instructions to Bidders).
2. 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.
3. The project shall adopt a Two-Stage Bidding Process as follows: 1.) Eligibility Check/Shortlisting Process, and 2.) Actual Bid Proposal Submission and Opening. The list of Eligibility Requirements and Sample Forms are available from the BAC Secretariat under Ms. Rena S. Ejorçadas.
4. The interested bidders may submit their Letters of Intent and the necessary Eligibility Requirements on or before **November 19, 2021, 11:00 A.M.** at NWD Office. The BAC shall hold an Eligibility Check and Screening on **November 19, 2021, 2:00 P.M** at NWD Board Room.



5. Only Eligible Bidders may attend and participate in the Pre-Bid Conference on **November 24, 2021, 9:00 A.M** at NWD Board Room.
6. The prospective bidders who found to be eligible can purchase the Bid Documents. The complete set of Bidding Documents may be acquired by eligible bidders upon payment of the applicable fee for the Bidding Documents, pursuant to the latest Guidelines issued by the GPPB, in the amount of **Twenty Five Thousand Pesos (Php 25,000.00)**. The Procuring Entity shall allow the bidder to present its proof of payment for the fees in person, by facsimile, or through electronic means.  
  
It may also be downloaded from the website of Naval Water District ([www.navalwd.gov.ph](http://www.navalwd.gov.ph)) and the Philippine Government Electronic Procurement System (PhilGEPS), provided that Bidders shall pay the nonrefundable fee for the Bidding Documents not later than the submission of their bids.
7. Bids must be duly received by the BAC Secretariat through manual submission at the office address as indicated below, on or **before December 6, 2021, 11:00 A.M.** 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 16.
9. Bid opening shall be on **December 6, 2021, 2:00 P.M.** at the NWD Board Room. Bids will be opened in the presence of the bidders' representatives who choose to attend the activity.
10. The Naval Water District 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. The bidders are requested to submit triplicate copies of the 1<sup>st</sup> and 2<sup>nd</sup> envelopes of the proposals.
12. For the detailed evaluation of the design and build proposals, a two-step procedure shall be adopted by the BAC as specified in "Annex G" of the 2016 Revised IRR of RA 9184:

**First Step Procedure:**

1. Review of the preliminary conceptual designs and track record submitted by the contractor as indicated in the Bidding Documents using a non-discretionary "pass/fail" criteria that involve compliance with the following requirements:
  - a. Adherence of the preliminary design plans to the required performance specifications and parameters and degree of details;
  - b. Concept of approach and methodology for detailed engineering design and construction with emphasis on the clarity, feasibility, innovativeness and comprehensiveness of the plan approach, and the quality of interpretation of project problems, risks, and suggested solutions; and
  - c. Quality of personnel to be assigned to the project which covers suitability of key staff to perform the duties of the particular assignments and general qualifications and competence including education and training of the key staff.
2. For complex or unique undertakings, such as those involving highly specialized or advanced engineering technology, eligible bidders may be required, at the option of the agency concerned, to make an oral presentation within fifteen (15) calendar days after the deadline for submission of technical proposals.

**Second-Step Procedure:**

Only those bids that passed the above criteria shall be subjected to the second step of evaluation.

The BAC shall open the financial proposal of each “passed” bidder and shall evaluate it using non-discretionary criteria – including arithmetical corrections for computational errors – as stated in the Bidding Documents, and thus determine the correct total calculated bid prices. The BAC shall automatically disqualify any total calculated bid price which exceeds the ABC. The total calculated bid prices (not exceeding the ABC) shall be ranked, in ascending order, from lowest to highest. The bid with the lowest total calculated bid price shall be identified as the Lowest Calculated Bid (LCB).

13. For further information, please refer to:

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**RENA S. EJORCADAS**

Bids and Award Committee Secretariat

Naval Water District

Castin St. Naval, Biliran Province, 6560

Tel No. ( 053 ) 500-9031, 500-9916

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**ENGR. MARK S. SERENO**

BAC Chairman

## ***Section II. Instructions to Bidders***

## 1. Scope of Bid

The Procuring Entity, through Naval Water District BAC invites Bids for the procurement of **“Design and Build” for the Construction of Water Supply System for Almeria, Biliran, and Caibiran (Biliran) For NHA Permanent Resettlement Site in Yolanda Affected Water Districts and Municipalities.** Bids with Project Identification Number **NWD-INFRA-2021-001.**

The Procurement Project (referred to herein as “Project”) is for the Design and Build Works, as described in Section VI (Specifications).

## 2. Funding Information

2.1. The Government of the Philippines (GOP) through the Local Water Utilities Administration (LWUA) in the amount of Thirty Three Million Five Hundred Forty Thousand Pesos (PHP33,540,000.00). The breakdown are as follows:

(Pabahay Phase 1 and Pabahay Phase 2) Almeria, Biliran	PHP 7,930,000.00
(San Antonio Village and Divine Grace Village) Biliran, Biliran	PHP13,137,000.00
(Vista Del Mar and Jade Crowne Meadows) Caibiran, Biliran	PHP <u>12,473,000.00</u>

**TOTAL PHP 33,540,000.00**

2.2. The source of funding is:

Republic Act (R.A.) No. 10633 (FY 2014 GAA) and appropriation for LWUA under R.A. No. 10717 (FY 2016 GAA).

## 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. *[If Procuring Entity has determined that subcontracting is allowed during the bidding, state:]*The Bidder must submit together with its Bid the documentary requirements of the subcontractor(s) complying with the eligibility criteria stated in **ITB** Clause 5 in accordance with Section 23.4 of the 2016 revised IRR of RA No. 9184 pursuant to Section 23.1 thereof.
- 7.2. *[If subcontracting is allowed during the contract implementation stage, state:]* The Supplier may identify its subcontractor during the contract implementation stage. Subcontractors identified during the bidding may be changed during the implementation of this Contract. Subcontractors must submit the documentary requirements under Section 23.1 of the 2016 revised IRR of RA No. 9184 and comply with the eligibility criteria specified in **ITB** Clause 5 to the implementing or end-user unit.
- 7.3. Subcontracting of any portion of the Project does not relieve the Contractor of any liability or obligation under the Contract. The Supplier will be responsible for the acts, defaults, and negligence of any subcontractor, its agents, servants, or workmen as fully as if these were the Contractor's own acts, defaults, or negligence, or those of its agents, servants, or workmen.

## **8. Pre-Bid Conference**

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

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

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

## **10. Documents Comprising the Bid: Eligibility and Technical Components**

- 10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in **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:*

Philippine Pesos.

a. *[indicate currency if procurement involves a foreign-denominated bid as allowed by the Procuring Entity, which shall be tradeable or acceptable by the BSP.]*

### **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 for one hundred twenty (120) calendar days from the date of the opening of the bids. Any bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

### **16. Sealing and Marking of Bids**

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

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

If the Procuring Entity allows the submission of bids through online submission to the given website or any other electronic means, the Bidder shall submit an electronic copy of its Bid, which must be digitally signed. An electronic copy that



cannot be opened or is corrupted shall be considered non-responsive and, thus, automatically disqualified.

## **17. Deadline for Submission of Bids**

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

## **18. Opening and Preliminary Examination of Bids**

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

ITB Clause																																																																			
5.2	For this purpose, contracts similar to the Project refer to contracts which have the same major categories of work, which shall be: “Design and Build Scheme” for water supply construction and related works.																																																																		
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10.3	<b>Valid PCAB license and registration: License Category – at least Category B: Size Range: Medium A – Water Supply Facilities, in accordance with PCAB Board Circular No. 201 Series of 2017</b>																																																																		
10.4	<p>A minimum of <b>three (3) years of work experience</b> is required for herein key personnel to be engaged/provided by the contractor:</p> <p><b>MINIMUM CONTRACTOR’S TEAM COMPOSITION/MANPOWER NETWORK:</b></p> <table border="1" style="width: 100%; border-collapse: collapse; margin-left: 20px;"> <thead> <tr> <th style="width: 50%;">Key Personnel</th> <th style="width: 15%;">Number /Gender</th> <th style="width: 15%;">General Experience</th> <th style="width: 15%;">Relevant Experience</th> </tr> </thead> <tbody> <tr> <td colspan="4"><b>DESIGN TEAM</b></td> </tr> <tr> <td>Project Manager</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Project Design Engineer (Civil)</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Project Design Engineer (Electrical or Mechanical)</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Engineering Assistant/Draftsman</td> <td style="text-align: center;">1</td> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> </tr> <tr> <td colspan="4"><b>CONSTRUCTION TEAM</b></td> </tr> <tr> <td>Project Manager</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Project Engineer/Civil works</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Materials Engineer</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Environment, Health and Safety Officer</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td colspan="4"><b>WELL COSTRUCTION TEAM</b></td> </tr> <tr> <td>Chief Driller</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Assistant Driller/Welder</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Driver</td> <td style="text-align: center;">1</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Local hire</td> <td style="text-align: center;">2</td> <td></td> <td></td> </tr> </tbody> </table>			Key Personnel	Number /Gender	General Experience	Relevant Experience	<b>DESIGN TEAM</b>				Project Manager	1	5	3	Project Design Engineer (Civil)	1	5	3	Project Design Engineer (Electrical or Mechanical)	1	5	3	Engineering Assistant/Draftsman	1	3	3	<b>CONSTRUCTION TEAM</b>				Project Manager	1	5	3	Project Engineer/Civil works	1	5	3	Materials Engineer	1	5	3	Environment, Health and Safety Officer	1	5	3	<b>WELL COSTRUCTION TEAM</b>				Chief Driller	1	5	3	Assistant Driller/Welder	1	5	3	Driver	1	5	3	Local hire	2		
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	Concrete Mixer	1 or 2 bagger	1
	Concrete Vibrator	30mm diameter	1
	Concrete Cutter		1
	Hydraulic Jack hammer		1
	Bar cutter		1
	Compressor		1
	Mechanical Tool Set		1
	Portable Concrete Drill Set		1
	Mobile Generator Set	30 KVA	1
	Welding Set/Oxy-Acetylene set		1
12	No further instructions.		
15.1	<p>The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts:</p> <p>a. The amount of not less than <b>PHP601,316.62 (2% of ABC)</b>, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit;</p> <p>b. The amount of not less than <b>PHP1,503,291.55 [5% of ABC]</b> if bid security is in Surety Bond.</p>		
19.2	Partial bid is not allowed. The infrastructure project is packaged in a single lot and the lot shall not be divided into sub-lots for the purpose of bidding, evaluation, and contract award.		
20	<i>No further instruction</i>		
21	<p>The following additional contract documents relevant to the Project are required:</p> <ol style="list-style-type: none"> <li>1. Construction Schedule and S-curve;</li> <li>2. Manpower Schedule;</li> <li>3. Construction Methods;</li> <li>4. Equipment Utilization Schedule;</li> <li>5. Construction Safety and Health Program approved by the Department of Labor and Employment;</li> <li>6. Health and Safety Measures as stated in Department of Public Works (DPWH) Order No.39 "Revised Construction Guidelines for the Implementation of Infrastructure Projects During the COVID-19 Public Health Crisis"</li> <li>7. PERT/CPM Network</li> <li>8. Other Materials and Equipment Details</li> <li>9. After Sales Service and Parts</li> <li>10. Site Investigation/Inspection Report</li> <li>11. Design Reports (including Structural Design Analysis/Computations)</li> <li>12. Gender and Development Action Plan</li> </ol>		

## ***Section IV. General Conditions of Contract***

## 1. Scope of Contract

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

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

## 2. Sectional Completion of Works

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

## 3. Possession of Site

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

## 4. The Contractor's Obligations

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

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

## **5. Performance Security**

5.1. Within ten (10) calendar days from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR.

5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

## **6. Site Investigation Reports**

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

## **7. Warranty**

7.1. In case the Contractor fails to undertake the repair works under Section 62.2.2 of the 2016 revised IRR, the Procuring Entity shall forfeit its performance security, subject its property(ies) to attachment or garnishment proceedings, and perpetually disqualify it from participating in any public bidding. All payables of the GOP in his favor shall be offset to recover the costs.

7.2. The warranty against Structural Defects/Failures, except that occasioned-on force majeure, shall cover the period from the date of issuance of the Certificate of Final Acceptance by the Procuring Entity. Specific duration of the warranty is found in the **SCC**.

## **8. Liability of the Contractor**

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

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



## 9. Termination for Other Causes

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

## 10. Dayworks

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

## 11. Program of Work

11.1. The Contractor shall submit to the Procuring Entity's Representative for approval the said Program of Work showing the general methods, arrangements, order, and timing for all the activities in the Works. The submissions of the Program of Work are indicated in the **SCC**.

11.2. The Contractor shall submit to the Procuring Entity's Representative for approval an updated Program of Work at intervals no longer than the period stated in the **SCC**. If the Contractor does not submit an updated Program of Work within this period, the Procuring Entity's Representative may withhold the amount stated in the **SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program of Work has been submitted.

## 12. Instructions, Inspections and Audits

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

## 13. Advance Payment

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

## **14. Progress Payments**

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

## **15. Operating and Maintenance Manuals**

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

## ***Section V. Special Conditions of Contract***

## Special Conditions of Contract

GCC Clause	
2	<p>The <b>Intended Completion Date</b> is <b>Two Hundred Forty (240) Calendar Days</b> upon receipt of the formal Notice to Proceed (NTP).</p> <p><b><i>NOTE: The contract duration shall be reckoned from the start date and not from contract effectivity date.</i></b></p>
3.1	The <b>Procuring Entity</b> shall give possession of all parts of the Sites to the Contractor at the start of the project.
6	The bidders shall be responsible in securing site investigation reports.
7.2	<p>In case of permanent structures, such as buildings of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron, or concrete which comply with relevant structural codes (e.g., DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnels, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures: Fifteen (15) years.</p> <p>In case of semi-permanent structures, such as buildings of types 1, 2, and 3 as classified under the National Building Code of the Philippines, concrete/asphalt roads, concrete river control, drainage, irrigation lined canals, river landing, deep wells, rock causeway, pedestrian overpass, and other similar semi-permanent structures: Five (5) years.</p> <p>In case of other structures, such as Bailey and wooden bridges, shallow wells, spring developments, and other similar structures: Two (2) years.</p>
8	No further instruction.
10	No dayworks are applicable to the contract.
11.1	The Contractor shall submit a detailed Program of Work of the Project within <b>fourteen (14) calendar days</b> after submission and approval of the final detailed engineering design by the water district.
11.2	<p>The period between Program of Work updates is <b>ninety (90) calendar days</b>.</p> <p>The amount to be withheld for late submission of an updated Program of Work is <b>₱50,000.00</b>.</p>
13	The amount of the advance payment is Fifteen (15%) Percent of the Contract Price. Recoupment shall start upon 20% accomplishment of the project.
14	Non-perishable materials such as pipes, deformed bars, treatment

	facilities, equipment, etc. delivered and accepted but not installed may be included for payment as Materials on Hand in accordance with Clause 5.9- Partial Payment, Volume II – LWUA Standard Specifications for Water System Construction.
15.1	<p>The date by which operating and maintenance manuals are required is upon completion of the project/issuance of certificate of completion of works.</p> <p>The date by which “as built” drawings are required is upon completion of the works/project.</p>
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 ₱50,000.00 each day of delay.

***Section VI. Terms of Reference/Technical Specifications***

# TERMS OF REFERENCE (TOR)

Procurement of

## **“DESIGN AND BUILD” CONTRACT FOR THE CONSTRUCTION OF WATER SUPPLY SYSTEM PROJECT FOR ALMERIA, BILIRAN AND CAIBIRAN (BILIRAN) FOR NHA PERMANENT RESETTLEMENT SITES IN YOLANDA AFFECTED WATER DISTRICTS AND MUNICIPALITIES**

### **I. THE PROPOSED PROJECT**

The Naval Water District is seeking a suitable qualified candidate or firm to carry out a contract for the design and construction of a water supply system project utilizing the most appropriate method and technology.

The contractual arrangement to be used for this project are: Design-and-Build Scheme (DBS) for Almeria the work items are as follows: reinforced concrete intake box, transmission pipelines (valves, fittings, appurtenances and break pressure chamber), treatment facility and storage facility (reinforced concrete ground reservoir), for Biliran the works items are as follows: reinforced concrete intake box, transmission pipelines (valves, fittings, appurtenances and break pressure chamber), storage facility (reinforced concrete ground reservoir), water meters and treatment facility and for Caibiran the work items are as follows: reinforced concrete intake box, transmission pipelines (valves, fittings, appurtenances and break pressure chamber), treatment facility, storage facility (reinforced concrete ground reservoir) and water meters.

The procuring entity awards all parts of the project to a single contract to a single firm, partnership, corporation, joint venture or consortium.

The following scheme is proposed as the Conceptual Design and should become the basis by the Contractor/Consultant of the Detailed Design:

#### **1.0 Almeria, Biliran (Site 1 and Site 2, Brgy. Jaramowan)**

The NHA Pabahay Phase 1 and Pabahay Phase 2 has a total number of 524 and 405 housing units respectively. The coordinates of Pabahay Phase 1 and Phase 2 are as follows:

Latitude 11<sup>0</sup>36'33.17" N  
Longitude 124<sup>0</sup>23'41.48" E  
Elevation 65.0 M

Latitude 11<sup>0</sup>36'22.96" N  
Longitude 124<sup>0</sup>23'9.46" E  
Elevation 27.0 M

#### **1.1 Spring Source Development**

Construction of a reinforced concrete intake box with measurement of 3.0 m x 3.0 m x 3.0 m in Brgy Iyusan. The spring is a combined source for the two (2) NHA sites in Brgy. Jamorawon with an estimated reported discharge of 11.0 L/s. Iyusan Spring located in Brgy. Iyusan with coordinates:

Latitude 11<sup>0</sup>37'21.792" N  
Longitude 124<sup>0</sup>24'58.14" E  
Elevation 164.0 M

Latitude 11<sup>0</sup>37'19.42" N  
Longitude 124<sup>0</sup>24'53.24" E  
Elevation 148.0 M

Proposed Intake Box  
Latitude 11<sup>0</sup>37'18.80" N  
Longitude 124<sup>0</sup>24'53.96" E  
Elevation 143.0 M

## **1.2 Pipelines (Valves, Fittings, Appurtenances and Break Pressure Chamber)**

Installation of approximately 4,335 LM transmission lines will be installed from the proposed intake box located in Brgy Iyusan to the proposed storage facility and to the two (2) NHA sites in Brgy. Jamorawon. Pipe diameters shall be finalized after the completion of the proposed source.

Cost under this item covers materials and labor inclusive of pipe laying, excavation, backfilling and sand bedding. The cost also includes provision for fittings, valves, pipe crossings and other appurtenances and break pressure chamber. Costs for pavement demolition and surface restoration are likewise included in this item.

The proposed pipeline will be interconnected to the existing pipelines at the entrance of Pabahay Phase 1 and Pabahay Phase 2.

## **1.3 Treatment Facility**

The proposed source will be equipped with a chlorinating equipment and its accessories.

## **1.4 Reinforced Concrete Ground Reservoir**

The design and construction of a reinforced concrete ground reservoir with a volume of 63.20 m<sup>3</sup> will be constructed in Brgy. Jamorawon, Almeria, Biliran.

## **2.0 Biliran, Biliran (San Antonio Village, Brgy. Villa Enage and Divine Grace Village, Brgy. Burabod)**



The NHA San Antonio Village and Divine Grace Village has a total number of 816 and 449 housing units respectively. The coordinates of San Antonio Village and Divine Grace Village are as follows:

Latitude  $11^{\circ}28'17.95''$  N

Longitude  $124^{\circ}29'10.25''$  E

Elevation 22.0 M

Latitude  $11^{\circ}24'26.82''$  N

Longitude  $124^{\circ}28'29.5''$  E

Elevation 73.0 M

## **2.1 Spring Source Development**

Design and Construction of a reinforced concrete intake box with measurement of 4.0 m x 4.0 m x 3.931 m in Brgy. Canila. The spring has an estimated reported discharge of 10.4 Lps located in Brgy. Canila with coordinates:

Latitude  $11^{\circ}30'02.52''$  N

Longitude  $124^{\circ}29'25.18''$  E

Elevation 153 M

## **2.2 Pipelines (Valves, Fittings, Appurtenances and Break Pressure Chamber)**

Installation of approximately 5,820 LM transmission lines will be installed from the proposed intake box located in Brgy. Canila to the proposed storage facility and to the two (2) NHA sites in Brgys. Burabod and Villa Enage. Pipe diameters shall be finalized after the completion of the proposed source.

Cost under this item covers materials and labor inclusive of pipe laying, excavation, backfilling and sand bedding. The cost also includes provision for fittings, valves, pipe crossings and other appurtenances and break pressure chamber. Costs for pavement demolition and surface restoration are likewise included in this item.

The proposed pipeline will be interconnected to the existing pipelines at the entrance of San Antonio Village and Divine Grace Village.

## **2.3 Reinforced Concrete Ground Reservoir**

The design and construction of a reinforced concrete ground reservoir with a volume of  $100\text{ m}^3$  will be constructed in Brgy. Burabod & Villa Enage, Biliran, Biliran.

## **2.4 Water Meters**

Provision and installation of 1,265 water meters. Please refer to the revised LWUA Standard Specifications for Water Supply System Construction (Volume II).

## **2.5 Treatment Facility**

The proposed source will be equipped with a chlorinating equipment and its accessories.

## **3.0 Caibiran, Biliran (Jade Crowne Meadows and Vista Del Mar, Brgy. Cabibihan)**

The NHA Vista Del Mar and Jade Crowne Meadows a total number of 522 and 989 housing units respectively. The coordinates of Vista Del Mar and Jade Crowne Meadows are as follows:

Latitude  $11^{\circ}34'41.03''$  N

Longitude  $124^{\circ}32'59.88''$  E

Elevation 37.0- 41.0 M

Latitude  $11^{\circ}35'2.29''$  N

Longitude  $124^{\circ}32'53.94''$  E

Elevation 41.0- 66.0 M

## **3.1 Spring Source Development**

Construction of a reinforced concrete intake box with a measurement of 3.0 m x 3.0 m x 3.0 m in Sitio Calawing, Brgy. Maurang. The spring source has an estimated reported discharge of 12.0 L/s located in Sitio Calawing, Brgy. Maurang with coordinates:

Latitude  $11^{\circ}32'45.90''$  N

Longitude  $124^{\circ}33'30.90''$  E

Elevation 259.0 M

## **3.2 Pipelines (Valves, Fittings, Appurtenances and Break Pressure Chamber)**

Approximately 5,121 LM transmission lines will be installed from the proposed intake box located in Brgy Maurang to the proposed storage facility in Brgy Cabibihan and to the two (2) NHA sites for Vista Del Mar and Jade Crown Meadows, Brgy. Cabibihan. Pipe diameters shall be finalized after the completion of the proposed source.

Cost under this item covers materials and labor inclusive of pipe laying, excavation, backfilling and sand bedding. The cost also includes provision for fittings, valves, pipe crossings and other appurtenances and break pressure chamber. Costs for pavement demolition and surface restoration are likewise included in this item.

The proposed pipeline will be interconnected to the existing pipelines at the entrance of Vista Del Mar and Jade Crown Meadows.

### **3.3 Treatment Facility**

The proposed source will be equipped with a chlorinating equipment and its accessories.

### **3.4 Reinforced Concrete Ground Reservoir**

The design and construction of a reinforced concrete ground reservoir with a volume of 100 m<sup>3</sup> will be constructed in Brgy. Maurang, Caibiran, Biliran.

### **3.5. Water Meters**

Supply and installation of 970 water meters. Please refer to the revised LWUA Standard Specifications for Water Supply System Construction (Volume II).

## **II. METHODOLOGY**

- (a) Implement the project taking into consideration the communities and their landscape, and achieve enhanced environmental performance and comprehensive environmental compliance.
- (b) Stimulate the local economy by maximizing local business participation in implementing the project.
- (c) Maximize use of minority or local business enterprises.
- (d) Gender perspective
- (e) Engage communities and stakeholders to proactively participate in the project from planning stage up to implementation/construction stage.
- (f) Develop and implement an effective Quality Program.
- (g) Achieve swift commencement and timely completion of the project.
- (h) Provide cost-effective solutions and cost-containment methodologies
- (i) Increase Work Zone safety with engineering improvements and enhanced awareness through public information
- (j) Minimize life-cycle cost of the project.
- (k) Any additional project goals will be included in the Special Provisions.

**Main Responsibilities of the Contractor** - The Contractor shall be responsible for furnishing all labor, material, plant, equipment, services and support facilities for the following:

- (a) Design and Construction of structures in the Project components including utility relocations.
- (b) Project construction management including Health and Safety Measures as stated in Department of Public Works (DPWH) Order No.39, Series of 2020 "Revised Construction Guidelines for the Implementation of Infrastructure Projects During the COVID-19 Public Health Crisis".
- (c) Project-related Public Information activities.
- (d) Coordination with Project stakeholders, other contractors, and utility owners.
- (e) Design Quality of temporary structures.
- (f) Construction Quality and Workmanship.
- (g) Environmental permitting, resource agency consultations, mitigation and compliance monitoring.
- (h) Additional environmental investigations, documentations, and monitoring associated with or resulting from Contractor's actions.
- (i) Maintenance and protection of traffic and access to properties (both temporary and permanent access).
- (j) Project safety and security.
- (k) Preliminary Engineering (PE), such as surveys and geotechnical investigations.
- (l) Harmful and hazardous materials remediation (design and construction)
- (m) Drainage and erosion control.
- (n) Construction waste disposal and handling.
- (o) Acquisition of required clearances, licenses, construction easements, and permits for the construction work, work sites, and storage areas, on or off site.
- (p) Ancillary Work, such as access roads, driveways, temporary fencing, relocation of drainage, work sites, and temporary works.
- (q) Location, acquisition, permits, and transportation for material.
- (r) Coordination and relocation of utilities and municipal drainage facilities (when required).

- (s) Site clearance and restoration.
- (t) Administration of the project during the contract period.
- (u) Implementation and administration of LWUA / NAVAL WD policy for construction work, as applicable. The Contractor will be required to plan, implement, and maintain a Quality Plan for the Work. The quality plan will detail how the Contractor will establish and operate its quality program management structure, independent from design and construction production, and document its procedures pertaining to all aspects of the work listed below. The quality plan will be established and maintained by the Contractor such that it provides an agency-auditable system that assures the Contractor complies with all contract requirements pertaining to the general areas of the construction work.

**MINIMUM CONTRACTOR’S TEAM COMPOSITION/MANPOWER NETWORK:**

<b>DESIGN TEAM</b>	<b>Number /Gender</b>	<b>General Experience</b>	<b>Relevant Experience</b>
Project Manager	1	5	3
Project Design Engineer (Civil)	1	5	3
Project Design Engineer (Electrical Or Mechanical)	1	5	3
Engineering Assistant/Draftsman	1	3	3
<b>CONSTRUCTION TEAM</b>	<b>Number /Gender</b>	<b>General Experience</b>	<b>Relevant Experience</b>
Project Manager	1	5	3
Project Engineer/Civil works	1	5	3
Project Engineer (Electro-mechanical)	1	5	3
Materials Engineer	1	5	3
Environment, Health and Safety Officer	1	5	3
When applicable, complete well drilling crew		5	3
- Chief Driller	1	5	3
- Assistant Driller/Welder	1	5	3
- Driver		5	3
- Local Hire	2		

### III. PROJECT DESCRIPTION

This Project is a “*Design and Build*” Scheme contract and is a fixed lump sum cost and changes or variation orders will only be allowed if the changes in the design and construction requirements were not anticipated in the preparation of contract documents prior to contract signing and approval. The following guidelines shall govern in the approval for changes or variation orders for work items under the DBS (Ref. Annex “G” of the revised 2016 IRR of R.A. 9184):

This Design and Build Contract includes submission of site investigation reports, preparation of structural computation/analysis, preparation of detailed construction drawings/plans and submission of As-Built Plans.

#### **Contract Implementation for the Design and Build Scheme:**

As a rule, contract implementation guidelines for the procurement of infrastructure projects shall comply with Annex “E” of the IRR of RA 9184, *as amended*. The following provisions shall supplement the procedures specified in Annex “E”.

1. No works shall commence unless the contractor has submitted the required documentary requirements and the procuring entity has given written approval. Work execution shall be in accordance with reviewed and approved documents.
2. The contractor shall be responsible for obtaining all necessary information as to risks, contingencies which may affect the works and shall prepare and submit all necessary documents specified by the procuring entity to meet all regulatory approvals as specified in the contract documents.
3. The contractor shall submit a detailed program of work within fourteen (14) calendar days after issuance of the Notice to Proceed (NTP) for approval by the procuring entity that shall include, among others:
  - a. The order in which it intends to carry out the work including anticipated timing for each stage of design/detailed engineering and construction;
  - b. Periods for review of specific outputs and any other submissions and approvals;
  - c. Sequence of timing for inspections and tests as specified in the contract documents;
  - d. General description of the design and construction methods to be adopted;
  - e. Number and names of personnel to be assigned for each stage of the work;
  - f. List of equipment required on site for each major stage of the work;
  - g. Description of the quality control system to be utilized for the project.

4. Any errors, omissions, inconsistencies, inadequacies or failure submitted by the contractor that do not comply with the requirements shall be rectified, resubmitted and reviewed at the contractor's cost. If the Contractor wishes to modify any design or documents which has been previously submitted, reviewed and approved, the contractor shall notify the procuring entity within a reasonable period of time and shall shoulder the cost of such changes.
5. As a rule, changes in **design and construction requirements** shall be limited only to those that have not been anticipated in the contract documents prior to contract signing and approval. The following guidelines shall govern approval for change or variation orders:
  - a. Change Orders resulting from design errors, omissions or non-conformance with the parameters and the contract documents by the contractor shall be implemented by the contractor at no additional cost to the procuring entity.
  - b. Provided that contractor suffers delay and/or incur costs due to changes or errors in the procuring entity's performance specifications and parameters, he shall be entitled to either one of the following:
    - i. an extension of time for any such delays under Section 10 of Annex "E"; or
    - ii. payment for such costs as specified in the contract documents, provided, the cumulative amount of the variation order does not exceed ten percent (10%) of the original contract price.
6. The contract documents shall include the manner and schedule of payment specifying the estimated contract amount and instalments in which the contract price will be paid.
7. The contractor shall be entitled to advance payment subject to the provisions of Section 4 of Annex "E".
8. The procuring entity shall define the quality control procedures for the design and construction in accordance with agency guidelines and shall issue the proper certificates of acceptance for sections of the works or the whole of the works as provided for in the contract documents.
9. The contractor shall provide all necessary equipment, personnel, instruments, documents and others to carry out specified tests.
10. All **design and builds projects** shall have a minimum Defects Liability Period of one (1) year after contract completion or as provided for in the contract documents. This is without prejudice, however, to the liabilities imposed upon the engineer/architect who drew up the plans and specification for a building sanctioned under Section 1723 of the New Civil Code of the Philippines.

11. The contractor shall be held liable for design and structural defects and/or failure of the completed project within the warranty periods specified in Section 62.2.3.2 of the IRR.

The major thrust of this project is the construction of water supply system for Almeria, Biliran and Caibiran for NHA Permanent Resettlement Areas in Yolanda Affected Water Districts and Municipalities.

The contractual arrangement to be used for this project are: a.) Part I- The Design and Built Scheme contract for the Almeria , Biliran and Caibiran water supply system project is proposed to be built in Brgys. Jamorawon (Almeria), Brgys. Villa Enage and Burabod (Biliran) and Brgy. Cabibihan (Caibiran). Works involves in the Design and Built Scheme are reinforced concrete intake box for the proposed spring sources, storage facility (reinforced concrete ground reservoirs), pipelines (valves, fittings, appurtenances and break pressure chamber), treatment facilities and water meters.

The procuring entity awards all parts of the project to a single contract to a single firm, partnership, corporation, joint venture or consortium.

The location of spring/s, proposed intake box, reservoirs and the location of proposed pipelines are shown in Section VII – Drawings.

#### **Special Instruction/Information To Bidders**

All the figures given in the TOR concerning reinforced concrete intake box sizes, pipeline sizes and lengths and volume of reinforced concrete ground reservoirs, will be used only as reference or guide in preparing preliminary conceptual design and financial proposal;

#### **IV. DETAILED DESCRIPTION OF SCOPE OF WORKS**

##### **A. Design and Build” Scheme (DBS) instruction for work items:**

1. Design and construct **Reinforced Concrete Intake Box** complete including soil investigation works, structural design analysis/computation, excavation, foundation works, backfill, compaction, all piping system, all valving system, drain system, leak testing, disinfection, site development, if required, and all other works as specified in the TOR/specifications and approved drawings;

The proposed spring box should be watertight and constructed of reinforced concrete. It should include a manhole with a removable cover to prevent contamination from rainwater while providing access for disinfection and maintenance. The design should include an overflow pipe that should not be higher than the natural elevation of the spring to prevent back pressure from the stored spring water in the box.



Site development may include some measure of erosion prevention, provision for diversion ditch for surface runoff, protection against livestock and/or wildlife contamination and soil compaction that could lead to reduced spring yield.

2. Design and laying of various sizes of **transmission and distribution pipelines**. Work includes excavation, laying/jointing, backfilling, compaction, hydro testing and disinfection;
3. Design and construct **Interconnection and pipe crossing works** in various locations including all fittings, trust blocks, supports, dewatering, leak test, disinfection, backfilling and compaction;
4. Installation of **Flowmeter**;
5. Installation of various **valves** and fittings including valve boxes and cover;
6. Construct **break pressure chamber**;
7. Design and construct **Concrete Ground Reservoirs** complete including soil investigation works, structural design analysis/computation, excavation, foundation works, backfill, compaction, all piping system, all valving system, drain system, inside/outside ladders, hatchway, air vents, water level indicator, concrete catwalk around the reservoir, electrical and lighting system, leak testing, disinfection, site development, if required, and all other works as specified in the TOR/specifications and approved drawings;
8. Installation of **Treatment facility/hypo-chlorinator** per LWUA standard specifications
9. Supply and install **Water Meters**. Please refer to the revised LWUA Standard Specifications for Water Supply System Construction (Volume II).
10. **Miscellaneous work items** such as pavement demolition/restoration, rock/limestone excavation, sand bedding/borrow fill, backfilling, disposal of excess materials and compaction;

## V. **CONCEPTUAL DESIGN**

The following schemes are proposed as the conceptual designs for the respective Municipalities and should become the basis by the contractor/consultant of the Detailed Design.

### 1.0 **Almeria, Biliran( Pabahay Phase 1 and Pabahay Phase 2, Brgy. Jamorawon)**

The NHA Pabahay Phase 1 and Pabahay Phase 2 has a total number of 524 and 405 housing units respectively. The coordinates of Pabahay Phase 1 and Phase 2 are as follows:

Latitude 11<sup>0</sup>36'33.17" N

Longitude 124<sup>0</sup>23'41.48" E  
Elevation 65.0 M

Latitude 11<sup>0</sup>36'22.96" N  
Longitude 124<sup>0</sup>23'9.46" E  
Elevation 27.0 M

### **1.1 Reinforced Concrete Intake Box (Spring Source Development)**

Construction of a reinforced concrete intake box with measurement of 3.0 m x 3.0 m x 3.0 m in Brgy Iyusan. The spring is a combined source for the two (2) NHA Sites 1 and 2 with an estimated reported discharge of 11.0 L/s.

Iyusan Spring No. 1 & 2 are located in Brgy. Iyusan with coordinates:

Latitude 11<sup>0</sup>37'21.792" N  
Longitude 124<sup>0</sup>24'58.14" E  
Elevation 164.0 M

Latitude 11<sup>0</sup>37'19.42" N  
Longitude 124<sup>0</sup>24'53.24" E  
Elevation 148.0 M

Proposed Intake Box  
Latitude 11<sup>0</sup>37'18.80" N  
Longitude 124<sup>0</sup>24'53.96" E  
Elevation 143.0 M

The proposed spring box should be watertight and constructed of reinforced concrete. It should include a manhole with a removable cover to prevent contamination from rainwater while providing access for disinfection and maintenance. The design should include an overflow pipe that should not be higher than the natural elevation of the spring to prevent back pressure from the stored spring water in the box.

Site development may include some measure of erosion prevention, provision for diversion ditch for surface runoff, protection against livestock and/or wildlife contamination and soil compaction that could lead to reduced spring yield.

### **1.2 Pipelines (Valves, Fittings, Appurtenances and Break Pressure Chamber)**

Installation of approximately 4,335 LM transmission lines will be installed from the proposed intake box located in Brgy. Iyusan to the proposed storage facility located in Brgy. Jamorawon and to be interconnected to the tapping point in the entrance of the two (2) NHA sites in Brgy. Jamorawon. Pipe diameters shall be finalized after the completion of the proposed source.

Cost under this item covers materials and labor inclusive of pipe laying, excavation, backfilling and sand bedding. The cost also includes provision for

fittings, valves, pipe crossings and other appurtenances and break pressure chamber. The break pressure chamber shall be constructed whenever is required. Costs for pavement demolition and surface restoration are likewise included in this item.

### **1.3 Treatment Facility**

Supply and Installation of one (1) chlorinating equipment and its accessories.

One (1) set of hypochlorinator facility must be provided. One set of hypochlorinator must include the feeder pump and its injector assembly, mixing tank with motorized stirrer, one (1) container of chlorine power/granules and residual testing kit.

Hypochlorinator set must be installed in the spring box/reservoir. Operation of the hypochlorinator must be electrically operated. Power supply of the hypochlorinator shall be the Owner's responsibility.

### **1.4 Storage Facility (Reinforced Concrete Ground Reservoir)**

Construction of reinforced concrete ground reservoir with a volume of 63.20 m<sup>3</sup> is necessary to meet the storage requirement for the NHA Resettlement Area. The proposed reservoir will be constructed in Brgy. Jamorawon.

Perform and submit soil investigation report, structural design analysis/computation, survey works (topographic map), prepare specifications and construction/design drawings for the reservoir in accordance with the Terms of Reference (TOR)/Design Specifications.

Provide materials, labor, tools and equipment complete including clearing, excavation, backfilling, compaction, roofing, coatings, piping works, valves & valving system, drain & overflow piping system, valve boxes, air vents, inside & outside ladders, hatchway, water level indicator and all other works as required and as shown in the approved drawings and specifications.

The location of the reinforced concrete ground reservoir shall be determined considering the operating pressure of Pabahay of 15 m.

### **1.5 Concrete pavement demolition and restoration works; and**

This item shall cover concrete pavement demolition (road/shoulder, t=200 mm) and restoration.

### **1.6 Special items / General Requirements.**

This item shall cover mobilization/demobilization cost, project organization, and procurement of all necessary permits, bonds, guaranties and insurances.

## **2.0 Biliran, Biliran (San Antonio Village, Brgy. Villa Enage and Divine Grace Village, Brgy. Burabod)**

The NHA San Antonio Village and Divine Grace Village has a total number of 816 and 449 housing units respectively. The coordinates of San Antonio Village and Divine Grace Village are as follows:

Latitude 11<sup>0</sup>28'17.95" N

Longitude 124<sup>0</sup>29'10.25" E

Elevation 22.0 M

Latitude 11<sup>0</sup>24'26.82" N

Longitude 124<sup>0</sup>28'29.5" E

Elevation 73.0 M

## **2.1 Reinforced Concrete Intake Box (Spring Source Development)**

Construction of reinforced concrete intake box with measurement of 4.0 m x 4.0 m x 3.931 m in Brgy. Canila. The spring is a combined source for the two (2) NHA sites with an estimated discharge of 10.0 L/s. Canila Spring is located in Brgy. Canila with coordinates:

Latitude 11<sup>0</sup>30'02.52" N

Longitude 124<sup>0</sup>29'25.18" E

Elevation 153 M

The proposed spring box should be watertight and constructed of reinforced concrete. It should include a manhole with a removable cover to prevent contamination from rainwater while providing access for disinfection and maintenance. The design should include an overflow pipe that should not be higher than the natural elevation of the spring to prevent back pressure from the stored spring water in the box.

Site development may include some measure of erosion prevention, provision for diversion ditch for surface runoff, protection against livestock and/or wildlife contamination and soil compaction that could lead to reduced spring yield.

## **2.2 Pipelines (Valves, Fittings, Appurtenances and Break Pressure Chamber)**

Installation of approximately 5,820 LM transmission lines will be installed from the proposed intake box located in Brgy Canila to the proposed storage facility and to be interconnected to the tapping point in the entrance of the two (2) NHA sites in Brgys. Villa Enage and Burabod. Pipe diameters shall be finalized after the completion of the proposed source.

Cost under this item covers materials and labor inclusive of pipe laying, excavation, backfilling and sand bedding. The cost also includes provision for fittings, valves, pipe crossings and other appurtenances and break pressure. The break pressure chamber shall be constructed whenever is required. Costs for pavement demolition and surface restoration are likewise included in this item.

### **2.3 Storage Facility (Reinforced Concrete Ground Reservoir)**

Construction of reinforced concrete ground reservoir with a volume of 100 m<sup>3</sup> is necessary to meet the storage requirement for NHA Resettlement Area. The proposed reservoir will be constructed in Brgys. Burabod and Villa Enage, Biliran, Biliran.

Perform and submit soil investigation report, structural design analysis/computation, survey works (topographic map), prepare specifications and construction/design drawings for the reservoir in accordance with the Terms of Reference (TOR)/Design Specifications.

Provide materials, labor, tools and equipment complete including clearing, excavation, backfilling, compaction, roofing, coatings, piping works, valves & valving system, drain & overflow piping system, valve boxes, air vents, inside & outside ladders, hatchway, water level indicator and all other works as required and as shown in the approved drawings and specifications.

The location of the reinforced concrete ground reservoir shall be determined considering the operating pressure of the Village of 15 m.

### **2.4 Water Meters**

Supply and installation of 1,265 water meters. Please refer to the revised LWUA Standard Specifications for Water Supply System Construction (Volume II).

### **2.5 Treatment Facility**

Supply and Installation of one (1) chlorinating equipment and its accessories.

One (1) set of hypochlorinator facility must be provided. One set of hypochlorinator must include the feeder pump and its injector assembly, mixing tank with motorized stirrer, one (1) container of chlorine power/granules and residual testing kit.

Hypochlorinator set must be installed in the spring box/reservoir. Operation of the hypochlorinator must be electrically operated. Power supply of the hypochlorinator shall be the Owner's responsibility.

### **2.6 Concrete pavement demolition and restoration works; and**

This item shall cover concrete pavement demolition (road/shoulder, t=200 mm) and restoration.

### **2.7 Special items / General Requirements.**

This item shall cover mobilization/demobilization cost, project organization, and procurement of all necessary permits, bonds, guaranties and insurances.

### **3.0 Caibiran, Biliran (Jade Crowne Meadows and Vista Del Mar, Brgy. Cabibihan)**

The NHA Vista Del Mar and Jade Crowne Meadows a total number of 522 and 989 housing units respectively. The coordinates of Vista Del Mar and Jade Crowne Meadows are as follows:

Latitude  $11^{\circ}34'41.03''$  N  
Longitude  $124^{\circ}32'59.88''$  E  
Elevation 37.0- 41.0 M

Latitude  $11^{\circ}35'2.29''$  N  
Longitude  $124^{\circ}32'53.94''$  E  
Elevation 41.0- 66.0 M

#### **3.1 Reinforced Concrete Intake Box (Spring Source Development)**

Construction of reinforced concrete intake box with measurement of 3.0 m x 3.0 m x 3.0 m in Brgy Maurang. The spring is a combined source for the two (2) NHA sites with an estimated discharge of 12.0 L/s. Calawing Spring is located in Sitio Calawing, Brgy. Maurang with coordinates:

Latitude  $11^{\circ}32'45.90''$  N  
Longitude  $124^{\circ}33'30.90''$  E  
Elevation 259.0 M

The proposed spring box should be watertight and constructed of reinforced concrete. It should include a manhole with a removable cover to prevent contamination from rainwater while providing access for disinfection and maintenance. The design should include an overflow pipe that should not be higher than the natural elevation of the spring to prevent back pressure from the stored spring water in the box.

Site development may include some measure of erosion prevention, provision for diversion ditch for surface runoff, protection against livestock and/or wildlife contamination and soil compaction that could lead to reduced spring yield.

#### **3.2 Pipelines (Valves, Fittings, Appurtenances and Break Pressure Chamber)**

Installation of approximately 5,121 LM transmission lines will be installed from the proposed intake box located in Brgy Maurang to the proposed storage facility and to be interconnected to the tapping point in the entrance of the two (2) NHA sites in Brgy. Cabibihan. Pipe diameters shall be finalized after the completion of the proposed source.

Cost under this item covers materials and labor inclusive of pipe laying, excavation, backfilling and sand bedding. The cost also includes provision for fittings, valves, pipe crossings and other appurtenances and break pressure chamber. The break pressure chamber shall be constructed whenever is required. Costs for pavement demolition and surface restoration are likewise included in this item.

### **3.3 Treatment Facility**

Supply and Installation of one (1) chlorinating equipment and its accessories.

One (1) set of hypochlorinator facility must be provided. One set of hypochlorinator must include the feeder pump and its injector assembly, mixing tank with motorized stirrer, one (1) container of chlorine power/granules and residual testing kit.

Hypochlorinator set must be installed in the spring box/reservoir. Operation of the hypochlorinator must be electrically operated. Power supply of the hypochlorinator shall be the Owner's responsibility.

### **3.4 Reinforced Concrete Ground Reservoir**

Construction of reinforced concrete ground reservoir with a volume of 100 m<sup>3</sup> is necessary to meet the storage requirement for the NHA Resettlement Are. The proposed reservoir will be constructed in Brgy. Cabibihan, Caibiran.

Perform and submit soil investigation report, structural design analysis/computation, survey works (topographic map), prepare specifications and construction/design drawings for the reservoir in accordance with the Terms of Reference (TOR)/Design Specifications.

Provide materials, labor, tools and equipment complete including clearing, excavation, backfilling, compaction, roofing, coatings, piping works, valves & valving system, drain & overflow piping system, valve boxes, air vents, inside & outside ladders, hatchway, water level indicator and all other works as required and as shown in the approved drawings and specifications.

The location of the reinforced concrete ground reservoir shall be determined considering the operating pressure of the housing sites of 15 m.

### **3.5 Water Meters**

Supply and installation of 970 water meters. Please refer to the revised LWUA Standard Specifications for Water Supply System Construction (Volume 2).

### **3.6 Concrete pavement demolition and restoration works; and**

This item shall cover concrete pavement demolition (road/shoulder, t=200 mm) and restoration.

**3.7 Special items / General Requirements.**

This item shall cover mobilization/demobilization cost, project organization, and procurement of all necessary permits, bonds, guaranties and insurances.

**CONCEPTUAL DESIGN / SPECIFICATIONS / PARAMETERS / OTHER REQUIREMENTS**

**A. FOR NEW WATER SUPPLY SYSTEM PIPELINES:**

1. The following design criteria shall be used in hydraulic analysis:

CRITERIA	VALUES
Demand Factor	Varies from 0.3 to 2.0
Maximum allowable velocity	3 meters per second (mps)
Minimum allowable velocity	0.10 mps
Maximum allowable head loss	10.0 m/1000 m
Minimum allowable head loss	1.0 m/1000 m
Maximum allowable pressure	70.0 m
Minimum allowable pressure	7.0 m
Design Year	As stated/required
Service Area	As stated/required. Provide schematic plan
Projected Population	As stated/required
Projected Water Demand	As stated/required
Projected Service Connections	As stated/required
Others as required	

Computer software for the design of water supply networks available in the Philippines market include the following:



LOOP	being used by LWUA and Water Districts
WATER	proprietary software developed by LWUA and being used by LWUA and WDs
EPANET	free software available on the Internet
WATERCAD	developed by Haestad; can be purchased on the Internet

2. Detailed survey works and construction plans shall be conducted and provided, respectively, to include but not limited to:
  - a. Survey Work includes: Line and Profile of Transmission Pipelines, Topographic Maps, Distribution Pipelines, etc.
  - b. Construction Plans includes: Line & Profile of Transmission Pipelines, Distribution System showing pipe alignment, RCPs, RCBCs, Bridges, Canals, etc. and detailed drawings of all pipe crossings/other obstructions.
  - c. Detailed drawings of other features/appurtenances such as valves, air release/vacuum valves, hydrants, fittings, interconnections, concrete boxes, etc.
3. Pipe Materials
  - a. Pipe materials included in the LWUA Standard Technical Specifications shall be used.
  - b. For other materials, pipes shall be subjected to standard testing procedures and approved by LWUA and WD.
4. All other requirements shall be defined and specified in the **Project Description**.

## **B. FOR ELECTRO-MECHANICAL EQUIPMENT**

1. Pump
  - a. Sizing of pump shall be based on the results of hydraulic analysis. For a well source, results of actual test pumping shall be used to determine the Total Dynamic Head (TDH) requirements, pump setting and length of cable.
  - b. For direct pumping scheme (w/o reservoir), pump shall be sized using the peak-hour demand and pressure requirement as shown by the hydraulic analysis.
  - c. For fill-and-draw and floating-on-the-line schemes, pump shall be sized using the max-day demand and pressure requirement as shown by the hydraulic analysis.

## 2. Motors

- a. The motor shall be sized according to the power requirements of the pump.
- b. Motors with ratings 30 Hp and below shall have an operating voltage of 230 volts, and for motors with ratings above 30 Hp shall have an operating voltage of 460 volts.

Wire sizing shall be in accordance with this guideline.

- c. 5-Hp motors and below shall be single (1) phase, 2-wire, 60 Hz. Above 5 Hp shall be rated three (3) phase, 3-wire, 60 Hz.
- d. Type of motor to be used shall be based on actual field conditions and its adaptability.
- e. All motors for water supply shall be squirrel cage induction motor (SCIM) type.
- f. Cost efficient motors shall be primarily considered.

## 3. Column Pipes

- a. Sizing of column pipes shall use the design criteria of water velocity  $\approx 1.5$  m/s or 5 ft/s.
- b. For the length of column pipe, a maximum additional length of 12.0m shall be added for pump submergence.
- c. Head losses along the column pipe, including losses in the pump discharge line shall be considered in the computation of TDH.

## 4. Submersible Cable

- a. Submersible cable shall be sized according to motor size and operating voltage.
- b. Total cable length shall consider the distance of the well from the motor control panel and cable sagging by adding 1.0 meter for every 10.0 meter of column pipe.

## 5. Stand-by Power

- a. All water supply system facilities shall be provided with generator sets as standby power source.
- b. Generators shall be sized at continuous rating.
- c. Generators shall be soundproof with a maximum dB rating of 75 dB at a distance of 7.0 m.
- d. KVA/KW rating of the generator, including operating voltage and no. of phases shall be based on the load/capacity requirements.

## 6. Motor Controllers

- a. Motor controller and its component shall be sized in accordance with the power requirements of the equipment.
- b. Motor controller shall provide protection against overcurrent, overloading, single phasing (for 3-phase) and under/over voltage. Motor overcurrent and overload protection shall be sized accordingly.
- c. Motor controller shall be either full-voltage (FVS) or reduced voltage (RVS). Where applicable it shall be at least soft-start/soft-stop or type or Variable Frequency Drive (VFD) motor controller with or without phase converter which will depend on the available local power.
- d. Motor controller enclosure shall be in accordance with applicable NEMA and ISO standards.

## 7. Wires and Cables

- a. Wire gutters and conduits shall be provided.
- b. All wires shall be of copper, annealed, soft drawn of 98% conductivity, insulated for 600 V working voltage, type "THW", "THHN" or "THWN" insulation.

## 8. Discharge Piping Layout

- a. The LWUA standard discharge piping layout shall be adopted.
- b. Discharge piping material shall be black iron (B.I.) pipe for pipe diameters up to 250 mm. Spiral welded pipes may be used for larger pipe diameters.

## 9. Pumphouse

1. Pumphouse shall be sized and designed to enable comfortable and easy movement for personnel inside and outside during normal operation, pump testing and repair activities. The structure shall provide enough ventilation for personnel and equipment.
2. Provide a space for generating set, if provided or to be provided in the future;
3. Electrical equipment and motor controls shall be located to afford easy viewing and shall be provided with ample protection against adverse weather conditions.

4. The pumphouse shall include chlorine room which shall be isolated to prevent corrosion of metallic materials by chlorine.
5. For areas located along typhoon belt, ample climate proofing shall be provided. A reinforced concrete structure must be used.

**C. FOR ALL STRUCTURAL DESIGN and ANALYSES THE FOLLOWING CRITERIA and PARAMETERS MUST BE UTILIZED:**

1. Standard Design Codes and References

The following standard codes and references shall be used where applicable.

a) American Concrete Institute (ACI) Standards

ACI 318	-	Building code requirements for reinforced concrete structures
ACI 315	-	Manual of standard practice for details and detailing of concrete reinforcement
ACI 350	-	Environmental Engineering Concrete Structures

b) Structural Design Manual Specifications

c) National Structural Code of the Philippines (NSCP)

d) Philippine National Standards (PNS)

e) American Society of Testing and Materials (ASTM)

f) Uniform Building Code (UBC)

g) Steel Construction Manual (AISC)

h) Portland Cement Association (PCA) Concrete Information

2. Design Load

Dead Load (DL)

a)

Concrete	24 KN /m <sup>3</sup> (150 pcf)
Steel	78 KN/m <sup>3</sup> (490 pcf)

Water 9.81 KN/m<sup>3</sup> (62.4 pcf)

b) Live Load (LL)

Roof with slope 1.44 KN/m<sup>2</sup>  
3 to 1 or less

c) Wind Load (WL)

Wind load shall be considered in the design in accordance with NSCP. Wind shall be assumed to come from any horizontal direction. no reduction in wind pressure shall be taken for the shielding effect of adjacent structures.

where:  $P = c_e c_q q_s I$

$P =$  design wind pressure, kPa

*For areas located along the typhoon belt:*

*$P = 250$  kph (minimum)*

$c_e =$  combined height, exposure and gust factor coefficient

$c_q =$  pressure coefficient for the structure or portion of structure under consideration

$q_s =$  wind stagnation pressure at a height of 10 meters

$I =$  importance factor as set forth by occupancy category

d) Earthquake Load (EL)

Design base shear (in accordance with NSCP)

Where:  $V = \frac{ZIC}{R_w} \times W$

$Z =$  Seismic zone factor

- I = importance factor based on standard occupancy
- $R_w$  = numerical coefficient based on global ductility capacity of lateral force-resisting frame
- W = the total seismic dead load
- C = numerical coefficient as determined from the formula
 
$$= \frac{1.25s}{t^{2/3}} \leq 2.75$$
- s = site coefficient for the given soil characteristics
- t = fundamental period of vibration, in seconds, of the structure for the direction under consideration
 
$$= c_t (h_n)^{3/4}$$
- $c_t$  = 0.050 (for all buildings as set forth by NSCP)
- $h_n$  = Height above the base to level n in meters

Seismic provisions of UBC 97 Edition shall also be verified for ground motion producing structural response and forces at any horizontal direction.

Basic allowable stresses are increased by 33% for combined DL+LL+EL OR DL+LL+WL whichever is greater wall design.

#### Hydrostatic and Hydrodynamic Loads

e)

All hydraulic structures shall be designed for hydrostatic forces imposed by the fluid contained in these structures. All hydraulic structures shall be designed for hydrodynamic forces using the ground acceleration and the response spectra provided by the geotechnical report.

f)

Loadings shall be calculated for different conditions. As a minimum, the following load combinations shall be determined:

Tank full: Hydrostatic loading plus dead load, or hydrodynamic loading plus seismic forces due to dead loads, or hydrodynamic loading plus seismic forces due to dead loads plus live load.

Tank Empty: Static soil pressure (active or at rest) plus dead load or seismic soil pressure plus seismic forces due to dead loads plus permanent surcharge.

### 3. Minimum Material Strength

a) Concrete,  $f_c'$  21 MPa (3,000 psi) or as specified

Minimum 28-day compressive cylinder strength for structural elements, including slabs on grade and stairs.

b) Reinforced Steel,  $f_y$

for 12mm and smaller	276 MPa (40,000 psi)
for 16mm and larger	414 MPa (60,000 psi)

c) Steel and Miscellaneous Metal Works

Structural shapes, $f_y$ (open or non-tubular) ASTM A 36	248.2 MPa (36,000 psi)
Shop and field welding, $f_y$ shall be in accordance with AWS A 5.1 or a 5.5 (E 70xx Series)	485 MPa (70,000 psi)
Anchor bolts shall, $f_t$	138 MPa (20,000 psi)

conform to ASTM A 307

Tension rods shall,  $f_y$  276 MPa (40,000 psi)

be structural steel conforming to  
ASTM A 40

#### 4. Allowable Stresses in Concrete

a) Flexure,  $f_c$

Extreme fiber stress in compression 0.45  $f_c'$

Extreme fiber stress in tension 1.6  $(f_c')^{1/2}$

b) Shear,  $v$

As a measure of diagonal tension at a  
distance  $d$  from the face of support

Beams with no web reinforcement 1.1  $(f_c')^{1/2}$

Joists with no web reinforcement 1.2  $(f_c')^{1/2}$

Members with web reinforcement 5  $(f_c')^{1/2}$

Slabs and Footings 2  $(f_c')^{1/2}$

c) Bearing

On full area 0.25  $(f_c')^{1/2}$

On one-third area or less 0.375  $(f_c')^{1/2}$

16 mm  $\emptyset$  bars and smaller 40 mm (1 1/2")

20 mm  $\emptyset$  bars and higher 50 mm (2")

d) Columns and Pedestal

Exposed to Earth, Water, Sewage or Weather

Stirrups & Ties 50 mm (2")

Principal Reinforcement 60 mm (2 1/2")

e) Walls



Formed concrete surfaces exposed to earth, water, sewage, weather or in contact with ground 50 mm (2")

f) Footings, Tie Beams and Base Slabs

At formed surfaces and bottoms bearing on concrete work mat 50 mm (2")

At unformed surfaces and bottoms in contact with earth 75 mm (3")

**MINIMUM REQUIREMENTS/PARAMETERS/SPECIFICATIONS:**

**CONCRETE RESERVOIR**

1. Contractor shall conduct soil investigation to determine the soil bearing capacity of the site as guide in the design of the reservoir.
2. Contractor shall prepare and submit Structural/Design Analysis of the reservoir. Soil bearing capacity to be used in foundation design is 2,000 psf (maximum) even if the actual soil bearing capacity is more than 2,000 psf.
3. The ground reservoir shall have the following features:
  - a. Manhole/Access Hatch Way w/ cover & lockable hatch
  - b. Inlet and Outlet pipes including controlling valves
  - c. Overflow and Drain pipes including valves
  - d. Under drain system (for foundation), *if necessary*
  - e. Air Vents
  - f. Water Level Indicator
  - g. Access Ladders (Inside & Outside).
  - h. Float Valve & Accessories
4. Standard Requirement for the Concrete Ground Reservoir
  - a. Designed to store "Clean & Potable" Water
  - b. Should be durable, long life
  - c. Stable Construction
  - d. Non-Leakage
  - e. Easy Assembly

**A.1 TECHNICAL SPECIFICATIONS FOR SUB-SURFACE INVESTIGATION**

**1.01 SCOPE OF WORK**

The Scope of work shall include all the excavation, drilling, sampling, insitu tests, laboratory tests and all other works necessary to be able to formulate geotechnical recommendation for the engineering design of the concrete ground/elevated reservoir in various NHA resettlement sites as stated herein.

In particular the work shall be in accordance with but not limited to the Scope of Work summarized in the Table S1-1. All works shall be performed in accordance with the applicable clauses of this Technical Specification.

**Table – S1-1**

**Scope of Services for Drilling and Test Pitting**

**Naval Water District**

<b>Location</b>	<b>Proposed Facilities and Improvement Requiring Investigation</b>	<b>Proposed Geotechnical Investigation</b>	<b>Tests and Reports</b>
Brgy. Tayud	50 cu.m. Ground/ Elevated Reservoir	Drilling of _____ holes, _____ depth each hole	<ul style="list-style-type: none"> <li>➤ Laboratory Tests*</li> <li>➤ SPT at 1m interval Factual Report</li> <li>➤ Technical Report including Evaluation and Recommendation regarding appropriate foundation design.</li> <li>➤ Soil classification only</li> </ul>

\* Laboratory Tests include the following tests,

- 1.. Sieve Analysis per ASTM D422
2. Atterberg Limit per ASTM D4318
3. Natural Moisture Content per ASTM D2216
4. Soil Classification per ASTM D2487

## **1.02 LOCATION OF THE SITES**

The approximate location of the work sites requiring soil sub-surface investigation are shown on the Location Plan. The Contractor shall visit the sites for verification, and to determine accessibility of the sites.

## **1.03 GEOLOGY OF THE SITES**

Before submitting his bid, the Bidder should have satisfied himself as to the general nature of the geological formation which he may encounter within the Sites.

## **1.04 ACCESS TO SITES**

The Water District will be responsible and make available to the Contractor the sites as stipulated in the Agreement. However, any cost pertaining to physical preparation of any access road to transport drilling equipment of the contractor will be at his own expense, and included in the mobilization cost.

## **1.05 CODES OF PRACTICE**

Unless otherwise specified, the Works included in the investigation and testing procedure shall be carried out in accordance with recommendations of Codes of Practice published by the American Society for Testing & Materials (ASTM), United States Bureau of Reclamation (USBR) or equivalent Philippine Standards.

## **1.06 TRANSPORT, HOUSING, PROTECTION AND SUPERVISION**

The Contractor shall make all necessary arrangements for the transport of personnel, equipment, and materials from his depot to and from the Sites and to designated position of boreholes. He shall provide housing for all his personnel during the conduct of the investigation.

## **1.07 DAMAGE AND CUTTING OF TREES**

The Contractor shall be solely responsible for the cost of repair and restoration of any damage caused inside or outside the areas of the Sites. No trees shall be cut down.

## **1.08 WATER SUPPLY**

The Contractor shall be responsible for making arrangements and borne the cost for the supply, and storage of water needed for the operations.

## **1.09 ON-SITE FACILITIES**

The Contractor shall provide proper on-site sanitary provisions for his personnel and shall maintain these, the Sites and their surroundings in a clean and sanitary condition to the satisfaction of the LWUA and/or the Water District (WD). The Contractor shall remove the sanitation facilities and dispose the waste to an area acceptable to LWUA and/or the WD after completion of the soil investigation works.

## **1.10 CONTRACTOR'S SUPERVISORY STAFF**

The Contractor shall provide continuous full time on-site supervision of the works by a qualified engineer or geologist, trained and experienced in soil investigation works and fully conversant with the requirements of this specification so that the works may be carried out as specified. The Contractor shall also supply the personnel necessary to carry out properly the tests as specified and to give accurate and reliable descriptions of soil and rock samples. Each boring gang shall have in charge a competent and experienced operator. The LWUA/WD Representative has the right at all times, should he not be satisfied with the standards, qualifications or experience of the Contractor's site supervisory staff, to order their removal from the Sites and their replacement by suitable persons at no additional cost.

## **1.11 INSTRUCTION FROM LWUA/WATER DISTRICT REPRESENTATIVE**

Whenever necessary, LWUA/WD or their representative may issue to the contractor a written instruction pertaining to the soil investigation works.

## **1.12 TIME FOR COMPLETION**

Work shall be completed and submission of technical report prior any activities in the construction of the reservoir .

## **1.13 PROGRAM OF WORKS**

Within 3 days after receipt of the Notice of Award, the Contractor shall submit to LWUA/WD for his approval a work program showing the order or procedure and method in which the Contractor proposes to carry out the works. The Contractor shall furnish as part of the work program, list of personnel, equipment and other resources to be committed by the Contractor to accomplish the Tasks.

The submission to and approval by LWUA/WD of such program or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Agreement.

## **1.14 POSITION OF WORKS**

The position of these holes and pits shall be set out on Site by the Contractor with reference to fixed points indicated by the LWUA/WD Representative. These positions

may be varied by the LWUA/WD Representative, as the work proceeds, in the light of the result obtained and other factors. Before work is started at any hole, the Contractor shall confirm its position and probable required depth from LWUA/WD Representative. These details shall be recorded in the form of a written instruction from LWUA/WD to the Contractor.

## **1.15 RESTORATION OF SITES**

The Contractor shall leave each Site in a neat and tidy state upon completion and shall remove all debris, rubbish, timber, temporary structures and spoil to the satisfaction of the LWUA/WD Representative.

## **2 BORING AND DRILLING**

### **2.01 GENERAL**

#### **1. Boring and Drilling Practice, Rig Type and Positioning**

- a. Except as otherwise specified, the Works included in this Contract shall be carried out in accordance with ASTM D2113-83 “Diamond Core Drilling for Site Investigation”.
- b. The boring/drilling rigs shall be of the rotary hydraulic feed type, skid mounted with a drilling head capable of recovering 50 mm diameter undisturbed samples in approved sample tubes.
- c. The Contractor shall provide such platforms as may be necessary to keep the drilling rigs level when sinking vertical drill holes on sloping ground.
- d. Measurement, for payment, for moving boring/drilling rig from one position to the next including setting up the rig shall be made of the number of moves directed by the LWUA/WD Representative. Movement of rig shall be paid only once irrespective of whether the Contractor uses the same rig or separate rigs for boring and drilling.

#### **2. Boring/Drilling Obstruction**

It shall be the Contractor’s responsibility when boulders or other obstacles are encountered to carry the boring/drilling through or pass such obstacles to determine their size and character. The unit price shall include drilling through obstruction and/or hard formation.

#### **3. Termination of Investigation Holes**

The Termination of each investigation hole shall be decided by the LWUA/WD Representative. The Contractor shall advise the LWUA/WD Representative as soon as the depth directed by him is reached.

Termination may also be made before the holes reach the specified depth if three (3) consecutive SPT blow counts has a value of at least 50 blows (for a penetration of 300 mm) or bedrock is encountered and penetration of at least 1.5 m is made to confirm bedrock.

## **2.02 BORING AND SAMPLING IN OVERBURDEN**

### **1. Boring**

Boring in overburden (alluvium, slopewash and residual soil) shall be carried out by rotary wash boring.

Each borehole at a Site for a structure shall be drilled to the specified depth below the existing ground surface unless a sound rock layer or three (3) consecutive SPT blow counts of 50 or more is encountered shallower than the prescribed depth. On the other hand, if, after drilling to the specified depth, soft formation is still encountered, the LWUA/WD Representative may allow the Contractor to extend the hole to a depth to be decided based on the condition of the soil formation encountered but not more than twice the specified depth.

The minimum diameter of pipe casing used in boring shall be 63 mm.

### **2. Disturbed Samples**

Disturbed samples shall be taken by the use of the split spoon sampler of the Standard Penetration Test at intervals of 1 m.

Disturbed samples shall be sealed and labeled into suitable airtight transparent plastic containers.

## **2.03 DRILLING IN ROCK FORMATION**

### **1. Drilling**

Drilling rigs shall be of the hydraulic feed type capable of using a rotary cutting tool, tipped with diamonds or other hard materials and equipped to recover cores, and a rock roller or similar bit for drilling without core recovery. Drilling shall normally be carried out to a depth of not less than 1.5 m into bedrock.

### **2. Cores**

Recovered core shall have a minimum diameter of 25 mm.

Pieces of cores recovered from diamond drilling shall be measured carefully. Records shall be maintained of the percentage of core recovery measured throughout the length of the drill hole.

Cores extracted shall be placed in correct order of depth in properly constructed core boxes. All pieces shall be carefully fitted together on breaks in the core. Where core losses occur, a red painted wooden block tightly fitting the core box shall be inserted to indicate the loss. Spacer bars between compartments in the core box shall be marked to indicate drill run lengths along the alignment from top to bottom of the drill hole.

The Contractor shall be responsible for the safe custody of all cores and core boxes and for the safe delivery of core boxes to the project office.

## **2.04 GROUNDWATER OBSERVATION**

The Contractor shall have an approved electrical water level measuring device on Site during all boring/drilling operations. Water levels in boreholes shall be made at the beginning of each work shift and at times when changes occur or are anticipated to occur.

## **2.05 FILLING AND SEALING OF INVESTIGATION HOLES**

All investigation holes shall be backfilled with excavated material up to 0.25m below the original ground level and filled with concrete.

## **2.06 MARKING INVESTIGATION HOLES**

The position of each investigation hole shall be permanently marked by concrete marker posts 100 mm square and 0.3 m high set firmly into the ground. The number of the investigation hole shall be clearly inscribed in the fresh concrete.

## **3 LABORATORY TESTING**

### **3.01 GENERAL**

Laboratory testing on soil and weathered rock shall be carried out at a laboratory acceptable to LWUA/WD.

All storing preparations and testing of samples shall be in accordance with relevant Standards and Codes of Practice.

LWUA/WD or their representative shall have access at all times to witness testing in progress. The Contractor shall carry out laboratory testing in accordance with testing schedules approved by LWUA/WD Representative. The Contractor shall give a 3 day notice of carrying out particular tests.

### **3.02 LABORATORY TESTS**

Laboratory test on soils and weathered rock will include but not necessarily limited to the following:

- Natural moisture content per ASTM D2216
- Sieve analysis per ASTM D422
- Atterberg Limits per ASTM D4318
- Soil Classification per ASTM D2487

## **4 REPORTS**

### **4.01 DAILY FIELD RECORDS**

Each day when work is in progress on the Site, the Contractor shall submit to LWUA/WD Representative a record of the previous day's work containing the following information in respect of each hole where work was in progress.

- Site Location
- Numbers, type and size of the hole
- Date and hours worked on the Site
- Brief description of the weather
- Total depth of hole at the beginning and end of each shift
- Make and type of machine in use
- Measured water levels and depths at which water inflows were encountered
- Diameter of the hole and depths of any reductions
- Length of hole for which casing was used with the casing diameter
- A full geotechnical description of each stratum encountered
- Depth below ground of each change of stratum
- Reference number, depths and other details of all small and large disturbed samples
- Commencing and terminating depths of each drilling run, lengths of core and samples recovered
- Data obtained during insitu test, including water levels recorded
- Details of delays and breakdowns
- Any other relevant information including details of activities for which additional payment may be claimed.

#### **4.02 EXPLORING LOGS**

Logs of all boreholes, drill holes and test pits shall be provided in a format approved by LWUA/WD Representative. They shall include descriptions of all strata including their macro-fabric i.e. fissures, details of samples taken, results of field test and observation made.

Logs of drill holes shall include notes on the nature, quantity and color of flush returns.

All logs shall be subject to the approval of the LWUA/WD Representative and draft copies shall be submitted to LWUA/WD not more than 2 weeks after the investigation hole is completed.

#### **4.03 LABORATORY TEST INTERIM RESULTS**

Laboratory testing of samples shall commence immediately and duplicate copies of the interim results obtained shall be supplied to the LWUA/WD Representative every week for tests completed within the week.

#### **4.04 SUB-SURFACE SOIL INVESTIGATION FACTUAL REPORT**

The Contractor's final report shall contain only factual information. The report shall comprise the following:

- A brief outline of the various field and laboratory testing methodology.
- A map showing the locations of field tests.



- Logs of boreholes, drill holes and test pits.
- Detailed results of all field tests.
- A summary of laboratory test results.
- Photographs

The Contractor shall submit the Sub-Surface Soil Investigation Report in accordance with agreed schedule. One (1) original copy and four (4) photocopies of the Sub-Surface Soil Investigation Report shall be submitted to LWUA/WD.

#### **4.05 TECHNICAL REPORTS**

The technical report shall contain the methodology used, evaluation and recommendation as well as the summary of findings, analysis and evaluation of all field boring logs and laboratory analysis. These shall describe the geological formation encountered in the investigation and an analysis of the recommended types of foundation appropriate for the proposed reservoir. The recommended bearing capacities and the anticipated calculated settlements which will be used in the design of the foundations will be elaborately discussed in the reports.

### **VIII. FOR STRUCTURAL DESIGN and ANALYSES THE FOLLOWING CRITERIA and PARAMETERS MUST BE UTILIZED:**

#### 1. Standard Design Codes and References

The following standard codes and references shall be used where applicable.

##### a) American Concrete Institute (ACI) Standards

ACI 318	-	Building code requirements for reinforced concrete structures
ACI 315	-	Manual of standard practice for details and detailing of concrete reinforcement
ACI 350	-	Environmental Engineering Concrete Structures

##### b) Structural Design Manual Specifications

##### c) National Structural Code of the Philippines (NSCP)

- d) Philippine National Standards (PNS)
- e) American Society of Testing and Materials (ASTM)
- f) Uniform Building Code (UBC)
- g) Steel Construction Manual (AISC)
- h) Portland Cement Association (PCA) Concrete Information

## 2. Design Load

- a)           Dead Load (DL)
 

Concrete	24 KN /m <sup>3</sup> (150 pcf)
Steel	78 KN/m <sup>3</sup> (490 pcf)
Water	
  
- b)           Live Load (LL)
 

Roof with slope	1.44 KN/m <sup>2</sup>
3 to 1 or less	
  
- c)           Wind Load (WL)

Wind load shall be considered in the design in accordance with NSCP. Wind shall be assumed to come from any horizontal direction. no reduction in wind pressure shall be taken for the shielding effect of adjacent structures.

where:  $P = c_e c_q q_s I$

$P$  = design wind pressure, kPa

*For areas located along the typhoon belt:*

$P = 300 \text{ kph (minimum)}$

$c_e$  = combined height, exposure and gust factor coefficient

$c_q$  = pressure coefficient for the structure or portion of structure under consideration

$q_s$  = wind stagnation pressure at a height of 10 meters

$I$  = importance factor as set forth by occupancy category

d)

#### Earthquake Load (EL)

Design base shear (in accordance with NSCP)

Where:  

$$V = \frac{ZIC}{R_w} \times W$$

$Z$  = Seismic zone factor

$I$  = importance factor based on standard occupancy

$R_w$  = numerical coefficient based on global ductility capacity of lateral force-resisting frame

W = the total seismic dead load

C = numerical coefficient as determined from the formula

$$= \frac{1.25s}{t^{2/3}} \leq 2.75$$

s = site coefficient for the given soil characteristics

t = fundamental period of vibration, in seconds, of the structure for the direction under consideration

$$= c_t (h_n)^{3/4}$$

$c_t$  = 0.050 (for all buildings as set forth by NSCP)

$h_n$  = Height above the base to level n in meters

Seismic provisions of UBC 97 Edition shall also be verified for ground motion producing structural response and forces at any horizontal direction.

e)

#### Hydrostatic and Hydrodynamic Loads

All hydraulic structures shall be designed for hydrostatic forces imposed by the fluid contained in these structures. All hydraulic structures shall be designed for hydrodynamic forces using the ground acceleration and the response spectra provided by the geotechnical report.

f)

Loadings shall be calculated for different conditions. As a minimum, the following load combinations shall be determined:

Tank full: Hydrostatic loading plus dead load, or hydrodynamic loading plus seismic forces due to dead loads, or hydrodynamic loading plus seismic forces due to dead loads plus live load.

Tank Empty: Static soil pressure (active or at rest) plus dead load or seismic soil pressure plus seismic forces due to dead loads plus permanent surcharge.

### 3. Minimum Material Strength

a) Concrete,  $f_c'$  21 MPa (3,000 psi) or as specified

Minimum 28-day compressive cylinder strength for structural elements, including slabs on grade and stairs.

b) Reinforced Steel,  $f_y$   
for 12mm and smaller 276 MPa (40,000 psi)  
for 16mm and larger 414 MPa (60,000 psi)

c) Steel and Miscellaneous Metal Works  
  
Structural shapes,  $f_y$  248.2 MPa (36,000 psi)

(open or non-tubular)

ASTM A 36

Shop and field welding,  $f_y$  485 MPa (70,000 psi)

shall be in accordance with

AWS A 5.1 or a 5.5 (E 70xx Series)

Anchor bolts shall,  $f_t$  138 MPa (20,000 psi)

conform to ASTM A 307

Tension rods shall,  $f_y$  276 MPa (40,000 psi)

be structural steel conforming to ASTM A 40

#### 4. Allowable Stresses in Concrete

##### a) Flexure, $f_c$

Extreme fiber stress in compression 0.45  $f_c'$

Extreme fiber stress in tension 1.6  $(f_c')^{1/2}$

##### b) Shear, $v$

As a measure of diagonal tension at a distance  $d$  from the face of support

Beams with no web reinforcement 1.1  $(f_c')^{1/2}$

Joists with no web reinforcement 1.2  $(f_c')^{1/2}$

Members with web reinforcement  $5 (fc')^{1/2}$

Slabs and Footings  $2 (fc')^{1/2}$

c) Bearing

On full area  $0.25 (fc')^{1/2}$

On one-third area or less  $0.375 (fc')^{1/2}$

16 mm  $\varnothing$  bars and smaller 40 mm (1 1/2")

20 mm  $\varnothing$  bars and higher 50 mm (2")

d) Columns and Pedestal

Exposed to Earth, Water, Sewage or Weather

Stirrups & Ties 50 mm (2")

Principal Reinforcement 60 mm (2 1/2")

e) Walls

Formed concrete surfaces exposed to earth, water, sewage, weather or in contact with ground 50 mm (2")

f) Footings, Tie Beams and Base Slabs

At formed surfaces and bottoms bearing on concrete work mat 50 mm (2")

At unformed surfaces and bottoms in contact with earth 75 mm (3")

## **IX. LWUA STANDARD SPECIFICATIONS**

### **A.: EARTHWORKS**

#### **GENERAL**

The Contractor shall perform all earthworks required and shown on drawings.

#### **A. Excavation Beneath Proposed Concrete Reservoir**

After the reservoir area has been stripped of all vegetation and debris, as specified in Sub-clause (a) herein, loam and topsoil from the top 60 cm (24 in.) of excavated soil shall be removed and stockpiled for possible later use as fill on or around the reservoir and for miscellaneous topsoil. Excavation under the reservoir shall extend to the bottom of the drainrock layer. After such excavation has been completed, the exposed surface shall be rolled with heavy compaction equipment to provide a reasonably smooth surface for placement of the drainrock. Areas under the reservoir upon which earthfill is to be placed shall be scarified to a depth of 15 cm (6 in.) brought to optimum moisture content, and compacted to ninety-five percent (95%) of maximum density.

#### **.B. Backfill Around and Beneath Proposed Structures and Paved Areas**

Except where otherwise specified for a particular structure or ordered by the Engineer, backfill placed around and beneath proposed structures and paved areas, shall be placed in horizontal layers not to exceed 200 mm (8 in.) in thickness, as measured before compaction, where compaction is attained by means of sheepsfoot rollers, pneumatic type rollers or any heavy compaction equipment approved by the Engineer. Where the use of heavy compaction equipment is impractical, the layers shall not exceed 150 mm (6 in.) in thickness before compaction, and compaction shall be attained by means of hand-operated power driven tampers. The backfill shall be brought up evenly, with each layer moistened and compacted by mechanical means to ninety-five percent (95%) of maximum density beneath proposed structures, and ninety percent (90%) of maximum density around the sides of structures and beneath proposed paved areas.

#### **C. Drainrock Beneath Proposed Concrete Reservoir**

When shown on the drawings, drainrock shall be provided in accordance with the following provisions:

1. Following site preparation, excavation, and any backfilling, a 150 mm (6 in.) thick layer drainrock shall be placed over the reservoir area as shown on the drawings.
2. Drainrock shall be clean gravel or crushed stone and shall be durable and free from slaking or decomposition under the action of alternate wetting and drying. It shall be uniformly graded and of such size that the percentage by weight, as determined by the "Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates"(ASTM C136), shall conform with the following grading:



<u>Sieve Size</u>		<u>Percentage Passing</u>
1 - inch		100
3/4 - inch	90 - 100	
3/8 - inch	40 - 100	
No. 4	25 - 40	
No. 8	18 - 33	
No. 30	5 - 15	
No. 50		0 - 7
No. 200		0 - 3

The drainrock shall have a sand equivalent of not less than seventy-five (75) as determined by ASTM D-2419.

- The drainrock shall be thoroughly moistened and compacted with at least two (2) passes using approved plate or roller type vibratory compacting equipment. The surface of the drainrock immediately beneath the reservoir shall be stabilized with hot applied liquid asphalt after the surface of the drainrock has been finish-graded. The Contractor shall use, at his option, one of the two types of asphalt listed below:

	Type 1	Type 2
Designation	MC 70	MC 250
Spray Temperature ( <sup>0</sup> C)	57-79	74-93
Coverage	2.3 L/m <sup>2</sup>	2.3 L/m <sup>2</sup>

If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

Instead of the hot-applied asphalt, the Contractor, at his option, may elect to use the waterproofing asphalt emulsion described in Sub-clause 21.17 (g)(1).

#### D. Backfill Around Reservoir Walls

Backfill around reservoir walls shall consist of selected material obtained from the excavation, and shall be placed in uniform layers not more than 200 mm (8 in.) in thickness before compaction where compaction is attained by means of sheepfoot

rollers, pneumatic type rollers or any approved heavy compaction equipment. Where the use of this equipment is impractical, the layers shall not exceed 150 mm (6 in.) in thickness before compaction shall be attained by means of hand-operated power-driven tampers. The backfill shall be brought up evenly with each layer moistened and compacted by mechanical means to ninety percent (90%) of maximum density. Flooding, ponding, or jetting will not be permitted. Backfill around the reservoir walls shall not be placed until after the reservoir has been tested for leakage. The reservoir shall remain filled with water while said backfill is being placed. Loaded carryalls or vehicles weighing more than 4,500 kg (9,900 lbs.) when loaded shall not be permitted closer to the walls than a horizontal distance equal to the depth of the fill at that time.

## **B. REINFORCED CONCRETE**

### **WORK INCLUDED**

The work to be undertaken under this Clause shall include all labor, materials, equipment, plant and other facilities and the satisfactory performance of all work necessary to complete all concrete work shown on the Drawings and specified herein. All work included under this Clause shall be subject to the General Conditions accompanying these specifications. The Contractor is required to refer especially thereto.

### **2. MATERIALS**

#### **a. Cement**

Except as may be otherwise provided in these specifications, cement shall conform with the "Standard Specifications for Portland Cement" (ASTM C-150-Latest Revision) and shall be Type I. The cement shall be of one brand and shall not be more than three (3) months from date of manufacture.

#### **b. Concrete-Aggregates**

1.) Concrete aggregates shall be well-graded, clean, hard particles of gravel or crushed rock conforming with the "Standard Specifications" for Concrete Aggregates" (ASTM C-33 Latest Revision).

2.) The maximum size of the coarse aggregates shall not be larger than one-fifth (1/5) of the narrowest dimension between sides of forms, nor one third (1/3) the depth of slabs, nor three-fourths (3/4) of the minimum clear spacing between individual reinforcing bars, or bundles of bars, and in no case larger than 38 mm (1-1/2 in.) in diameter except that larger diameters may be allowed in massive concreting with written permission from the Engineer.

#### **c. Water**

Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel reinforcement.

d. Reinforcing Steel

All reinforcing steel bars used shall be of deformed type conforming with the specifications for the deformed and plain billet steel bars for concrete reinforcement (ASTM A615M) , new, free from rust, oil, defects, greases, or kinks. They shall conform with the latest edition of National Structural Code of the Philippines with a minimum grade equal to 275 MPa unless otherwise shown on the plans.

e. Admixture

At the Contractor's option or at the request of the Engineer, but in either case at the expense of the Contractor, an admixture may be added to the concrete to control the set, effect water reduction, and increase workability. Such admixture may be either a hydroxylated carboxylic and acid type or a hydroxylated polymer type, but shall contain no calcium chloride. The required quantities of cement shall be used in the mix regardless of whether or not any admixture is used. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's instructions. Where the air temperature at the time of placement is expected to be consistently over 26.7°C (80°F), such admixture shall be Super Concrete Emulsions' "Plastiment", "Master Builder's", "Pozzolith 300R", or substitute.

f. Calcium Chloride

Except as otherwise specified for Architectural finish, the use of calcium chloride in concrete will not be permitted.

3. STORAGE OF MATERIALS

Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion by foreign matter. Any material which has deteriorated or which has been damaged shall not be used for concrete. Steel shall be stored under cover or otherwise prevented from rusting.

4. TESTING OF MATERIALS

The Owner or his duly authorized representative or the Engineer shall periodically order the test of any material supplied by the Contractor entering into concrete or reinforced concrete to determine its suitability for the intended purpose. Such tests shall be in accordance with the standards of the American Society for Testing and Materials, as noted elsewhere in these Specifications. Samples shall be provided by the Contractor without cost to the Owner. Expenses for the testing and cost of transporting samples to testing laboratory shall be borne by the Owner. Copies of results of tests shall be furnished to the Owner promptly. Compressive strength specimens for tests of concrete during construction shall be according to "Making and Curing of Concrete Compression and Flexural Strength Test Specimens in the Field" (ASTM C-31).

5. CONTROLLED STRENGTHS OF CONCRETE

a. Concrete for structural elements of all water retaining structures shall develop a minimum of 28-day compressive strength of 28 MPa (4000 psi) unless otherwise specified in the plan.

- b. Concrete for structural elements, including slabs on grade within non-water-retaining structures and stairs shall develop a minimum 28-day compressive cylinder strength of 21 MPa (3,000 psi), unless otherwise specified in the plans.
- c. Concrete for non-structural elements such as cradles, unreinforced encasements, thrust blocks, and partition walls shall develop minimum 28-day cylinder strength of 18 MPa (2,500 psi), unless otherwise specified in the plans.
- d. Leveling or lean concrete under reservoir base slabs, retaining structures, foundations and column footings shall develop a minimum 28-day cylinder strength of 14 MPa (2,000) psi, unless otherwise specified in the plans.

6. METHOD OF DETERMINING STRENGTH: TRIAL BATCH

The Contractor shall submit design mixes and test results of samples made in accordance with "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory" (ASTM C-192-Latest Revision) and "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM Designation C-39) for each strength required, stating the proposed slump and the proportional weights of cement, saturated surface dry aggregates, and water. These mixes shall be proved by preliminary tests thirty (30) days before concreting and shall show a 28-day strength of fifteen percent (15%) higher than the ultimate strength required. No substitution shall be made in the materials or mixed without additional tests to show that the quality of concrete is satisfactory.

.7 CONCRETE PROPORTIONS AND CONSISTENCY

- a. The proportions of aggregate to cement for any concrete shall be such as to produce a mixture, which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed on the work but without permitting the materials to segregate, or excess free water to collect on the surface. The combined aggregates shall be of such composition of sizes that when separated on the No. 4 standard sieve, the weight passing the sieve (fine aggregate) shall not be less than thirty percent (30%) of the total, except that these proportions do not necessarily apply to lightweight aggregates.
- b. The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work. Measurement of materials for ready-mixed concrete shall conform with the "Standard Specifications for Ready-mixed Concrete" (ASTM C-94, Latest Revision) where applicable.
- c. Aggregates shall be measured out by weight and to within one percent (1%). Cement shall conform with 40 kg (88 lbs.) per bag and this is to be verified from time to time. Water shall be measured by weight or volume to within one and one-half percent (1-1/2 %).
- d. The water shall in no case exceed 21.24 litres and 25.67 litres (5.62 and 6.79 US gallons) per bag of cement for all concrete with specified strength of  $f'_c=21$  MPa (3,000 psi) and 18 MPa (2,500 psi), respectively. Slumps shall be within the following limits:

Portion of	Slump
------------	-------

<u>Structure</u>	<u>Millimetres</u>	<u>Inches</u>
Columns and end supported beams, girders	50-100	2-4
Walls and thin vertical sections	75-100	3-4
Footings, slabs on grade and canti- levered beams and slabs	50-75	2-3

Slumps shall be according to "Test of Slump for Portland Cement Concrete" (ASTM C-143).

- e. The minimum cement content for 21 MPa (3000 psi) concrete shall be 8.39 sacks per cubic meter of concrete.
- f. Job mix adjustments on water content shall be allowed only with Engineer's permission and provided that cement is also added to maintain the original water-cement ratio of the design mix.

## 8 EXCLUSION OF WATER

No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the work. No concrete shall be deposited under water without the explicit permission of the Engineer, and then only in strict accordance with his directions; nor shall the Contractor, without explicit permission, allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the approval of the Engineer.

## 9. MIXING CONCRETE

- a. No hand mixing shall be allowed, except in emergency such as mixer breakdown during concreting operations and this shall stop as soon as the pour is completed, at a construction joint shown or otherwise designated by the Engineer. All concrete shall be machine mixed for at least one and one-half (1-1/2) minutes after all materials, including water, are in the mixing drum.
- b. The mixer shall be of an approved size and type, which will insure a uniform distribution of material throughout the mass. It shall be equipped with a device for accurately measuring and controlling the amount of mixing water in each batch.

- c. The first batch of concrete materials placed in the mixer shall contain a sufficient excess of cement, sand, and water to coat the inside of the drum without reducing the cement of the mix to be discharged.
- d. Retempering, i.e., remixing with the addition of water to concrete that has been partially hardened will not be permitted.

## 10 PREPARATION OF SURFACES FOR CONCRETING

- a. Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.
- b. Concrete surfaces upon or against which concrete is to be placed, where the placement of the old concrete has been stopped or interrupted so that, in the opinion of the Engineer, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be leveled with a wooden float to provide a reasonably smooth surface. A surface consisting largely of coarse aggregate shall be avoided. Except where the drawings call for joint surfaces to be painted, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material. Such cleaning shall be accomplished by sandblasting followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed. After the surfaces have been prepared to the satisfaction of the Engineer, all approximately horizontal construction joints shall be covered with a layer of mortar approximately 25 mm (1 in.) thick. The mortar shall have the same proportion of cement and sand as the regular concrete mixture, unless otherwise directed by the Engineer. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed upon it, and the consistency of the mortar shall be suitable for placing and working in a manner hereinafter specified. The mortar shall be spread uniformly and shall be worked thoroughly into all irregularities of the surface, and wire brooms shall be used where possible to scrub the mortar into the surface. Concrete shall be placed immediately upon the fresh mortar.
- c. When the placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means that will secure proper union with subsequent work, provided that construction joints shall be made only where approved by the Engineer.

## 11 PLACING CONCRETE

- a. Concrete which upon or before placing is found not to conform with the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these specifications, or which is of inferior quality, as determined by the Engineer, shall be removed and replaced by and at the expense of the Contractor. No concrete shall be placed except in the presence of a duly authorized representative of the Engineer. Concrete shall not be placed when unsuitable heat or wind conditions will prevent proper placement and curing, as determined by the Engineer. Prior to placing any concrete, the Contractor shall give the Engineer twenty-four (24) hours written notice.

- b. Concrete shall be deposited in its final position without segregation, re-handling, or flowing. Placing shall be done preferably with buggies, buckets, chutes or wheelbarrows. Chutes will be allowed to transfer concrete from hoppers to buggies, wheelbarrows, or buckets in which case, they shall not exceed six (6) meters (20 ft) in aggregate length.
- c. Placing of concrete with a free drop or fall more than 1.20 meters (4 ft) shall not be allowed, except when approved by the Engineer and when approved sheet metal conduits, pipes, or "elephant trunks" are employed. When employed, these conveyors shall be kept full of concrete and the ends kept buried in the newly placed concrete as pouring progresses.
- d. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 450 mm (18 in.) and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 1.5 meters (5 ft) of vertical rise per hour.

## 12 FORMS

### a. General

The Contractor shall provide forms to confine the concrete and shape it to the required lines. Plastering, in general, shall not be allowed. The Contractor shall assume full responsibility for the adequate design of all forms. However, forms which in the opinion of the Engineer are unsafe or inadequate in any respect may at any time be condemned by the Engineer; and the Contractor shall promptly remove the condemned forms from the work and replace them at his own expense. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. Whenever, in the opinion of the Engineer, additional forms are necessary to maintain the progress schedule, such additional forms shall be provided by the Contractor at his own expense. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable safety regulations, and as may be specified in the General Conditions of these Specifications.

### b. Materials

Except as otherwise expressly approved by the Engineer, all lumber brought at the job site for use as forms, shoring, or bracing shall be new material.

All forms shall be smooth surface forms and shall be of the following materials:

- Walls - steel or plywood panels
- Columns - steel, plywood or surfaced lumber
- Roof - plywood

All other work - steel panels, plywood or surfaced lumber

Plywood shall be manufactured especially for concrete formwork and shall be oiled with an approved form oil and edge-sealed.

- c. Column forms shall be checked for plumbness before concrete is deposited. Hand holes shall be provided in column forms at lowest points of pour lifts to render this space accessible for cleaning.
- d. All girder, beam, and slab centerlines shall be crowned at least 6.3 mm (1/4 in.) in all directions for every 4.57 meters (15 ft) span. However, cambers from all cantilevers shall be as indicated on the plans or obtained from the Engineer by the Contractor.
- e. The following are the tolerance limits for formwork:

1. Variation from plumb:

In lines and surfaces of columns, piers, walls and risers:

In 3.05 m (10 ft)	6.3 mm (1/4 in.)
6.10 m (20 ft) max.	9.5 mm (3/8 in.)
12.20 m (40 ft)	
or more	19.0 mm (3/4 in.)

For exposed corner columns and/or piers, control joint grooves and other conspicuous lines:

In any bay 6.10 m (20 ft) max.	6.3 mm (1/4 in.)
In 12.20 m (40 ft) or more	13.0 mm (1/2 in.)

2. Variation in cross-sectional dimensions of columns and piers, beams, and thickness of walls and slabs:

Minus	6.3 mm (1/4 in.)
Plus	13.0 mm (1/2 in.)

3. Footings

Variations in dimensions on drawings (applied to concrete only and not to reinforcing bars or dowels):

Minus	13.0 mm (1/2 in.)
Plus	50.0 mm (2 in.)

Misplacement of eccentricity, two percent (2%) of the footings width in the direction of misplacement but not to exceed 50.0 mm (2 in.). Reduction in thickness five percent (5%) at specified thickness.

7. Variation in steps:



(1) In a flight of steps

Rise	3.2 mm (1/8 in.)
Tread	6.3 mm (1/4 in.)

(2) In consecutive steps

Rise	1.6 mm (1/16 in.)
Tread	3.2 mm (1/9 in.)

When required for another work, or when requested by the Owner or his Engineer, the Contractor shall remove or relocate shoring; but existing shoring shall not be disturbed until new shores are set in position.

f. Design

1. All forms shall be true in every respect to the required shape and size, shall conform with the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, or offsets, or similar surface defects in the finished concrete. Plywood, 16.0 mm (5/8 in.) and greater in thickness, may be fastened directly to studding if the studs are close enough to prevent visible deflection marks in concrete. The forms shall be tight so as to prevent the loss of water, cement, and fins during placing and vibrating of the concrete. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be subject to the approval of the Engineer.
2. Concrete construction joints will not be permitted on locations other than those shown or specified, except as may be approved by the Engineer. When a second lift is placed on hardened concrete, special precaution shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the form where required.
3. Unless otherwise shown, exterior corners in concrete members shall be provided with 19.0 mm (3/4 in.) chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise shown.

4. Reservoir forms and falsework supporting the roof slab shall be designed for a minimum additional live load or 1,000 (20 psf).

g. Form Ties

Form ties with integral water stops shall be provided with a cork or other suitable means for forming a conical hole to insure that the form-tie may be broken off back of the face of the concrete. The maximum diameter or removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 38 mm (1-1/2 in.) and all such fasteners shall be such as to leave holes of regular shape for reaming. Holes left by the removal of fasteners from the ends of snap-ties or form-ties shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough before being filled with mortar as provided in Clause 21.20. Wire ties for holding forms will not be permitted. No form tying device or part thereof, other than metal, shall be left embedded in the concrete, nor shall any tie be removed in such manner as to leave a hole extending through the interior of the concrete member. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 25 mm (1 in.) back from the formed face or faces of the concrete. Form ties or metal rods left embedded in concrete of water-retaining tanks shall be equipped with an integral metal waterstop of not less than 38 mm (1-1/2 in.) in diameter.

h. Vertical Surfaces

All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is called for on the drawings or explicitly authorized by the Engineer. Not less than 25 mm (1 in.) of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

i. Maintenance of Forms

Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Forms, when in place, shall conform with the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The forms surfaces shall be treated with a non-staining mineral oil or other lubricant approved by the Engineer. Any excess lubricant shall be satisfactorily removed before placing the concrete. In addition, all forms shall be given a preliminary oil treatment by the manufacturer or shall be oiled by the Contractor at least two (2) weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embodied in concrete. Forms may be reused if in good condition and if approved by the Engineer. Light sanding between uses will be required wherever necessary in the opinion of the Engineer to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces, which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic structures, unused tie rod

holes shall be covered with metal caps or shall be filled by other methods approved by the Engineer.

j. Removal of Forms

Directions of the Engineer concerning the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 15.52 MPa (2,250 psi) provided that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained a strength of 15.52 MPa (2,250 psi) and has been in place for a minimum of seven (7) days. The time required to establish said strength will be determined by the Engineer who will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the seven-day minimum, then it shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least three (3) days after the concrete has been placed. Forms for all parts of the work not specifically mentioned herein shall remain in place for periods of time as ordered by the Engineer.

13 CONSTRUCTION JOINTS

a. General

Construction joints shall be provided where shown on the drawings. Special care shall be used to prepare concrete surfaces at joints where bonding between two sections of concrete is required. Unless otherwise indicated on the drawings, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with Clause 21.10. Except where otherwise shown or specified, at all joints where waterstops are required, the joint face of the first pour shall be coated with an approved bond breaker applied in accordance with the recommendations of the manufacturer. It shall contain a coloring agent so that areas of applications will be readily distinguishable for a six-month period in sunlight. The surfaces of the groove for the sealant shall not be coated. Concrete next to waterstops shall be placed in accordance with Sub-clause 21.16 (b).

b. Construction Joint Sealant

Where shown, construction joints in floor slabs shall be provided with tapered grooves, which shall be filled with a construction joint sealant. The material used for forming the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sandblasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, they shall be primed and filled with the construction joint sealant. The primer used shall be supplied by the same manufacturer supplying the sealant. No sealant will be permitted to be used without a primer. Care shall be used to completely fill the sealant grooves. Areas designated to receive a sealant fillet shall be thoroughly cleaned, as outlined for the tapered grooves, prior to application of the sealant. The sealant shall be polyurethane polymer designed for bonding to concrete, which is continuously submerged in water. No material will be acceptable which has an

unsatisfactory history as to bond or durability when used in the joints of hydraulic structures. Prior to ordering the sealant material, the Contractor shall submit to the Engineer for approval sufficient data to show general compliance with the specification requirements. The material shall meet the following requirements:

Work Life	45-90 minutes
Time to Reach 20 Shore	
"A" Hardness (at 25°C)	
Ultimate Hardness	30-40 Shore "A"
Tensile Strength	1.73 MPa (250 psi) min.
Ultimate Elongation	400 percent, min.
Tear Resistance	
(Die C ASTM D624)	13.4 kg/cm (75 lb. per inch) of thickness, min.
Color	Light Gray

In addition, the material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure:

1. Sealant specimen shall be prepared between two concrete blocks 25 mm x 50 mm x 75 mm (1 in. x 2 in. x 3 in.) in size. Spacing between the blocks shall be 13 mm (1/2 in.). Coated spacers 50 mm x 38 mm x 13 mm (2 in. x 1-1/2 in. x 1/2 in.) shall be used to insure sealant cross-sections of 13 mm x 50 mm (1/2 in. x 2 in.) with a width of 13 mm (1/2 in.).
2. Sealant shall be cast and cured according to manufacturer's recommendations except that curing period shall not exceed twenty-four (24) hours.
3. Following the curing period, the gap between blocks shall be widened to 31.7 mm (1-1/4 in.). Spacers shall be used to maintain this gap for twenty-four (24) hours prior to inspection for failure.

Certified test reports from the sealant manufacturer on the actual batch of material being supplied indicating compliance with the above requirements shall be furnished to the Engineer before the sealant is used on the job. The primer and sealant shall be placed strictly in accordance with the recommendations of the manufacturer, taking special care to properly mix the sealant prior to application. Before any sealant is placed, the crew doing the work shall be carefully instructed as to the proper method of application by a representative of the sealant manufacturer. All sealant shall cure at least seven (7) days before the structure is filled with water.

c. Waterstops

1. Material and Manufacture

Waterstops shall be extruded from an elastomeric polyvinylchloride compound containing the necessary plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these specifications. No reclaimed or scrap material shall be used. The waterstop manufacturer shall furnish to the Engineer current test reports and a written certification that the material to be shipped to the job site meets the following physical requirements:

Physical Property,

<u>Sheet Material</u>	<u>Value</u>	<u>ASTM Std.</u>
Tensile Strength-		
minimum	12.07 MPa (1750 psi)	D412, Die C
Ultimate Elongation		
minimum	350%	D412, Die C
Low Temp. Brittle-	-37°C	
ness - max.	(-35°F)	D746
Stiffness in	2.76 MPa	
Flexure minimum	(400 psi)	D747
<u>Accelerate Extraction</u>		
Tensile strength-	10.35 MPa	D412
minimum	(1500 psi)	Die C
Ultimate Elongation-		
Minimum (%)	300	D412, Die C

Effect of Alkalies

Change in Weight (%)	+0.25/	
	-0.10	-

Change in Durometer,

Shore A	+5	
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Finished Waterstops

Tensile strength-

minimum MP	10.67	D412, Die C
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Ultimate Elongation-

minimum (%)	280	D412, Die C
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2. Qualification Samples

Prior to production of the material required under this Contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used, and shall be accomplished so that the material and workmanship represents in all respects the material to be furnished under this Contract. The balance of the material to be used under this Contract shall not be produced until after the Engineer has approved the qualification samples.

3. Splices and Joints

Prior to use of the waterstop material in the field, a sample of a fabricated cross constructed of each size or shape of material to be used shall be submitted to the Engineer for approval. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be furnished under this Contract. Field samples of fabricated fittings (crosses, tees, etc.) will be selected at random by the Engineer for testing by a laboratory at the Owner's expense. When tested, they shall have tensile strength across the joints equal to at least 4.14 MPa (600 psi). Field splices and joints shall be made in accordance with the waterstop manufacturer's instruction using a thermostatically controlled heating iron.

5. Flat-Strip Waterstops

Flat-strip waterstops, where required, shall be as shown. At no place shall the thickness be less than 4.76 mm (0.1875 in.). Adequate means shall be provided for anchoring the waterstop in concrete. In placing flat-strip waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete as it is placed. Horizontal waterstops shall be held in place with continuous supports to which the top edge of the waterstop shall be tackled. Vertical waterstops shall be

held in place with light wire ties on 450 mm (18 in.) centers, which shall be passed through the edge of the waterstop and tied to the two curtains of reinforcing steel. In placing concrete around waterstops, concrete shall be worked under the waterstops by hand so as to avoid the formation of air and rock pockets.

d. Expansion Joint Filler

Where expansion joint filler is indicated on the drawings, the material shall be of the performed non-extruding type joint filler which may be constructed of open cellular sponge rubber, or closed cellular sponge rubber of firm texture. Bituminous fiber type will not be permitted. All non-extruding and resilient-type performed expansion joint fillers shall conform with the requirements and tests set forth in "Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction", Type (ASTM Designation D-1752), except as otherwise provided herein.

#### 21.14 CORROSION PROTECTION REQUIREMENTS

Pipes, conduits, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 50 mm (2 in.) clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

#### 21.15 ORDER OF PLACING CONCRETE

- a. The order of placing concrete in all parts of the work shall be subject to the approval of the Engineer. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the drawings. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least seven (7) days before the contiguous unit or units are placed, except that vertical walls shall be placed until the wall footings have cured at least fourteen (14) days, and the corner sections of vertical walls shall not be placed until all the adjacent wall panels have cured at least fourteen (14) days.
- c. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 19.0 mm (0.75 in.) thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 13.0 mm (0.50 in.) above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

#### 21.16 TAMPING AND VIBRATING

- a. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted through-out the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles,

thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement.

- b. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are used, the concrete shall be worked under the waterstops by hand making sure that all air and rock pockets have been eliminated.
- c. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Except in special cases where their use is deemed impracticable by the Engineer, the Contractor shall use internally vibrated, high speed power vibrators not less than 8000 rpm of an approved immersion type in sufficient numbers, with standby units as required, to accomplish the results herein specified within fifteen (15) minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its face.

21.17 CURING AND WATERPROOFING

a. *General*

All concrete shall be cured for not less than fourteen (14) days after placing, in accordance with the methods specified herein for the different parts of the work, and described in detail in the following Sub-clauses.

Surface to be cured or <u>waterproofed</u>	<u>Method</u>
Unstripped wooden forms	1
Construction joints between footings and walls, and floor slabs and columns	2
Encasement concrete and thrust blocks	3



All concrete surfaces not  
specifically provided for  
elsewhere in this Sub-clause 4

Floor slabs in hydraulic  
structures and exterior surfaces  
of exposed roof slabs 5

Exterior buried surfaces of walls 6

b. Method 1

Wooden forms shall be wetted immediately after concrete has been poured and shall be kept wet with water until removed. If forms are removed within fourteen (14) days of placing the concrete, curing shall be continued in accordance with the applicable method for the particular structure as set out in Methods 2, 4, 5 and 6 below.

c. Method 2

The surface shall be covered with burlap mats, which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

d. Method 3

The surface shall be covered with moist earth, not less than four (4) hours nor more than twenty-four (24) hours after the concrete is placed.

e. Method 4

1. The surface shall be sprayed with a liquid curing compound, which will not affect the bond of paint to the concrete surface. It shall be applied in accordance with the manufacturer's instructions at a maximum coverage rate of  $4.91 \text{ m}^2/\text{l}$  ( $200 \text{ ft}^2/\text{gal}$ ) in such manner as to cover the surface with a uniform film which will seal thoroughly.
2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.
3. Wherever curing compound may have been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, said compound shall be entirely removed by sandblasting prior to the placing of new concrete.

4. Where curing compound is specified, it shall be applied within two (2) hours after completion of the finish or unformed surfaces, and within two (2) hours after removal of forms on formed surfaces. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be sandblasted to remove the curing compound, following which repairs shall be made as provided under Clause 21.20.

f. Method 5

Immediately after the concrete has been troweled, it shall be given a coat of curing compound in accordance with Sub-clause (e) herein. Not less than one (1) hour or more than four (4) hours after the coat of curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle and concrete curing blankets shall be placed on the slabs. The curing blankets shall consist of one of the following two types:

1. Sheets of heavy, waterproof sisalkraft paper laid with the edges butted together and with the joints between strips sealed with 50 mm (2 in.) wide strips of sealing tape or with the edges lapped not less than 76 mm (3 in.) and fastened together with a waterproof cement to form a continuous watertight joint.

Sheets of clear polyethylene having a thickness of not less than six (6) mils laid with edges butted together and with the joints between sheets sealed with 25 mm (1 in.) wide strips or acetate tape.

The curing blankets shall be left in place during the 14-day curing and shall not be removed until after concrete for adjacent work has been placed. Should the curing blankets become torn or otherwise ineffective, the Contractor shall replace damaged sections. During the first seven (7) days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 16 mm (5/8 in.) minimum thickness laid over the curing blanket.

g. Method 6

1. The surface shall be sprayed with a waterproofing agent consisting of an asphalt emulsion immediately after the wall forms have been removed. Application shall be in two coats. The first coat shall be diluted to 1/2 strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 2.45 m<sup>2</sup>/L (100 ft<sup>2</sup>/gal) of dilute solution. The second coat shall consist of an application of the specified material undiluted, and shall be sprayed on so as to provide a maximum coverage rate of 2.45 m<sup>2</sup>/L (100 ft<sup>2</sup>/gal).
1. As soon as the asphalt emulsion applied in accordance with Subsection 21.17 (g) (1), has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used which produces a uniformly coated white surface and which so remains until placing of the backfill.

Should the whitewash fail to remain on the surface until backfill is placed, the Contractor shall apply additional whitewash as ordered by the Engineer.

18 CARE AND REPAIR OF CONCRETE

The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the complete work, or which departs from the established line or grade, or which for any other reason does not conform with the Specifications, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

19 FINISH OF CONCRETE SURFACES

- a. All finished or formed surfaces shall conform accurately with the shape, alignment, grades and sections as indicated on the plans or as prescribed by the Engineer. Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface.
- b. Except as otherwise provided herein, unformed top surfaces of concrete shall be brought to uniform surfaces and worked with suitable tools to a reasonably smooth woodfloat finish. Excessive floating of surfaces while the concrete is plastic will not be permitted. All surfaces shall be placed monolithically with the base slab. Dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floor slabs and exposed tops of walls and curbs shall be given a steel trowel finish. At the Contractor's option, the above mentioned floor slabs may be finished with a power float after screeding. Subsequent to the aforementioned finish, all sloping surfaces of floor slabs shall be lightly broomed to provide a skid-resistant surface.

20 TREATMENT OF SURFACE DEFECTS

- a. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer, and then only in strict accordance with his directions. Concrete containing voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced; provided that where required or approved by the Engineer, defects shall be repaired with gunite or with cement mortar placed by an approved compressed air mortar gun. In no case will extensive patching of honeycombed concrete be permitted. All repairs and replacements herein specified shall be promptly executed by the Contractor at his own expense.
- b. Defective surfaces to be repaired as specified in Sub-clause (a) hereon, shall be cut back from trueline a minimum depth of 13.0 mm (1/2 in.) over the entire area.

Feathered edges shall be avoided. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 0.79 mm (1/32 in.) depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with gunite or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair purposes shall consist of mixture of one (1) bag of cement to 0.08 m<sup>3</sup> (3 ft<sup>3</sup>) of sand. For exposed walls, the cement shall contain such a proportion of white portland cement as is required to make the color or the patch match the color of the surrounding concrete.

- c. Holes left by the tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed mortar. Holes left by form-typing devices having a rectangular cross-section and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with dry-packed mortar.
- d. All repairs shall be built up and shaped in such a manner that the completed work will conform with the requirements of Clause 21.19 using approved methods which will not disturb the bond, cause sagging or horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- e. Prior to filling any structure with water, any cracks that may have developed shall be "vee'd" as shown on the drawings and filled with sealant conforming with the requirements of Sub-clause 21.13(b).

## 21 ARCHITECTURAL FINISH

All prominently exposed exterior, vertical, above-ground concrete surfaces shall be given an architectural finish as follows:

Immediately after the forms are stripped, the concrete surface shall be inspected and any poor joints, voids, rock pockets, or other defective areas shall be repaired and all formtie fastener holes filled as required in Clause 21.20. After the concrete has cured at least fourteen (14) days, wet the surface and apply with a brush a grout made by mixing one (1) part portland cement and one (1) part of fine sand that will pass a No. 16 sieve with sufficient water to give it the consistency of thick paint. The cement used in said grout shall be one-half gray and one-half white portland cement, or as directed by the Engineer. Calcium chloride in the amount of five percent (5%) by volume of the cement shall be used in the brush coat. The freshly applied grout shall be vigorously rubbed into the concrete surface with a wood float filling all small air holes. The surface shall then be kept moist for an hour or more, depending on the weather, until the grout hardens sufficiently so that it can be scraped from the surface with the edge of a steel trowel without disturbing grout in the air holes. After all the surface grout has been

removed with a steel trowel, the surface shall be allowed to dry and, when dry, shall be vigorously rubbed with burlap to remove completely all surface grout so that there is no visible paint-like film of grout on the concrete. The entire cleaning operation for any area must be completed the day it is started, and no grout shall be left on the surface overnight. Cleaning operations for any given day shall be terminated at panel joints. It is essential that the various operations be carefully timed to secure the desired effect, which is a light-colored concrete surface of uniform color and texture without any appearance of a paint or grout film. In the event that improper manipulation results in an inferior finish, the Contractor shall rub such inferior areas with carborundum bricks as directed by the Engineer. Before beginning any of the final treatment on exposed surfaces, the Contractor shall treat in a satisfactory manner an area of at least 18.6 m<sup>2</sup> (200 ft<sup>2</sup>) in some inconspicuous place selected by the Engineer and shall preserve said treated area undisturbed until the completion of the job. All architecturally treated concrete surfaces shall conform with the approved sample in texture, color, and quality. It shall be the Contractor's responsibility to maintain and protect the concrete finish.

## 22 READY-MIXED CONCRETE

- a. At the Contractor's option, ready-mixed concrete may be used meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in the requirements of the "Specifications for Ready-Mixed Concrete" (ASTM C-94), including the supplementary requirements specified in Sub-clauses (b) through (g) herein.
- b. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first. In hot weather, or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 29.44°C (85°F) or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed forty-five (45) minutes.
- c. Truck mixers shall be equipped with electrically actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.
- d. Each batch of concrete shall be mixed in a truck mixer for not less than seventy (70) revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment. 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 determining the number of revolutions of mixing.
- e. Truck mixers and their operation must be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than 25 mm (1 in.) when the specified slump is 76 mm (3in.) or less, or if they differ by more than 50 mm (2 in.) when the specified slump is more than 76 mm (3 in.), the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the

mixer, such as water measuring and discharge apparatus, condition of the blades, speed rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

- f. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a ticket furnished to the Engineer and showing volume of concrete, the weight of cement in kilograms (pounds), and total weight of all ingredients in kilograms (pounds). The ticket shall also show the time of day at which the materials were batched.
- g. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the Engineer.

## 23 SLIPFORM PROCESS IN CONCRETE WORK

### a. General

The use of slipform in concrete work is optional for this project. However, should the Contractor decide to adopt slipform in concreting, the procedures/ guidelines outlined below shall be followed.

### b. Form Material

Either steel, plywood, or timber sheeting shall be used.

### c. Depth of Forms

The effective depth of any slip form shall be a minimum of 1.00 m (39 in.) and a maximum of 2.00m (78 in.).

### d. Yokes

Additional supports shall be provided in order to prevent buckling of the jack rods.

### e. Bracing and Working Platform

The Contractor shall provide adequate bracing which shall be a part of the working platform. Plywood not less than 19 mm (0.75 in.) thick may be used as the working platform. The top of the working platform shall be in the same level as the tops of the inside forms, to permit direct shoveling of concrete from the deck into the forms.

### f. Jacking System

The Contractor shall use hydraulic lifting gear with hydraulic jacks bearing against rods buried in the concrete. Alternately, the forms may be lifted by winches and cable, rack and pinion, or hung from steel rods. Hydraulically operated jacks with capacities ranging from 3,000, 4,500 and 6,000 kilograms shall be used. Jacks shall be cylindrical in shape with a hole in the center through which the jack rod passes, with two sets of jaws, which alternately lift and grip.

g. Jack Rods

The Contractor shall use 25 mm (1 in.) diameter smooth mild steel bars with threaded ends for easy coupling for extension. Jack rods shall remain in place as part of the reinforcement. Unsupported length of jack rods shall not be more than 0.60 m (2 in.) on maximum load. Where rods pass through large formed openings, they must be braced adequately.

h. Control of the Jacking Process

A suitable process distribution system from a control hydraulic pump shall be used. The Contractor shall operate all jacks at the same speed to give uniform lift, care being taken that the jacks carry the same loads. All jacks shall be provided with the same hydraulic pressure to avoid cases where some will lift more slowly than the others.

To control the level of the forms during the jacking process, plastic pipes with colored water may be used, care being taken to purge out or remove entrapped air in the plastic pipe.

i. Control and Tolerances

As jacking proceeds, provisions shall be made to limit any deviations from the vertical. A plumb bob shall be used during the entire operation.

j. Reinforcement

1. Vertical reinforcement placed shall be held in position by templates mounted on the forms and moving with them. Steel shall be lapped and tied to the rod below and shall be held at the top by the templates at heights of from 1.20 to 3.00 m (3.94 to 9.84 ft) from the deck. Where difficulties are encountered in the use of templates, the Contractor shall weld a piece of steel to the yokes just above the top of the forms to guide the reinforcement into the correct position.
2. Horizontal reinforcement shall be placed as work progresses. The Contractor shall thread the bars through the yokes and tie or weld these to the vertical steel to control buckling. Steel should be of short lengths, say, 3.00 m (9.37 ft) to permit easy handling. The reinforcing steel should be placed on the working platform in the correct order for placement.

k. Forming Openings and Recesses

The Contractor shall employ special techniques to form openings for doors, for connections of beams and floors, and for provisions of nibs and haunches. Toothed or dovetailed connections shall be used.

l. Handling Concrete

The Contractor shall use the common method for slip forming structural cores by depositing the concrete on the working platform and shoveling it into its final position. Crane and bucket or hoist and barrows may be used.

m. Normal Concreting Operations

After the slip process has started, the workmen shall place the concrete continuously around the structure in 150 mm to 220 mm (6 in. to 8.8 in.) layers by shoveling same into forms. On ceasing concreting, the forms shall be kept moving to prevent formation of excessive adhesion. The "hack off" process shall involve jacking at a decreasing rate, about 2-3 hours after placing or until the freeboard is about 450 mm to 500 mm (18 in. to 20 in.). When concreting resumes again, the workers shall jack the forms up about 25 mm to 50 mm (1 in. to 2 in.) before pouring concrete.

n. Care and Maintenance of Formwork

After concreting has ceased, the exposed forms must be cleaned and oiled. Care should be taken to prevent coating of reinforcing steel and spillage onto the set concrete.

o. Finishing and Curing

1. Finishing

Where small holes and depressions occur, a sponge float to fill small holes shall be used to improve the overall appearance of the finished surface.

2. Curing

Potable water shall be used for curing. Wherever possible, water shall be sprayed directly into the surface. The Contractor shall provide suitable and adequate water supply at the working platform. Workers shall apply water to the concrete surface intermittently. Where the finished structure is to be exposed to the elements, the wetting action of rain to complete the cement hydration may be used as a curing method.

Covering of the interior and exterior surfaces of the formed structure with plastic sheets to keep the moisture always in contact with the concrete surface will be an acceptable method of curing.

24. PLACING REINFORCEMENT

- a. All reinforcement shall be placed in accordance with the plans furnished by the Engineer. In case of any doubt or ambiguity in placing of steel, the Contractor shall consult with the Engineer whose decision shall be final in such cases.
- b. All loose rust or scale, all adhering materials, and all oil or other materials which tend to destroy bond between the concrete and the reinforcement shall be removed before placing the steel and before concreting begins.
- c. Metal reinforcement shall be accurately placed and adequately secured by using annealed iron wire ties or suitable clips at intersections and shall be supported by concrete or metal supports, spacers, or metal hangers. The minimum clear distance between parallel bars shall be one and one-half (1-1/2) times the diameter for round bars, and twice the side dimension for square bars. In no case shall the clear distance between bars be less than 25 mm (1 in.) nor less than one and one-third (1-



1/3) times the maximum size of the coarse aggregate. Where bars are used in two or more layers, the bars in the upper layers shall be placed directly above those in the lower layers at a clear distance of not less than 25 mm (1 in.).

- d. Bends for stirrups and ties shall be made around a pin having a diameter not less than six (6) times the minimum thickness of the bar, except that for bars larger than 25 mm (1-in.), the pin shall not be less than eight (8) times the minimum thickness of the bar. All bars shall be bent cold.
- e. Reinforcement steel shall not be straightened or rebent in a manner that will injure the material. Bars with kinks or bends not shown on the drawings shall not be used. Heating of the reinforcement will be permitted only when approved by the Engineer.

## .25 OFFSETS AND SPLICES IN REINFORCEMENT

- a. In slabs, beams, and girders, splices of reinforcement at points of maximum stress shall be generally avoided, and may be allowed only upon written approval of splice details by the Engineer. Splices shall provide sufficient lap to transfer stress between bars by bonding shear or by butt welding to develop in tension at least one hundred twenty-five percent (125%) of the specified yield strength of the reinforcing bar. Splices in adjacent bars shall be generally staggered.
- b. Where changes in the cross-section of a column occur, the longitudinal bars shall be offset in a region where lateral support is afforded. Where offset, the slope of the inclined portion of the bar with the axis of the column shall not be more than one in six; in the case of tied columns, the ties shall be spaced not over 76 mm (3 in.) on center for a distance of 300 mm (12 in.) below the actual point of offset unless otherwise shown on the plans.

## 26 TEST ON CONCRETE

- a. The Owner or the Engineer may require a reasonable number of tests on the concrete to be made during the progress of the work. Not less than four (4) cylindrical specimens shall be made for each test of which at least two (2) shall be reserved for 28-day test. Not less than one test shall be made for every fifty (50) cubic metres of concrete and in no case less than one test for each day's concreting. Samples shall be secured and molded in accordance with "Standard Method of Sampling Fresh Concrete" (ASTM C-172 - Latest Revision) and "Standard Method of Making and Curing Test Specimens in the Field" (ASTM C-31 - Latest Revision). Strength test shall be made in accordance with the "Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens" (ASTM C-39 - Latest Revision).

The Contractor shall provide the samples to be taken at the place of deposit and as specified by the Engineer and shall also box samples for shipment, packing them to prevent damage from sharp blows. The Owner or his duly authorized representative shall transport the test cylinders to a laboratory for testing. The owner shall pay costs of said transportation and testing of the samples.

- b. To conform with the requirements of these Specifications, the average strength of test samples representing each class of concrete as well as the average of any five (5) consecutive strength tests representing each class of concrete, shall be equal to or greater than the specified strength and not more than one strength test in ten shall have an average value less than ninety percent (90%) the specified strength.
- c. Should the test fail to give the required strength, the Owner shall have the right to order a change in the proportions or in the procedures of curing of the concrete for the rest of the structure.

## 27 LIQUIDATED DAMAGES (FOR FAILURE TO MEET CONCRETE STRENGTH REQUIREMENTS)

For failure to meet the specified strengths of concrete which has been designed, prepared, and deposited by the Contractor, the Contractor shall pay the Owner as liquidated damages, not as penalty or forfeiture, the following schedule applied on the amount of concrete represented by the samples.

- a. For concrete less than one hundred percent (100%) but greater than or equal to ninety percent (90%) of specified strengths, payment of ten percent (10%) of the unit bid cost per cubic metre of concrete.
- b. For concrete less than ninety percent (90%) but greater than or equal to eighty percent (80%) of specified strengths, payment of fifteen percent (15%) of the unit bid cost per cubic metre of concrete.
- c. For concrete less than eighty percent (80%) of the specified strength, removal of the concrete so deposited and the replacement of same at the expense of the Contractor.
  - (i) In any case of failure to meet specified strength, the Contractor may, at his expense, obtain concrete core samples from the poured concrete and the compressive strength of same, as determined by a competent testing authority, shall be taken as conclusive evidence of its strength and integrity, provided the corings will not impair the safety of the structure and can be satisfactorily replaced.

To determine adequacy of affected parts, the Owner shall have the option to order load tests on parts of the structure where concrete strength tests are below eighty percent (80%) of specified. These tests shall be in accordance with ACI-318, latest revision; recommendations and their costs shall be borne by the Contractor.

- (ii) In case of failure of samples to meet specified strengths to the extent mentioned in (a), (b) or (c) above, the Contractor shall be required to prolong the curing of the poured concrete as directed by the Engineer, in addition to payment of the liquidated damages mentioned above.

# Technical Specifications for Electro-Mechanical Works

## DIVISION 1 - MECHANICAL WORKS

### 1.01 GENERAL

- a. The Contractor shall design, furnish, deliver, install and test at site all mechanical equipment as shown on the Drawings and/or specified herein. He shall provide the necessary supervision, tools, materials, supplies and appurtenances for the proper installation, testing and operation of the completely assembled equipment. The contractor shall accomplish the work in a complete and finished manner in keeping with good supervisory practice in accordance with the drawings, manufacturer's recommendations and to the satisfaction of the Engineer.
- b. All equipment furnished and installed shall be brand new and non- obsolete model (at most three years ex-stock), unused and guaranteed from defects in material, design and/or workmanship. No equipment nor material shall be delivered for installation on site prior to:
  - 1. The return of acceptable shop drawings submitted by the Contractor in accordance with Division 7. Shop drawings of imported items which are ex-stock, shall be accompanied with importation papers to prove conformity with the three-year ex- stock requirement;
  - 2. The equipment successfully passing the laboratory test to be conducted at the manufacturer's plant in the presence of authorized LWUA or Water District representatives. For imported equipment, certified copies of the performance test shall be furnished to the Engineer in accordance with Clause 7.02 prior to shipment. In no case shall the Contractor be allowed to deliver and install any equipment until satisfactory laboratory tests have been conducted.
  - 3. Submission of a certificate of availability of parts and service locally for five (5) years, for all equipment supplied herewith to ensure operational viability of the installation within the said period.

All cost incidental to the above pre-delivery requirement shall be borne entirely by the Contractor.

- c. Upon completion of the contract work, the Contractor shall arrange that a field testing be conducted on the installed equipment;
- d. In the presence of authorized LWUA or Water District Engineers, the test shall be made to show that the installed equipment satisfies its specifications and operational requirements.
- e. In the event of failure of the equipment to meet the guaranteed performance or to operate to the Engineer's satisfaction, the Contractor shall make such modifications, repairs and/or replacements and shall receive no additional compensation thereof. Failure of the equipment to meet the contract requirements in three (3) official field tests shall be a ground for rejection of the unit. Expenses to be incurred, including the travel expenses of LWUA or Water District Engineers, during the second, third and any subsequent official field test of the same equipment shall be charged to the

Contractor/Supplier. The contract work will not be accepted, and final payment will not be recommended until satisfactory test has been made. The test run shall be made within thirty (30) days upon receipt of the Contractor's request for such testing. Provided, however, that if the Engineer/s fail to appear and witness the test within the said period the field test shall not further delay the acceptance of the work.

- f. Above field test shall be made only after the Contractor has furnished the Engineer, a copy of satisfactory results of his initial or preliminary tests on the equipment as part of his work and without cost to the Owner. Only after all the equipment has been properly installed, tested and adjusted shall the new facilities be put into operation.
- g. During the testing of the equipment, the Contractor shall arrange to have available, as necessary, representatives of the manufacturers of all the various pieces of equipment or other qualified persons who shall instruct the plant personnel in the operation and care thereof. These representatives shall have spent at least 72 working hours for the instruction and training of authorized Owner representatives. A certificate of completion of this requirement shall be issued by the Owner and shall form part of the Certificate of Project Completion of the contract works.
- h. The equipment and installation shall be guaranteed for a period of at least one (1) year of trouble-free operation. A warranty certificate shall be issued by the Contractor to this effect. Effectivity date of the warranty shall start on the same day the units have been accepted. A duplicate copy of the same shall be furnished to the Engineer. The Contractor shall furnish and replace, without cost to the Owner, any equipment or part that is defective or shows undue wear within the one (1) year warranty period.
- i. Before acceptance of the work, the Contractor shall furnish, for each piece of equipment supplied and/or installed, four (4) complete bound sets of manuals/catalogues giving the following information (in the English language):
  - 1. Clear and concise instructions for the proper operation, adjustments, lubrication and other maintenance procedures required by each particular equipment.
  - 2. List of spare parts, as provided by the Contractor on the date of completion of work and to be stored by the Water District.
  - 3. List of all spare parts for each equipment, with catalog numbers and other data necessary for ordering replacement parts in the future.
- j. All equipment furnished under these Specifications shall comply with all applicable mandatory safety codes.

- k. Where materials of construction are not specified, the Contractor shall use first class commercial grades best suited for the particular use for which they are employed.
- l. The Contractor shall employ licensed Mechanical and/or Electrical Engineer/s to supervise the mechanical and/or electrical works as required by Commonwealth Act No. 294, known as the Mechanical Engineering Law and Republic Act No. 184, known as the Electrical Engineering Law.

## **1.02 SCOPE/LIMIT OF CONTRACT WORK**

The Contractor/Supplier shall be solely responsible for the supply and proper installation of all electro-mechanical equipment including all necessary requirements to fulfill the works specified herein. The contract works shall consist of but not necessarily be limited to the Design. Supply, deliver, install, testing and commissioning of following work.

1. Brand new units of pumping equipment which include submersible pump and motors, submersible cables, column pipes, discharge piping assembly, hypochlorinator unit, pump house lighting system, grounding/earthing system complete with all accessories and appurtenances in accordance with the specifications and as shown on the Drawings. Also included under pumping facilities is the pump house and the perimeter/security fencing.
2. Supply, delivery and installation of diesel generator set complete with all accessories in accordance with the Specifications and as shown on the Drawings.
3. Supply, delivery and installation of distribution transformers and its protective devices, metering equipment and necessary materials and equipment to extend the single (1 $\emptyset$  or 3 $\emptyset$ ) phase primary line from Electric Cooperative/local power provider nearest available up to proposed sites of various pumping stations.

## **1.03 EQUIPMENT PARTS AND AFTER SALES SERVICE**

The Contractor shall guarantee the availability of replacement parts and after sales service for a period of five (5) years, within the Luzon, Visayas or Mindanao areas for each piece of equipment supplied herewith. For contractors whose supplier/s has no service and parts outlet in that particular area, a Certificate of commitment from a reputable local based company to provide such parts and services shall be submitted and shall form part of the requirement prior of the provisional acceptance of the works.

## **1.04 PUMPING EQUIPMENT**

### **A. GENERAL**

1. The Contractor shall design, furnish, deliver, install, test and commission in accordance with these Specifications and drawings, one (1) submersible pump and motor set, complete with Full Voltage motor controller in \_\_\_\_\_ Pumping Station, and all other appurtenances as required in the proper installation and as specified herein and shown on the drawings.
2. The services of a factory representative to check the pumping equipment during and after the installation shall be furnished at no cost to the Owner. However, if the Contractor fails to provide the services of this representative, the Owner has the right to pay the expenses incurred in the rendering of these services chargeable to the project cost.
3. The Contractor shall be responsible for all components, and for satisfactory installation and operation of the completely assembled unit, including the motor, motor control, electric motor, discharge head, combination of right angle-gear drive and pump.
4. Except as otherwise provided in these Specifications, the pump and motor assembly and accessories shall conform to AWWA Standard E 101-77.
5. The minimum pump efficiencies specified herein are the minimum laboratory efficiencies for a completely staged unit. The head capacity curve of the pump shall rise continuously to the left and the design point shall be located to the right of the point of maximum efficiency. There shall be no point within the operating range on the pump curves wherein the required horsepower exceeds the rated motor horsepower. The laboratory and field tests to be conducted on the pump assemblies shall be in accordance with AWWA Standards.
6. Anchor bolts for the pumps shall be furnished by the Supplier/manufacturer and set by the Contractor.
7. Determination of plumbness/correct alignment of the centrifugal pump and electric motor shall be part of pump installation.

## **B. SUBMERSIBLE PUMP**

### **1. General**

The Contractor shall furnish and install submersible pump as shown on the drawings and as specified herein. The pump shall be of the low head high capacity type that should satisfy the operational requirements described herewith. Pumps shall be as stated in Section VII-Bill of Quantities and in Breakdown of Prices or approved equal.

2. **Design/Operating Requirements** – The pumps shall meet the following operating requirements:

Operating Requirements	
Number of Units	
Minimum capacity at design head, lps (gpm)	5 (79.40)/To confirm after drilling
Design head, TDH, m (ft.)	To be determined (TBD)
Minimum pump laboratory efficiency at design head), percent (%)	TBD
Nominal size of column, mm (in.)	TBD)
estimated location of pump suction strainer, m (ft.)	TBD
Design speed, rpm	3500
Maximum diameter of motor/pump bowl including cable guard, mm (in.)	TBD
Recommended Nom. Motor Rating, HP (KW)	To be determined
Length of Submersible Cable, m (ft.)	TBD
Generator Set, KVA (KW), Volts, Phase	KVA (TBD), 230VAC, 1Ø
Well depth and diameter (m/mm)	TBD
Distribution Transformer, KVA	TBD

There shall be no point within the operating range of the pump wherein the required horsepower exceeds the rated motor horsepower. In addition to the above requirements, the design point shall be located within the best efficiency range of the pump. Efficiency range shall be within the -5% of the pump's peak efficiency (0.05 x PPE).

### 3. PUMP CONSTRUCTION

- a. **Pump Element** – The impellers shall be of the enclosed type, constructed of bronze or stainless steel, accurately fitted, smoothly finished, and dynamically balanced at normal pump speeds. They shall have removable wearing rings and lateral seal rings mounted on their companion cases. The bowl cases shall be constructed of closed-grained cast iron and stainless steel. Cast iron bowls shall be provided with non-toxic epoxy or glass enamel lining. Pump bearings shall be at least 2-1/2 times the diameter of the shaft. The pump shaft shall be of type 416 stainless steel.
- b. **Column/Common Pipe** – The column pipe for the submersible pump shall be seamless black iron not lighter than schedule 40, furnished in 6.0 or 3.0 meters (10 or 20 ft.) nominal lengths, and shall be connected with threaded couplings. The pump suction shall include a stainless-steel strainer to restrict entry of solid materials that may damage the pump elements. The pump inlet area shall be equal to at least five (5) times the

impeller inlet area. A non-leak check valve shall be provided and installed at the top portion of the bowl assembly to protect the motor from backflow when the pump stop operation.

- c. Each pump shall be provided with a **nameplate**, one each on the equipment itself and one each to their respective above ground discharge elbow. Each plate shall show the serial number of the equipment, name of the manufacturer, capacity in liters per second, TDH in meters and rated speed in revolutions per minute. Such other information as the manufacturer may consider necessary for complete identification shall be shown on the plates.
4. **MOTOR**-The motor shall be of squirrel cage, submersible induction type, nominally rated and, shall be operable at 230V AC, 1 $\emptyset$ /3 $\emptyset$  (whichever is applicable), 60 hertz AC, running at 3500 rpm. They shall be designed for continuous duty operation and shall have a minimum service factor of 1.15. The motors shall be water filled and shall incorporate a mechanical seal to restrict foreign matter from entering the motor. The thrust bearings shall be of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust and shall be an integral part of the driver. Each unit shall be equipped with expansion diaphragm to compensate for filling water expansion/contraction due to temperature changes. The units shall be fitted with a permanent non-corrosive nameplate on which all NEMA standard motor data shall be stamped or engraved in English/Metric. A duplicate of the plate shall be attached to the discharge elbow to afford ready identification of the installed submersible motor. Each pump shall have a nameplate showing the serial number of the equipment and the name of the manufacturer. The nameplate shall show the capacities in cu.m./hr. total head in meters and the rated speed in revolution per minute. Such other information as the manufacturer may consider necessary may be shown on the plate. The nameplate of the distributing agent will not be acceptable. The nameplate shall be securely attached to the equipment to the location affording easy viewing when delivered and installed. Installation of winding temperature sensors may be offered separately.

The motor shall withstand operation of the pump against closed discharge valve for a minimum of six (6) minutes without damage from overheating.

The thrust bearings shall be designed for sustained operation against closed discharge valves (disregarding motor requirements) and shall be shock and water-hammer proof.



The lifetime of the thrust bearings shall be guaranteed for five (5) years' continuous operation under actual site conditions considering various heads, throttled flow, power failures, etc.

## **1.05 DIESEL GENERATOR SET**

### **a. General**

#### STANDARDS

ISO 3046 pts. 1, 3, 4, 5, 6, 7 – Reciprocating Internal Combustion Engines

ISO 7967 - Reciprocating Internal Combustion Engines – Vocabulary of components and systems.

ISO 8178 - Reciprocating Internal Combustion Engines – Exhaust Emissions.

ISO 8628 - Reciprocating Internal Combustion Engine Driven A.C. Generating Sets

IEC 60085 - Thermal Evaluation and Classification of Electrical Insulations

IEC 60947 - Low Voltage Switchgear and Control gear.

1. The Contractor shall design, furnish and install one (1) Diesel Generator Set, weather/sound proof or equivalent. The diesel generator set shall be factory mounted on a torsionally stiff structural steel subbase complete with all necessary engine and generator accessories, ready for operation, manual pushbutton start type, for emergency power supply rated for standby operation under the conditions specified herein.
2. Submittals and Quality Assurance Manufacturer's test certificates shall be furnished, together with four (4) copies of operation and maintenance manual, including list of recommended spare parts. Supplier's local agent shall be able to supply supervision during installation.
3. The diesel generator set shall bear manufacturer's nameplate which shall show:
  - Name of Manufacturer
  - Engine Model Number
  - Engine Rotation
  - Standard kW/kVA Rating @ 1800 RPM
  - Engine Serial Number
  - Power Factor
  - Frequency
  - Year Manufactured

The nameplates shall be securely mounted on each engine where it can be plainly viewed.

4. Acceptance Test/Commissioning. On completion of the installation, start-up test and commissioning shall be performed by a factory-trained dealer/representative of the manufacturer that owner requirements and factory specifications are satisfactorily met. Further the said representative shall devote at least two working days for the proper training and orientation of operators assigned by the Owner. A statement of satisfactory test and completion of the training of operators shall be issued by the Owner to this effect.

**b. Diesel Engine**

1. General - The engine shall conform to the standards and shall be of the (Radiator) water-cooled, heavy-duty, 4-cycle, industrial type and shall develop the full continuous power required by the alternator using diesel fuel when operating at a speed not exceeding 1800 RPM. The engine shall satisfy the following operating characteristics:

- a. Design speed ----- 1800 RPM
- b. Maximum specific fuel consumption (lbs/Bhp-hr) ----- 0.45

The engine shall be a manufacturer's current production model with aluminum pistons or light alloy connection removable type cylinder sleeved, heavy-duty replaceable precision type bearings. The crankcase shall be a single piece, stress relieved casting. The crankshaft shall be dropped forged, precision ground and surface hardened, statistically balanced and other features common to heavy-duty engines.

2. Starter - The engine shall be equipped with a VDC solenoid engaged electric motor starter. All necessary components for the safe, efficient and reliable starting shall be included.
3. Cooling System - The cooling system shall consist of a belt driven water circulating pump and an engine mounted radiator. All necessary mounting brackets, hoses, and connections shall be furnished and installed for a complete system.
4. Lubricating System - The lubricating system shall have forced lubrication, a vane or gear type oil pump, a full flow oil filter system with an oil cooler, an oil pressure gauge and oil level indicator.

5. Exhaust System – The engine shall be equipped with a residential silencer, sized in accordance with the engine manufacturer’s recommendation. Maximum back pressure measured at the exhaust header shall not be more than 350 mm (14 in) of water column. The silencer shall be installed with a flexible metal expansion section of stainless steel as shown on the Drawings and shall be designed together with all pipes, bends, bolts, nuts and clamps, for temperatures not less than 1000° F.

The entire exhaust assembly excluding expansion joint shall be insulated with 2-50 mm layers of magnesium or Rock Wool insulation or equivalent heat resistant with aluminum lagging or cladding.

6. Air Suction Filters – Manufacturer’s Standard.

7. Fuel System - The fuel system shall include an injection pump, engine fuel transfer pump, flexible fuel connections, fuel filters and shut-off valves. The fuel system shall also include the following:

- a. Fuel Oil Tank - The tank shall have a net capacity of at least 24 hours operation at maximum load and shall come complete with all accessories as shown in the drawings. Suitable connections to fill the tank from either drums or from a bulk Supply tanker. Inside surface of the tank shall be pickled or sandblasted to remove all mill scale, thoroughly cleaned of all dust and foreign matter and lightly coated with oil. All tank openings shall be sealed prior to shipping.

- b. Fuel Level Gauge - The Contractor shall furnish and install float, valve and a level gauge on each fuel day tank for visual indication of the amount of fuel remaining in the tank. The gauge shall be of either clear glass or plastic materials resistant to normal diesel fuel corrosion. The level gauge shall be provided with valves on both ends for isolation during routine maintenance and replacements. The gauge shall be of appropriate length with graduations calibrated in both liters and percentage of the total fuel tank capacity.

8. Instrument Panel - The engine shall be equipped with an instrument panel mounted separately with that of the engine frame and must be as mentioned together with the D.G. Control Box. The panel shall be installed on a suitable instrument box in a location affording easy viewing and access. The instrument panel shall include but not be limited to the following instrument:

Ammeters/Voltmeters/Frequency Meters/Watt Meter/Watt Hr-meters

Lube Oil Pressure Gauge

Water Temperature Gauge

Tachometer

Hour Meter

9. Battery and Charger - There shall be installed a battery complete with cables for supplying appropriate DC power to the engine controls for starting the engine. The battery shall have the necessary ampere-hour rating for cranking the engine for 10 minutes. The battery charger shall be 220 volts VAC input. It shall have an amperage output sufficient to recharge the battery in 4 hours when the battery is 50% discharged. The charger shall incorporate adjustable float and equalizing voltage potentiometers. A current limit signal shall be supplied in the control circuit from the current sensing resistor. It shall be of the full wave rectifier type and shall include all the required standard components.

10. Miscellaneous Equipment - In addition to the item listed in the previous sub-clauses, the engine shall be equipped but not limited to with the following:

- a. Dry-type or oil intake air cleaner or manufacturer's standard.
- b. Flywheel, flywheel housing and stub shaft.
- c. One (1) tool kit, which shall include the following and any special tools required for maintenance, and servicing of the engine.

1. 2 pcs. Pipe wrench with 2" opening
2. 1 pc. 12" hacksaw
3. 1 pc. screwdriver 3/8"x8" square blade  
1 pc. Screw driver 1/4"x6" round blade
4. 1 pc. side cutting plier, 18"
5. 1 pc. long nose with cutter, 7"
6. 1 pc. diagonal cutting plier, 6"
7. 1 pc. Ball peen hammer, 16 oz. head wt.
8. 1 pc. adjustable wrench, 15"
9. 1 pc. adjustable wrench, 10"
10. 1 set TORQUE wrench (suitable for Cyl. Heads & Bearings)
11. Greaser
12. 14 pc. set combination open end box wrench
13. 1 pc. vice grip, 10" straight nose
14. 21 pc. set socket wrench including ratchet flex handle, extension bar and universal joint
15. 11 piece set Allen wrench
16. Double cut files, 12" (1 pc. each)
  - a. Round file
  - b. Triangular file
  - c. Flat file
  - d. Half round

Items 11, 12, and 13 should suit dimensional requirements of the engine to be supplied:

- e. Four (4) sets of oil lube filters and fuel filters.
- f. One (1) set complete water pump repair kit.
- g. Necessary "O" rings, seals, gaskets for replacing equipment under (d) and (e) above.

11. Direct Coupling – Manufacturers standards or ISO standards for Reciprocating Internal Combustion Engines components and system.

12. Automatic Speed Governor- 0.25% tolerance electronic governor, capable of isochronous frequency regulation from no load to full load.

**c. Alternator**

1. The alternator shall be rated (rating as indicated in the above) (minimum) for standby operation at its designed capacity, 1-phase, 60 Hz, 1800 RPM, 230 volts or 460 volts as required, 50°C rise over 30°C ambient temperature at 75 masl and shall be directly coupled to the engine. The alternator shall be single bearing, synchronous type with brushless exciter and shall be built according to applicable NEMA Standards. Class H insulation shall be further protected with 100% epoxy impregnation and an overcoat of resilient insulating material to reduce possible fungus and/or abrasion deterioration.
2. The exciter shall be self-regulating capable of maintaining rated voltage at 200% of rated current and sustaining under short circuit conditions at 400% of rated current. An alternator-mounted volts per hertz type automatic voltage regulator shall be provided to match the characteristic of the alternator and engine. Voltage regulator shall be  $\pm 2\%$  from no-load to full rated load. Readily accessible voltage drop, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of  $\pm 5\%$ . The solid-state regulator module shall be shock mounted and epoxy encapsulated for protection against vibration and atmospheric deterioration.
3. Alternator shall be capable of sustaining an overload capacity of 300%full load current at zero power factor for a period of 10 seconds without damage to it. Output voltage recovery, after sudden application or rejection of rated load shall be within 0.3 seconds.
4. Alternator shall be open, drip-proof construction with an over-all efficiency of at least 85% at full load, IP21or IP22 Standard Waveform deviation less than 5%.
5. Alternator windings and electrical components shall betropicalized.

**d. Generator Control Panel**

1. A separately mounted engine-alternator control panel shall be supplied with the diesel- generator set. The control panel shall be free-standing, dead front construction, 14 gauge NEMA 4 (IP65) enclosure. Cabling and control wiring shall be either top or bottom or MCCB Box shall be located in front of Generator together with the control unit box.
2. Instruments. Panel shall contain, but not limited to the following equipment:
  - a. Alternator circuit-breaker, thermal-magnetic type, molded case, rating as required.
  - b. 1 voltmeter with phase selector switch and potential transformers.
  - c. 1 ammeter with phase selector switch and current transformers.
  - d. 1 frequencymeter/watthour meter/wattmeter
  - e. 1 hour operating counter.
  - f. Voltage level adjustment rheostat.
  - g. Engine instrumentations which shall consist of:
    - Ammeter D.C.7
    - Lube Oil Pressure Gauge
    - Water Temperature Gauge
    - Tachometer
    - Hour Operations Counter
  - h. Panel illumination lights and switch.
  - i. Indicating relays and fault indicator lamps for phase failure on alternator supply, low oil pressure, high engine temperature, overspeed, alternator overload and short circuit.
  - j. Power Factor meter.
  - k. Kilowatt meter/ KW-Hr meter
  - l. Frequency Meter
3. Operating switches and pushbuttons shall include:
  - a. Manual start/stop pushbuttons
  - b. Alternator on-off
  - c. Control lamps test
  - d. Speed regulator switch

- e. Selector switches
  - f. Test switches
  - g. Battery charge switch
4. Operational Controls. During operation, the standby generating set shall be monitored for the following disturbances:
- a. Loss of lube-oil pressure
  - b. Excess engine temperature
  - c. Alternator overload
  - d. Alternator short circuit
  - e. Over speed

Should any of the faults listed above arises, then the individual signal relay installed for the special task shall respond. To avoid lasting damage if operation were to continue, the generating set shall be automatically shut off and a subsequent new starting effort shall be blocked, and the corresponding fault indicator lamp shall be on.

- 5. At protracted overloading of the alternator, the thermal overcurrent release with time delay shall cause the alternator main circuit breaker to trip. The set shall continue in operation unloaded to obtain cooling of the alternator.
- 6. In case of feeder short circuit during an emergency supply operation, the alternator shall immediately be disconnected from the fault location by means of the electromagnetic trip relay of the main circuit breaker.
- 7. A power mains supply voltage monitor shall be kept constantly in circuit and in case of phase failure, i.e., more than 10% drop in voltage, symmetrical or asymmetrical of this power supply shall be indicated by means of a signal relay and a horn signal.
- 8. Battery charger with protective circuit shall be mounted on the top portion of the panel.
- 9. All control panel electrical components shall be tropicalized.

#### **1.06 MANUAL TRANSFER SWITCH**

A wall-mounted automatic manual transfer switch, single or three -phase, 60 Hz, 230 or 460 as required Voltage ratings, two (2) poles with solid neutral in a NEMA 4 (IP65) enclosure shall be supplied and installed as shown on the plans. It shall have single, free-wheeling handle mounted in front of two mechanically

interlocked (rating as required) industrial type circuit breakers. Components of the operating mechanism shall be insulated or electrically dead. Linkages and handles shall be ruggedly constructed and shall not be subject to deterioration. It shall be similar to Westinghouse type ATSS or approved equal.

## **1.07 FLOWMETER**

The Contractor shall design, furnish and install flowmeters as shown in the drawings. The flowmeters shall be of the magnetic drive, propeller type and shall be furnished with an integral cast body of close grain high tensile cast iron, faced and drilled ANSI flanged ends and shall be designed for 10.56 kg/cm<sup>2</sup> (150 psi) working pressure. Each unit shall have the same nominal inside diameter throughout their length and shall be furnished with non-corrosive, non-toxic liners. Each meter shall register within two percent (2%) of true flows within the rated range. The register drive shall be completely isolated from water pressure by an O-ring sealed bronze housing and shall be magnetically coupled to the register drive by the use of permanent type ceramic magnets. The propeller blades shall be fabricated of thermoplastic materials resistant to normal water corrosion. Each meter shall be furnished with a six-digit straight reading type totalizer calibrated in cubic meters.

## **1.08 HYPOCHLORINATION FACILITY**

### **1. General**

- a. The Supplier shall design, furnish and install in accordance with these specifications three (3) units of hypochlorinator system complete with all necessary appurtenances to each of the proposed pump stations.
- b. The hypochlorinator system shall include the hypochlorite feed pump assembly, solution ejector, anti-siphon valve, foot valve and strainer assembly, hypochlorite solution tank, safety switch, piping system and other materials to make a complete operating system.

### **2. Hypochlorite Feed Pumps**

- a. General – The pump shall be of the positive displacement type with all parts constructed of corrosion resistant materials suitable to wet chlorine service.
- b. Capacity – The feed pump shall have a maximum operating capacity of 30 gal/day of hypochlorite solution and shall be equipped with manually operated feed control knob mounted on top of the pump suitable for the above maximum feed rate. The unit shall incorporate a visual feed indicator to permit instantaneous monitoring of the prevailing feed rate at any time during operation.
- c. Operation – Feed control adjustment knob shall be adjustable within the rated range while the pump is in operation. The knob shall reflect the prevailing feed rate as percentage of the maximum rated capacity of the pump. The hypochlorite feed pump shall be capable of operating under the following conditions:



Maximum Solution feed rate : 30 gal./day

Maximum Back Pressure : 100 psi

At point of application

Electric power supply : 220/240 Volts; 60 hertz, 1-phase AC

- d. **Standard Accessories** – Each hypochlorinator shall be supplied with lubricating oil, plastic tubing, suction and discharge tubes with the appropriate fittings, anti-siphon valve, foot valve and strainer, check valve with pipe fittings for injection into the water main, plastic solution tank with cover to hold 30 gallons of hypochlorite solution and plastic measuring cup.

- e. Spare Parts/Special Tools

The Contractor shall provide with each hypochlorinator all the spare parts and special tools necessary in the operation and maintenance of the unit.

### **3. Powder Chlorine**

The Contractor/Contractor shall also provide one (1) drum (50 kgs.) of calcium hypochlorite powder with 70% available chlorine to each of the proposed pump station.

### **4. Chlorine Residual Test Kits**

- a. The Contractor shall provide three (3) sets of digital chlorine residual test kit complete with color standards chemical solutions in plastic bottles with dropper and instructions to each of the proposed pump stations.
- b. The test kits shall be of colorimetric type and the residual chlorine shall be determined digitally. The test kit shall have a range of 0-5 mg/l or PPM with increments of 0.1 mg/l or PPM.
- c. The units shall be capable of analyzing digitally for total and free chlorine residuals using DPD method or approved equal. Stock chemical shall be provided with the test kit.
- d. All components necessary to carry out chlorine test in the field shall each be provided with a self-contained sturdy carrying case.

### **5. LITERATURE**

The Supplier shall furnish together with the hypochlorination equipment a chlorine manual containing the basic chlorine principles necessary for handling, preventive maintenance and emergency procedures in case of chlorine leakage.

## **DIVISION 2 – ELECTRICAL WORKS**

### **2.01 GENERAL**

- a. The Electrical Work shall consist of the furnishing, all labor, materials, tools and necessary services incidental to the proper and operation of the electrical system as specified herein and as shown on the Drawings.

The Drawings and Specifications are intended to provide only a broad outline of the required equipment and system of operation and may not include all details of design and construction. Any item of work or material though not expressly shown on the Drawings or specified herein but is obviously required to obtain a usable installation shall be deemed included in the required works.

- b. All system components shall be compatible with each other and suitable for 24-hour continuous operation.
- c. As used in these Specifications, the word "Owner" refers to the Water District named in the Contractor or Purchase Order (PO). The word "Engineer" refers to the individual or firm authorized by the Local Water Utilities Administration (LWUA), - acting as the Owner's representative to oversee the execution of the Contract/PO. The word "Contractor" refers to the party who entered into Contract with the Owner or who received a PO issued by the Owner of LWUA.

## **2.02 CODES AND REGULATIONS**

- a. The work under this Contract shall be done in accordance with the requirements of the latest edition of the Philippine Electrical Code (PEC Parts I and II), the regulations and requirements of power and telecommunications utilities as far as their permanent services are concerned, and the government ordinances enforced in the locality. In case of conflict with these specifications or the drawings, the preceding clause shall govern.
- b. The Contractor shall be responsible for securing all necessary permits from the pertinent government authorities, at his expense, both for the construction and for the operation of the system upon completion of the work. The Contractor shall furnish the Owner with the approved Certificate of Final Electrical Inspection.

## **2.03 MATERIAL STANDARD**

- a. All materials, components, and equipment to be supplied and/or installed shall be of recent manufacture, brand new (at most, three (3) years ex-stock), unused and suitable for intended operation. They shall conform with U.S. Underwriter's Laboratory (U/L) Standard for Safety, ASA, NEMA, IEC, IPCEA and ASTM in every case where such standards have been established, or with any other International Standards acceptable to the Engineer.
- b. All materials and components shall be as specified unless specifically exempted, in which case, they shall be the best of their respective kind.
- c. Samples of materials to be supplied shall be submitted for approval when required by the Engineer.
- d. All electrical equipment and materials shall bear the manufacturer's inspection label, unless exception to this requirement is inherent to a particular item.

## **2.04 SHOP DRAWINGS AND CATALOG DATA**

- a. The Contractor shall submit to the Engineer for approval seven (7) copies of the shop drawings of equipment and control components he intends to supply, as indicated in the drawings and specifications.
- b. Shop drawings shall provide sufficient information to evaluate the suitability and compliance of the proposed equipment and control components with the plans and specifications.
- c. Catalog data shall also be submitted to supplement the shop drawings. Catalog cuts, bulletins, brochures or the like, or photocopies of applicable pages thereof shall be submitted where drawings for certain items are not required to be submitted.
- d. Should an error in the shop drawings be encountered during installation, the correction, including any field changes found necessary, shall be incorporated on the drawings and the revised drawing shall be submitted to the Engineer for review and approval.

## **2.05 PRE-DELIVERYEQUIPMENTAPPROVAL**

The electrical equipment to be supplied shall be completed, assembled, wired and tested at the factory and shall be inspected and tested by the Engineer for approval prior to delivery to the project site.

## **2.06 COORDINATION**

The Contractor shall coordinate and work with all other parties with whose apparatus he shall connect part/s of the work required herein. The Contractor shall prepare drawings of details of the equipment he supplied, location of sleeves, conduits and support that may be required by other trades and shall furnish the Owner with at least five (5) copies of these drawings, for the information of all parties concerned. The approval of such drawings shall not relieve the Contractor in any way from the responsibility of properly locating and/or coordinating his work with those of other parties involved.

## **2.07 WORKMANSHIP**

- a. The work throughout shall be executed in the best and most thorough manner in accordance with the best practice of the trade involved and to the satisfaction of the Engineer.

- b. Skilled workmen using proper tools and equipment under continuous competent supervision as required by the trade shall accomplish the works.
- c. The Contractor shall maintain on file at job site a set of as-built drawings incorporating all actual installation and deviations from the Drawings. The as-built drawings shall be submitted to the Owner prior to provisional acceptance of the electrical works.

## **2.08 FIELD TEST REQUIREMENT**

The Supplier shall furnish labor and equipment to perform the following test:

- a. System Test – Each panel-board shall be tested with the power equipment connected, circuit breakers closed, and all loads and fixtures permanently connected for their intended operation for a minimum of 24 hours continuous operation in the presence of the Engineer, at the expense of the Contractor. The entire installation shall be free from any ground fault and from any short circuit. In no case shall the insulation resistance be less than that allowed by PEC regulations for Electrical Equipment of Buildings and/or manufacturer's recommendations. Failures shall be corrected in a manner satisfactory to the Engineer.
- b. Performance Test and Equipment Setting – It shall be the responsibility of the Contractor to test the entire electrical system for the proper equipment operation. Setting of all protective relays, pilot devices, and auxiliary systems shall conform to operating requirements. The Contractor shall turnover the entire electrical installation to the Owner in a satisfactory working condition.

## **2.09 GUARANTEES**

- a. The Contractor guarantees that the supplied electrical equipment and components shall be free from any defect in workmanship or materials for a period of one (1) year from the date of Provisional Acceptance or 14 months from completion of installation, whichever comes first.
- b. The Contractor shall indemnify and render harmless the Owner and/or the Engineer from and against all liabilities due to injuries or disabilities to persons; from damages to property; or from any and all legal and other expenses which may be incurred by the Owner and/or the Engineer in defense of any claim, legal action or suit arising out of the Contractor's performance of the Contract.

## **2.10 INTERMEDIATE METAL CONDUIT (ALTERNATE RIGID STEEL) CONDUIT)**

- a. General: NEMA Standard trade sizes, UL approved or equivalent to Matsushita, Maruichi, Korea or approved equal.

- b. Material: Mild steel, hot dipped galvanized with inside enamel or epoxy coating.
- c. Size. 15 mm (1/2") minimum
- d. Couplings, unions and fittings: standard, threaded
- e. Use limitation: As specified in the latest edition of PEC and/or NEC
- f. Expansion fittings. Use for runs spanning expansion joints.
- g. Paint field cuts and repair damaged protective coating with red or zinc lead chromate. Conduit threads shall not be painted.

### **2.11 POLYVINYLCHLORIDE (PVC) CONDUIT**

- a. General: Standard trade sizes, heavy wall, manufactured to NEMA TC-2 Type 40, rated for 90 °C cable as manufactured by Neltex, Moldex and Atlanta or approved equal.
- b. Material: Polyvinylchloride, extruded.
- c. Nominal Size: 20 mm (3/4") minimum.
- d. Couplings and Fittings: Standard joint by solvent weld process.
- e. Use Limitation
  - 1. As specified in the latest edition of PEC and/or NEC.
  - 2. Not permitted where subject to mechanical damage.
  - 3. As indicated on the drawings.
- f. Pulling Hardware: Flat fish tape with ball and flexible leader or polyethylene or Manila rope. Use of steel pulling cable not permitted.

### **2.12 FLEXIBLE GALVANIZED STEEL CONDUIT**

- a. General: Standard trade sizes, UL approved or equivalent,
- b. Material: Steel, galvanized
- c. Size: 15 mm (1/2") minimum
- d. Fittings: Standard
- e. Use Limitation:
  - 1. Between motor terminal boxes, or vibration producing devices and rigid conduit.
  - 2. Short lengths of concealed wiring to lighting fixtures (max. length – 1800 mm).
  - 3. Other applications: only where approved or where shown on plans.

### **2.13 FLEXIBLE LIQUID TIGHTCONDUIT**

- a. General: Standard trade sizes. UL approved or equivalent.
- b. Material: Galvanized steel with outer liquid-tight plastic jacket.
- c. Diameter: 15 mm (1/2")
- d. Fittings: Liquid-tight
- e. Use Limitation:

1. Short lengths to vibration producing devices situated in wet or potentially wet locations.
2. Between motor terminal boxes or vibration producing devices and rigid conduit.
3. Other applications: Only where approved or where shown on plans.

## **2.14 CONDUIT INSTALLATION**

- a. General: Install in accordance with applicable codes and recognized standards of good practice.
- b. Location: Approximately as shown on drawings; actual routing subject to approval.
- c. Wall and floor sleeves:
  1. General: Provide for passage of conduits through walls, floors, or partitions. Set sleeves in masonry during construction; set sleeves through concrete before pouring begins.
  2. Material: Galvanized pipe, securely fastened in position.
  3. Sleeves through exterior building walls: Install conduit in center of sleeve, fill annular space with loosely packed oakum. Seal interior and exterior of packing with hot applied asphalt. Fit the conduit on each side of the wall with round galvanized steel flange fastened to conduit by two set screws to retain sealing compound.
  4. Sleeves through waterproof constructions: Flanged type
  5. Opening required after footings, walls, floors, or ceilings are constructed shall be provided and patched at Contractor's expense in an approved manner.
- d. Embedded Conduit:
  1. General: Install the conduit before concrete pouring and take the shortest possible line route.
  2. Underground installation: Encase conduits with concrete, 75 mm (3") from outer face of conduits.
  3. Conduit joints shall be half-wrapped with 3M Scotch Wrap #50 PVC Tape or approved equivalent.
- e. Joints: Make with approved couplings and unions to provide electrically continuous and moisture-tight system.
- f. Expansion joints: Use expansion fittings and bonding jumpers wherever conduit spans building expansion joints (coordinate during bid walk-through).

- g. Drainage: Avoid pockets in conduit runs as much as possible; provide suitable fittings at low spots in exposed conduits where pocket cannot be avoided. Weep holes are not permitted.
- h. Bends: Not more than the equivalent of three 90° bends between pulling joints.
- i. Wiring of fire related motors shall be embedded or encased in concrete.
- j. Field cuts and threads:
  - 1. Cut ends of conduit square with hand or power saw and ream to remove burrs and sharp edges. Do not use wheel cutter.
  - 2. Threads cut on job shall have same effective lengths, thread dimensions, and taper as factory cut threads.
  - 3. Carefully remove burrs from threads. Conduit threads shall not be painted.
  - 4. Apply coat of protective paint through conduits where protective coating is damaged.
- k. Supports:
  - 1. Manufacturer: Unistrut or approved equal.
  - 2. Hangers, supports, or fasteners: Provide at each elbow and at the end of every straight run terminating in a box or cabinet. Rigid fastenings shall be spaced in accordance with the PEC.
  - 3. Clamps: Galvanized malleable iron one-hole straps, beam clamps, or other approved device with necessary bolts and expansion shields.
  - 4. Adjustable hangers:
    - a. Use to support horizontal runs only.
    - b. Trapeze hangers: For parallel runs of conduits. Install pipe clamps every third intermediate hanger for each conduit. Paint the hangers in one prime coat of red lead or zinc chromate and one finish coat of approved color. Hangers are not detailed but must be adequate to support the combined weights of conduit, conductors, and hangers.
  - 5. Submit shop drawings for approval.
- l. Concealing: Conceal conduits in all areas except mechanical equipment rooms and areas as specified. Run exposed conduits parallel with, or at right angle to, lines of buildings.
- m. Conduit ends:
  - 1. Cap conduit.
  - 2. Open conduit ends terminating in panels for enclosures where exposed to entrance of foreign material: Plug space around cables with commercial duct sealing compound.

- 3. Cap conduit ends during construction to prevent entrance of foreign material.
- n. Cleaning: Clean inside by mechanical means to remove all foreign materials and moisture before wires or cables are installed.
- o. Conduit connections at panels and boxes: Double locknuts and bushings.

**2.15 JUNCTION AND OUTLET BOXES:**

- a. General: Provide junction boxes for pulling and splicing wires, and outlet boxes for installation of wiring devices as required, or as shown on drawings. As a rule, provide junction boxes in all runs that are greater than 30 meters (100 ft.) in lengths. For other lengths, provide boxes as required for splicing or pulling. Boxes shall be in accessible locations.
- b. Construction. Welded sheet steel, galvanized finish. Provide removable covers attached with round head machine screws, minimum of 1.6 mm MSG (Ga. 16).
- c. Finish: Galvanized.

**2.16 WIRES AND CABLES**

- a. All wires shall be of stranded copper, annealed, soft drawn, of 98% conductivity, insulated for 600 V working voltage, with type "THW" or "THWN" insulation unless otherwise noted on the Drawings. Insulation shall bear manufacturer's name and trademark, type, voltage rating and size of the conductor.
- b. Cable for submersible pump operation shall be oil and water-resistant. Cable shall have a minimum of two insulation jackets. The inner jacket shall be of rubber or elasticized rubber material while the outer jacket shall be of neoprene, PE or PB material. The outer jacket shall bear the manufacturer's name and trademark, insulation type and application, voltage and ampere rating and size of the conductor. Cable shall be uncut and unspliced from the motor pigtail to the junction box or terminal for the motor starter. It shall be fixed with straps of acceptable materials for such application.

Cable termination to motor pigtail shall be by means of heavy duty splicing kit or its equivalent.

Splicing paste shall have a minimum expiration period of one (1) year. Columbia, Duraflex, Philflex, Durex or Phelps Dodge; or approved equal.

- c. For lighting and power systems, no wire smaller than 3.5 mm<sup>2</sup> shall be used. Building wire size 8.0 mm<sup>2</sup> and larger shall be stranded.



- d. Conductors shall not be pulled into the raceway until:
  - 1. Raceway system has been inspected and approved by the Engineer;
  - 2. Masonry work has been completed in the case of concealed installation;  
and
  - 3. Raceway has been freed from moisture and debris
- e. Conductors shall be hand-pulled, using lubricant where necessary.
- f. Wires for the control system shall have a minimum size of 0.75 mm<sup>2</sup> (AWG #18) and thermoplastic-insulated, unless specified otherwise.

## **2.17 PANELBOARDS – CIRCUIT BREAKER**

- a. General: Furnish and install circuit-breaker panelboards as indicated in the panelboard schedule and where shown in the drawings.
- b. Wall Switches: where more than one flush wall switch is indicated in the same location, the switches shall be mounted in gangs under common plate.

## **2.18 MOTOR CONTROL EQUIPMENT**

**A. GENERAL** – Each of the reduced voltage type magnetic starter units shall consist of magnetic contactors in combination with an industrial-type circuit breaker with three overload relays for three phase motor load and two overload relays for single phase motor load, one in each phase, for motor protection against excessive overloading on starting and in operation. Contactors shall be rated for AC2/AC3 applications according to applicable NEMA or IES standards. Magnetic starter unit shall consist of all necessary relays, timers and motor protective auxiliary devices as shown on the Electrical Drawings (Minimum Requirements of Reduced or Full Voltage Motor Starter Control Circuit Diagram).

### **B. COMPONENTS**

#### **1. CIRCUIT BREAKERS**

Circuit breakers in combination with motor starter shall be of the industrial type, molded case type, manually-operated, shall have trip-free operating mechanism of the quick-make, quick-break type, shall have an earth leakage tripping/ground fault protective device unless otherwise specified. The circuit breaker shall be of automatic trip type with combination thermal and instantaneous magnetic trip units and provided with standard outside operating handle mounted on the panel.

The thermal-magnetic time delayed over current protection and instantaneous short circuit protection shall operate a common trip bar that will open all poles in case of overload or short circuit current in any one pole.

Circuit breaker shall be trip indicating, with tripped position of breaker handle midway between "ON" and "OFF" positions.

## **2. OVERLOAD RELAY**

Overload relay shall conform to IEC 292, IEC 947, IEC 947, VDE 0660. Rated operational insulation voltage shall be according to IEC 292-1, VDE 0110, UL CSA or better. Overload tripping shall be according to UL 508/IEC 947-4 (Class 10) or better.

## **3. OVERLOAD PROTECTION FOR SUBMERSIBLE PUMP**

Overload protection for submersible pump operation shall be of the ambient-compensated, extra-quick trip type with an operating trip response time of five (5) seconds or better at stalled/locked rotor conditions.

## **4. CIRCUIT DIAGRAM**

Laminated control circuit diagram indicating termination numbers on code shall be fastened inside each of the control unit for ready reference.

## **5. RELAYS**

- a. In general, relays shall be of the electro-mechanical or electronic type suitable for panel mounting and industrial applications. Relay coils shall be rated for continuous operations at 220 volts AC 60 cps or 48 volts DC as required by their applications. Permissible coil pick-up voltage shall be minus 25% to 40% of rate voltage. Coil burden shall be compatible with each application. Operating temperature shall be minus 5 degrees Centigrade or better. Control relay shall conform to IEC 158-1, 1337 and 255, VDE 0660, or better. Ambient temperature for operation shall be from – 40 to +60 degrees centigrade. Control voltage range shall be from 12 to 600V. Mechanical life shall be a minimum of 5 million operations. Rated insulation voltage shall conform to VDE 0110C, IEC 158-1, BS 5452 or better.
- b. General application relays shall be instantaneous, non-time delay, of the electro-mechanical or electronic type suitable for panel mounting and industrial applications. Relay action whether closing or opening of the contact shall remain steady until power supply is removed.
- c. Electronic timing relays shall be used where time delay requirements are of short durations. These relays shall have a repeat accuracy of plus or minus 10% with adjustable time setting as indicated on the plans or as recommended. Reset time shall be as specified. Timers shall conform to IEC 255-5. Dry ambient temperature for operation shall be from -25 to +55 degree Centigrade. Rated insulation voltage shall be according to IEC 158-1 and VDE 0110. Degree of protection against

direct finger contact shall be according to VDE 0106. Reset time shall be 40 milliseconds or less unless otherwise specified.

- d. Motor operated time delay relays shall be used where time delay is three minutes or longer. These relays shall be synchronous with elapsed time indication. Repeat accuracy of relay shall be +2% or less with adjustable time setting as indicated in the drawings. Automatic resetting shall be upon removal of supply voltage in case of time delay on energization and upon application of supply voltage in case of time delay in de-energization. For interrupting timing cycles, the timing relay shall reset to its original state without operating the output contacts and ready for a new timing cycle. Timer reset shall be as specified.
- e. Relay contacts shall be 220 volts, 60 hertz rating or 48 volts DC as required by their applications. Continuous current ratings of contacts shall be compatible with the load output requirements and load application, resistive, inductive or motor switching. In the case of inductive applications, make and break currents shall also be considered for the kind of load connected. Contact material shall be silver, good for a mechanical lifetime of minimum 5 million operations. Response time of contact shall be 20 milliseconds or less.
- f. Phase monitor relay shall be provided to protect the system against over/under voltage, single phasing and phase reversal power supply conditions.
- g. Level actuated relays shall be used to actuate reservoir and deep well water levels to control pump operation at any pre-determined high or low level desired.
- h. Relays for use with motor protective devices shall be as required for their intended operations as shown on the Drawings. Relay control sensitivity shall be matched to the specific conditions to be controlled.

## **5. CONTROL TRANSFORMER**

Control transformer shall be of suitable capacity as required by their corresponding control components, rated at 60 hertz, dry-type, two-winding and mounted inside the control panel or as shown on the Drawings. Control transformer must be capable of maintaining a high degree of voltage regulation (not less than 95%) from no load to full load through the worst momentary inrush requirements of the control components. It shall have an insulation good for 800°C rise over an ambient of 400°C and a hot spot temperature of 1500°C with a BIL of 10 KV. Control transformer wiring and terminations shall be accessible. The unit shall be manufactured in accordance with U.S. NEMA or IEC Standards.

## **6. PANEL METERS**

- a. **Ammeter** – All ammeter to be provided shall be of the quadratic panel type with slide-in dial having minimum dimensions of 70 mm x 70 mm. Scale range shall be as required for the pumping station load current at system voltage adopted; with a minimum accuracy of plus or minus 2% of full scale. Units for three phase application shall be provided with a 3-position selector switch connected to phase R, S, and tT, and three (3) current transformers of suitable rating for each phase while those for single phase shall have an on-off selector switch only.
- b. **Voltmeter** – The unit shall be quadratic panel type with slide-in dial and shall have minimum dimensions of 70 mm x 70 mm. Scale range shall be as required for the system voltage adopted at 60 hertz, with an accuracy of plus or minus 2% of full scale or better. The unit shall be provided with a 3-position selector switch connected across RS, RT, and ST.

## **7. HANDLE-OPERATING MECHANISM**

Operating handle for the main circuit breaker shall be designed with the operating handle fitted to the panel door of the control equipment. It shall be used for operating the door and effecting the “ON-TRIP-OFF” operation of the breaker.

It shall be designed such that the door cannot be opened when the breaker is at the “ON” position and shall be provided with a door locking mechanism. A release screw shall be provided to permit the interlock to be cancelled if it is necessary to open the door with the breaker at the “ON” position. Dimensions shall be as recommended by the Manufacturer.

## **8. TERMINAL BLOCKS**

Terminal blocks shall be rated 300 volts AC, 60 cps of molded thermoplastic material. Terminals shall be screw-type, tinned and rated for the maximum continuous current carried among the control components at 75-degree Centigrade temperature rating.

## **9. HOUR OPERATION COUNTER**

Hour operation counter (elapsed time meter) shall be rated 220 volts, 60 hertz suitable for panel mounting. Counter shall have six (6) digits hours register, the last digit of which shall indicate tenths of an hour. Hour operation counter shall have square dust-resistant case of 65 mm each side. Counter shall be non-resetting type.

## **10. SELECTOR SWITCHES**

Three-position selector switch, where required, shall have three operating positions; manual, off, and automatic. Rating of selector switches shall be 220 volts, 60 cps or 48 volts DC as required by its application and with a current capacity suitable for the type of load connected. They shall be of the thumb-operated pointed type.

#### **11. PUSHBUTTON UNITS**

Push button units shall be standard-duty type, with silver momentary contact-type provided with springs to insure return to their original position. Ratings of pushbutton units shall be 230 volts, 60 cps or 48 volts DC as required by its application with a current capacity suitable for the type of load connected in series with them. Pushbutton units shall be concave shaped with a minimum diameter of 20 mm. Text printed in front of pushbutton shall indicate its function.

#### **12. PILOT LAMPS/INDICATORS**

Pilot lamps shall be rated 220 volts, 60 cps or 48 volts DC as required by its application. They shall be clear glass incandescent type.

All pilot lamp indicators shall be designed for front mounting and of a square, round or rectangular type. Text printed on the face of the lamps shall indicate the function of the lamp. Changing of the lamp shall be from the front.

#### **13. NAMEPLATES**

Control panel nameplates shall be of hard plastic material at least 2 mm thick. Words as indicated on the plans shall be etched on nameplates in white on a black background. Letters shall be easily readable and in no instance smaller than 10 mm in height. Nameplates shall be affixed on control panel by means of flat head screws or glued on.

#### **14. AUXILLIARY PROTECTIVE DEVICES**

The Contractor shall furnish and install all auxiliary motor protective devices intended for their application as shown on the drawings.

#### **15. PRESSURE SWITCH**

The Contractor shall furnish and install a pressure switch with a range of 0 - 100 psi to the proposed pump station. The switch shall have the required setting range with the cut-in and cut-off mode set independently. The exact setting of the switch/es shall be determined by the Engineer on field, upon testing and commissioning. The switch shall be single pole, single throw, mercury-switch actuated for indoor/outdoor installation.

## **2.19 LIGHTING FIXTURES**

- a. General: The Electrical Contractor shall furnish, install and connect all lighting fixtures to the building wiring system unless otherwise noted.
- b. Fixture type: The fixture type shall be as indicated in the drawings.
- c. Fluorescent Ballasts: All fluorescent fixtures shall have high power factor ballast.
- d. Shop Drawings

Shop drawings for lighting fixtures shall indicate each type together with manufacturer's name and catalog number. No fixture shall be delivered/install unless approved by the Engineer.

## **2.20 WIRING DEVICES**

- a. General:

Furnish and install wiring devices as required.

- b. Devices and Plates

- 1. Wall Switches: Quiet type, spring operated. The type of switch shall be of tumbler operation.
- 2. General Purpose Receptacles: Flush mounting, type as shown in the plans.
- 3. General Purpose Wall Plates: Type, color, plating and appearance of device plates shall be as selected by the Consultant. Appropriate samples shall be submitted prior to the purchase of face plates.
- 4. Manufacturers: National, G.E. Toshiba or approved equal.

## **2.21 NAME PLATES**

- a. General: provide and install nameplates wherever indicated as required in these specifications. Wording shall be approved prior to purchase of nameplates.
- b. Material: Red Bakelite engraving stock, white core.
- c. Lettering: Engraved, approximately 5.0 mm high. Wording shall identify function of device to which nameplate is attached, or identify equipment served by device.
- d. Installation (except for factory-installed nameplates): Attach with sheet metal screws after painting of equipment is completed.

- e. All receptacle outlets/switches, plates shall be identified with circuit and panel homerun numbers using “dymo” tape labeller.

## **2.22 FUNGUS CONTROL FOR ELECTRICAL COMPONENTS**

Electrical equipment shall be treated fungus and moisture as follows:

- a. Current carrying components for both chlorination houses such as switches, fuses and contacts shall not be treated. Other materials and components, which are inherently fungus-resistant or are protected by hermetic sealing, need not be treated.
- b. Circuit elements not covered above and which have a temperature rise of not more than 75 °F (24 °C) when operating as full loads for both chlorination houses shall be coated with a fungus-resistant varnish. Fungus-resistant varnish shall consist of paraphynol formaldehyde resin in combination with tung oil in suitable salient, made fungistatic by the addition of not less than 7 to 8 percent salicy-tanilide, suitable for the overall treatment of assembled electronic communications, and associated electrical equipment and certain with their component sub-assembly to prevent visible fungus growth. The method of treatment shall be in accordance with the manufacturer’s advice and recommendations. Circuit elements include but are not limited to cable, wire, switchboards, panel-boards, terminal and junction blocks, junction boxes, capacitors.

## **2.23 TRANSFORMER**

### **2.23.1 General**

These specifications cover the electrical and mechanical characteristics of a Single-Phase Overhead (or pad mounted if to be located in concrete roof slab of PH) type distribution transformer. All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI standards.

- 1. C57.12.00 IEEE Standard General Requirements for Liquid- Immersed Distribution, Power, and Regulating Transformers.
- 2. C57.12.20 Overhead-Type Distribution Transformers, 500 kVA and smaller
  - 1. High Voltage, 34500 Volts and below
  - 2. Low Voltage, 7970/13800Y Volts and below
  - 3. C57.12.35 Bar Coding for Distribution Transformers

3. C57.12.90 IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and regulating Transformers and IEEE Guide for Short Circuit Testing of Distribution and power Transformers
4. C57.12.91 Guide for loading Mineral-Oil-Immersed Overhead and Pad-Mounted Transformers rated 500 kVA and less with 55 oC or 65 oC average winding rise.

### **2.23.2 Ratings**

- a. The transformers shall be designed in accordance with these specifications and shall be as required by the load.
- b. The primary voltage and the basic insulation level (BIL) shall be 34500 Grd/19920 and 150 kV, respectively.
- c. The secondary voltage shall be 240 Volts. The BIL of the secondary voltage shall be 30 kV.
- d. The transformer shall be furnished with full capacity high-voltage taps. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required in Section 6.2.1 of ANSI C57.12.20. The unit shall have one of the following tap configurations:

Two – 2 ½ % taps above and below rated voltage

Four – 2 ½ % taps below rated voltage

NEMA taps (14400, 13800, 13200, 12470, 12540)

#### High Voltage Bushings and Terminals

The high voltage bushing shall be 150 kV BIL withstand, 432 mm creepage distance. It shall have a 60 Hz Dry 1- minute withstand of 60 kVA and 60 Hz wet 10-second withstand of 50 kV.

The bushing terminals provided shall be tin plated to accommodate both aluminum and copper conductors. Unless otherwise specified, the color of the bushings shall match Light Gray Number 70, Munsell Notation 5BG7.0/0.4.

### **2.23.3 Low Voltage Bushings and Terminals**

The low voltage bushings shall have a 60 Hz Dry 1-minute withstand of 10 kV and 60 Hz wet 10-second withstand of 6kV.



The bushing terminals provided shall be tin plated to accommodate both aluminum and copper conductors.

The internal secondary leads shall be permanently embossed with the letters A, B, C and D per ANSI C57.12.00 and C57.12.20. This marking can be used to locate such leads with respect to one another for internal reconnection.

#### **2.23.4 Protection**

The protection scheme of the transformer shall consist of the following:

- a. Protected primary overcurrent protection shall be provided by an internally mounted weak link fuse.
- b. Primary overcurrent and transformer overload protection shall be provided by a breaker installed on the primary side of the transformer. This breaker shall have the capability to energize and de-energize the transformer by one hot stick operation. This device may be used in series with a current-limiting fuse to provide 50,000 A interrupting capability.

#### **2.23.5 Tank**

The tank shall include a pressure relief device as a means to relieve pressure in excess of pressure resulting from normal operation. The venting and sealing characteristics shall be as follows:

***Cracking pressure: 10psig +/- 2 psig***  
Resealing pressure: 6 psig minimum  
Zero leakage from reseal pressure to -8 psig  
Flow at 15 psig: 35 SCFM minimum

The tank coating shall meet all requirements in ANSI C57.12.31 including the following:

Salt Spray Test  
Crosshatch Adhesion Test  
Humidity Test  
Impact Test  
Oil Resistance Test  
Ultraviolet Accelerated Weathering Test  
Abrasion Resistance – Taber Abraser

The tank shall have recessed tank bottom, which offers protection when sliding over rough surfaces.

The tank shall have an internal mark, which indicates the proper oil level per Section 6.2.3 of ANSI C57.12.20

The tank shall be provided with a mild steel cover ring with stainless steel cover ring loops and a stainless-steel bolt. A bronze nut shall also be provided to eliminate corrosion problems and avoid galling.

The tank shall be complete with an anodized aluminum laser engraved nameplate. This nameplate shall meet ANSI Standard C57.12.00.

#### **2.23.6 Shipping**

Unit shall be banded, blocked or bolted to a suitable skid with 2½ inches of clearance for shipment.

#### **2.23.7 Testing and Losses**

All units shall be tested for no-load (85 OC) losses, total (85 OC) losses, percent impedance (85 OC), excitation current (100% voltage). Each unit shall be subjected to a full wave voltage impulse and leak test. The manufacturer shall provide certification upon request for all design and other tests listed in Table 17 of ANSI C57.12.00 including verification that the design has passed the Short Circuit Criteria per ANSI C57.12.00 and C57.12.90

### **2.24 FULL VOLTAGE MOTOR CONTROLLER**

The Full Voltage type magnetic starter unit shall consist of magnetic contactors in combination with an industrial-type circuit breaker with three overload-relays and a capacitor start type, relays for motor protection against excessive overloading on starting and in operation. Contactors shall be rated for AC3 applications. Magnetic starter unit shall consist of all necessary relays, timers and motor protective auxiliary devices, as shown on the Drawings and as specified.

Overload relay shall conform to IEC 292-1, IEC 947-4, NF C 63-650 and VDE 0660. Rated operational insulation voltage shall be according to IEC 292-1, VDE 0110, UL, SA or better. Overload tripping shall be according to UL 508/IEC 947-4 (Class 10) or better. Ambient air temperature for normal operation shall be from – 25 to +55 °C and ambient temperature shall be from – 15 to +55 °C.

Overload relay for submersible pump protection shall be of the type with an operating trip response time of 500 milliseconds or less at 100% trip setting.

Laminated control circuit diagram indicating coded termination numbers shall be attached inside the control panel-board for ready reference.

## RELAYS

- a. In general, relays shall be of the electro-mechanical or electronic type suitable for panel mounting and industrial applications. Relay coils shall be rated for continuous operation at 220 volts AC or 48 volts DC as required by their application. Permissible coil pick-up voltage shall be  $-15\%$  and  $+15\%$  or broader. Drop-out voltage shall be  $-25\%$  to  $40\%$  of rated voltage. Coil burden shall be compatible with each rated voltage. Coil burden shall be compatible with each application. Operating temperatures shall be  $-5^{\circ}\text{C}$  or better. Ambient temperature of operation shall be from  $-40$  to  $+60^{\circ}\text{C}$ . Control voltage range at 60 Hz shall be from 12 to 600 volts. Mechanical life shall be a minimum of 5 million operations. Rated insulation voltage shall conform to VDE 0110C, IEC 158-1, BS 5424 or better.
- b. General application relays shall be instantaneous, non-time delay types. Application of supply voltage across the coil shall cause the instantaneous opening or closing of contacts as required, and remains at this condition until power supply is removed.
- c. Electronic timing relays shall be used where time delay requirements are of short duration. These relays shall have a repeat accuracy of plus or minus  $10\%$  with adjustable time setting as indicated on the plans or as recommended by the manufacturer. Reset time shall be as specified. Dry ambient temperature for operation shall be from  $-25$  to  $+55^{\circ}\text{C}$ . Reset time shall be 40 milliseconds or less unless otherwise specified.
- d. Motor operated time delays shall be used where time delay is three minutes or longer. These relays shall be synchronous with elapsed time indication. Repeat accuracy of relay shall be  $+2\%$  or less with adjustable time setting as indicated in the drawings. Automatic resetting shall be upon removal of supply voltage in case of time delay on energization and upon delay in de-energization. For interrupting timing cycles, the timing relay shall reset to its original state without operating the output contact and ready for a new timing cycle. Timer reset shall be 200 milliseconds or less unless otherwise specified.
- e. Relay contacts shall be 220 volts, 60 hertz rating or 48 volts DC as required by their applications. Continuous current ratings of contacts shall be compatible with the load output requirements and load application, resistive, inductive or motor switching. In case of inductive applications, make and break currents shall also be considered for the kind of load connected. Contact material shall be silver, good for a mechanical lifetime of 10 million operations. Response time of contact shall be 20 milliseconds or less.
- f. Level actuated relays shall be used to actuate reservoir and deepwell water levels to control pump operation at any predetermined high or low level desired. The control sensitivity shall be matched to the specific resistance of water to be controlled.
- g. The phase monitor relay shall be provided to protect the system against power supply conditions such as over/under-voltage, single phasing, phase unbalance and phase reversal.

- h. Relays for use with motor protective devices shall be as required for their intended operations as shown on the Drawings and as specified. Relay control sensitivity shall be matched to the specific conditions to be controlled.

### **Required Accessories**

The external interlocks and start/stop contacts shall remain fully functional whether the drive is in Hand, Auto or Bypass. All wires shall be individually numbered or labeled at both ends.

The disconnect handle shall be thru-the-door type and be lockable in the “Off” position using a padlock. Surge Protection on the incoming power lines shall be provided.

Other requirements are as follows: (a) Stainless Steel Door Nameplate, (b) Space heater for winter to prevent condensation, (c) Weatherproof and dust/insect-proof enclosure, and (d) Fluorescent light (external mounting).



### **SPECIAL ITEMS**

- a. Procurement of all permits, bonds, insurances, warrantees/guarantees, etc; and
- b. Provide and maintain Project Signboards.



### **GENDER AND DEVELOPMENT ACTION PLAN**

- a. The Gender Action Plan (GAP) shall also form part of the contract. The contractor shall comply with the measures set forth in the GAP. Further highlighting the project’s benefits in terms of community development, livelihood and income opportunities, gender and participation.
- b. The contractor shall adhere with RA 6685, apply core labor laws and regulations and incorporate applicable workplace occupational safety norms; strongly encourage to hire at least 20% women in skilled and unskilled position in civil works; comply with GAD-related legal mandates, including prevention and response to gender-based violence.
- c. Establish and implement a mechanism that will prevent and address incidents of sexual harassment and other forms of gender-based violence occurring in the context of civil works at work and affected or surrounding communities/areas.



## **LWUA STANDARD SPECIFICATIONS (Volume 2)**

The revised “LWUA Standard Specifications for Water Supply System Construction shall be part of the Technical Specifications as Volume 2 of 2 of the Bidding Documents.

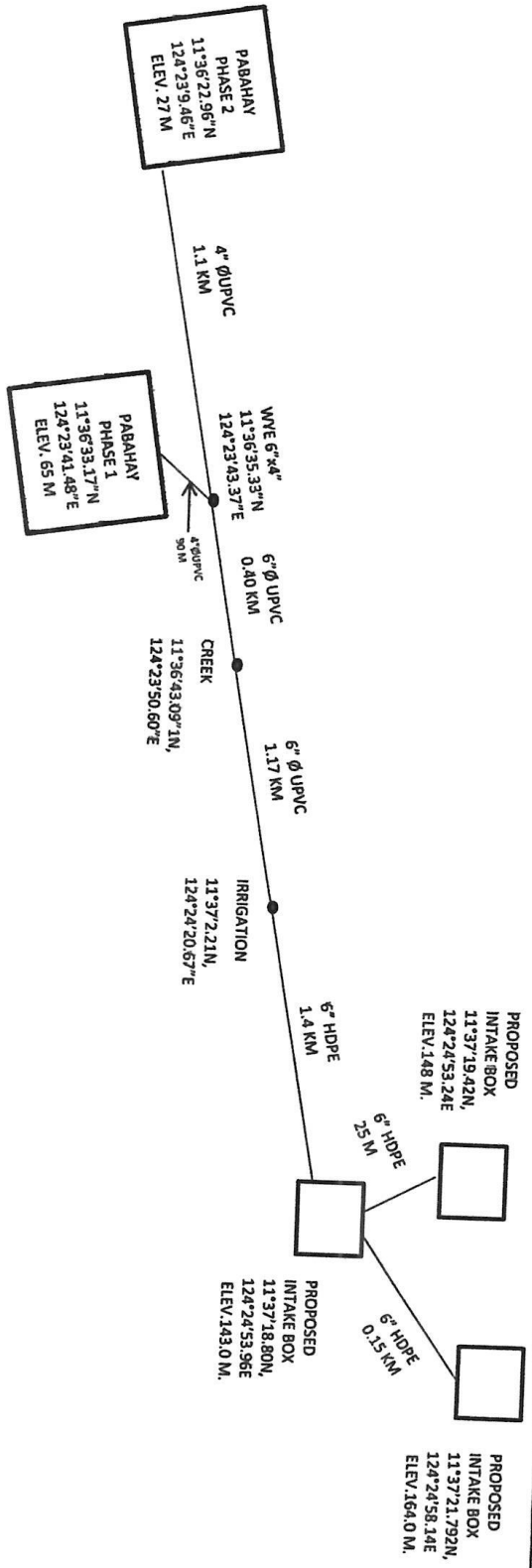
Any applicable provision/s **on** the “LWUA Standard Specifications for Water Supply System Construction” **NOT** inconsistent with this Terms of Reference (TOR) **shall remain valid and binding.**

## ***Section VII. Drawings***

**LOCATION OF THE PROPOSED SPRING AND PIPELINES FOR PABAHAY PHASE 1 AND  
PABAHAY PHASE 2, BRGY. JAMORAWON, ALMERIA, BILIRAN**

Note: The Bidder should coordinate with the WD concerning the proposed location of reinforced concrete intake box (springs), pipelines (valves, fittings and appurtenances), reinforced concrete ground reservoir and treatment facility.

Installation of approximately 4,335 LM transmission lines will be installed from the proposed intake box located in Brgy Iyusan to the proposed storage facility located in Brgy. Jamorawon and to be interconnected to the tapping point in the entrance of the two (2) NHA sites in Brgy. Jamorawon.

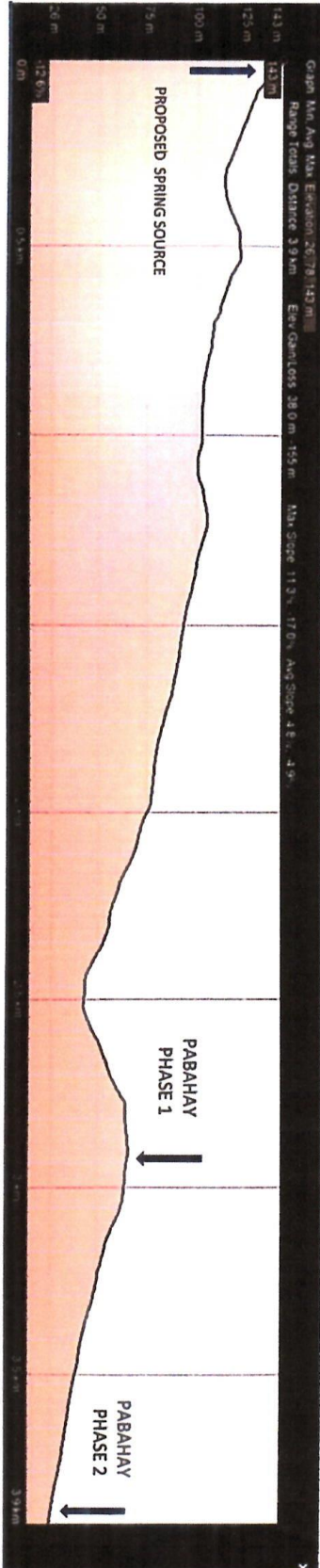


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C-1  
SCALE  
**SCHEMATIC DIAGRAM**  
NTS.

PROJECT TITLE: V ALER SUPPLY SYSTEM FOR YOLANDA P: MAL EN HO ISING PROCESAM MUNICIPALITY OF ALMERA		PREPARED BY: ENGR. <i>[Signature]</i> DIVISION MANAGER C-PECM DEPT.	APPROVED BY: ENGR. <i>[Signature]</i> GENERAL MANAGER	NOTED BY:	SHEET CONTENT: AS SHOWN	SHEET NO. C-1 1
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TRANSMISSION LINE FROM PROPOSED SPRING SOURCE (11°37'18.80"N, 124°24'53.96"E) BRGY. IVUSAN TO PABAHAY -PHASE 1, BRGY. JAMORAWON (11°36'36.17"N, 124°23'41.48"E) AND TO PABAHAY -PHASE 2, BRGY. JAMORAWON (11°26'22.93"N, 124°23'9.46"E)



PROJECT TITLE: WATER SUPPLY SYSTEM FOR YOLANDA FEEDBACK USING PROCRMA Route location: MUNICIPALITY OF ALMERIA	PREPARED BY: ENGR. <i>[Signature]</i> DIVISION MANAGER - CREDIT DEPT.	APPROVED BY: ENGR. <i>[Signature]</i> GENERAL MANAGER	NOTED BY:	SHEET CONTENT: AS SHOWN	SHEET NO: C-3 3
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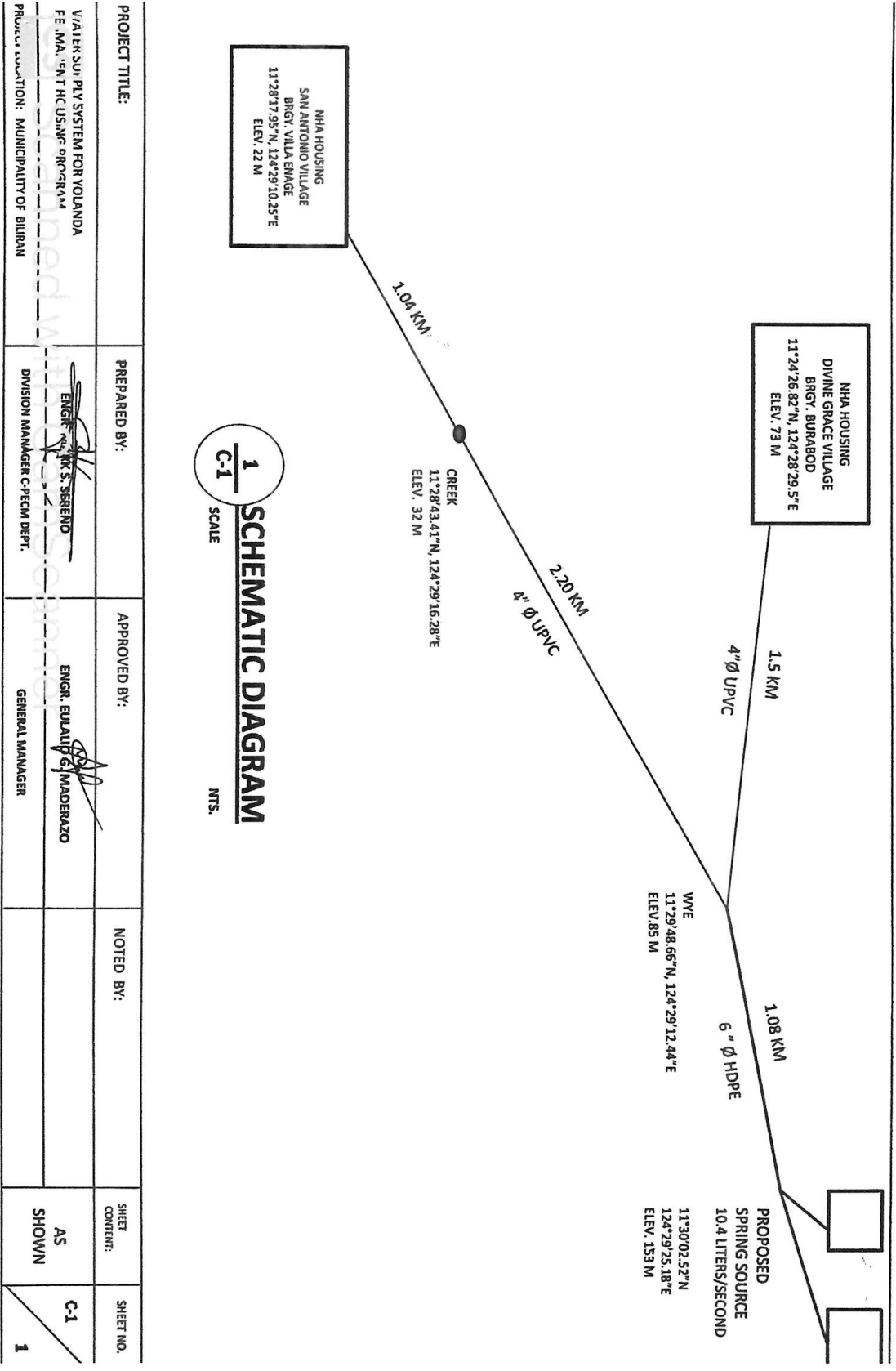


<p><b>PROJECT TITLE:</b></p> <p>WATER SUPPLY SYSTEM FOR YOLANDA E. MAINTENANCE PROGRAM</p> <p>PROJECT LOCATION: MUNICIPALITY OF ALMERIA</p>	<p><b>PREPARED BY:</b></p> <p>ENGR. ALDO K. S. SERRANO</p> <p>DIVISION MANAGER-CPECM DEPT.</p>	<p><b>APPROVED BY:</b></p> <p>ENGR. RIVALDO D. MADERAZO</p> <p>GENERAL MANAGER</p>	<p><b>NOTED BY:</b></p>	<p><b>SHEET CONTENT:</b></p> <p>AS SHOWN</p>	<p><b>SHEET NO</b></p> <p>C-2</p> <p>2</p>
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**LOCATION OF THE PROPOSED SPRING AND PIPELINES FOR SAN ANTONIO VILLAGE, BRGY.  
VILLA ENAGE AND DIVINE GRACE VILLAGE, BRGY BURABOD, BILIRAN, BILIRAN**

Note: The Bidder should coordinate with the WD concerning the proposed location of reinforced concrete intake box (springs), pipelines (valves, fittings and appurtenances), reinforced concrete ground reservoir, treatment facility and water meters.

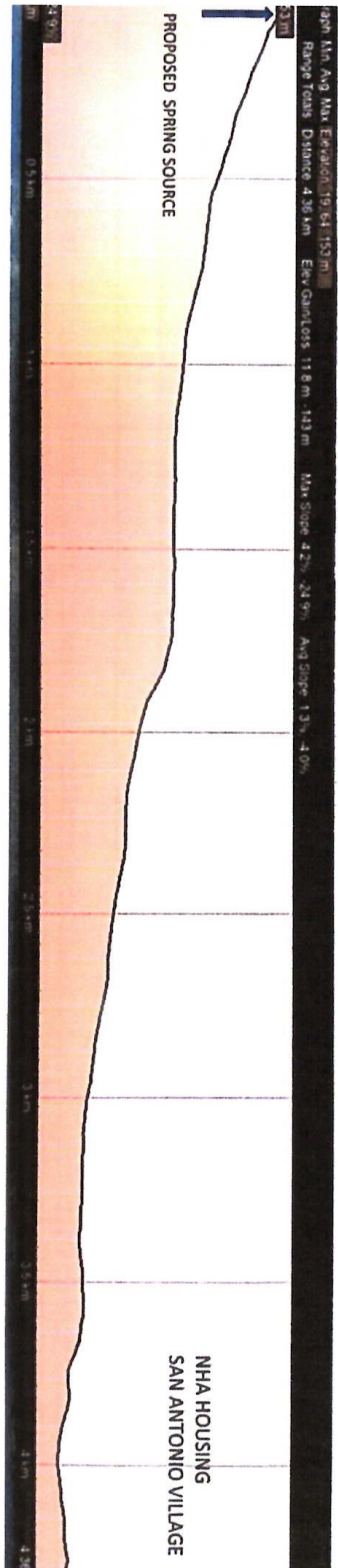
Installation of approximately 5,820 LM transmission lines will be installed from the proposed intake box located in Brgy. Canila to the proposed storage facility located in Brgy. Jamorawon and to be interconnected to the tapping point in the entrance of the two (2) NHA sites in Brgys. Villa Enage and Burabod.



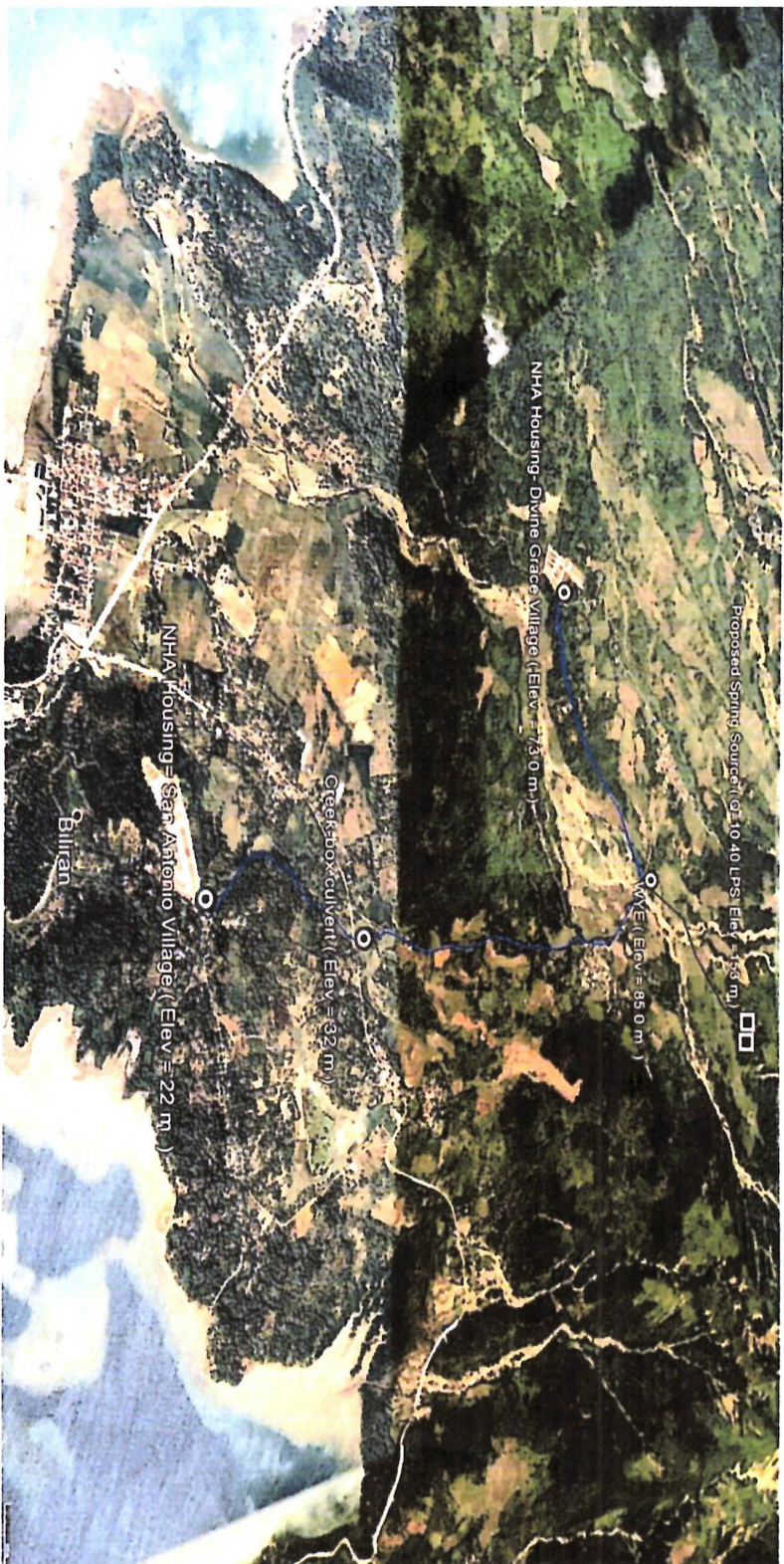
**1**  
**C-1**  
**SCHEMATIC DIAGRAM**  
 SCALE NTS.

<b>PROJECT TITLE:</b> WATER SUPPLY SYSTEM FOR YOLANDA FE. MA. T. N. T. HC. US. NG. PROGRAM PROJECT LOCATION: MUNICIPALITY OF BURAN	<b>PREPARED BY:</b>  ENGR. M. S. SERENO DIVISION MANAGER C-PECM DEPT.	<b>APPROVED BY:</b>  ENGR. EULALIO G. MADERAZO GENERAL MANAGER	<b>NOTED BY:</b>  
	SHEET COMMENT: AS SHOWN	SHEET NO. C-1 1	

TRANSMISSION LINE FROM PROPOSED SPRING SOURCE (11°30'02.52"N, 124°29'25.18"E) BRGY. HUGPA TO SAN ANTONIO VILLAGE, BRGY. ENAGE (11°28'17.95"N, 124°29'10.25"E)



<p>TITLE:</p> <p>WATER SUPPLY SYSTEM FOR YOLANDA ENR. HUGA USING PROPOSED SPRING SOURCE LOCATION: MUNICIPALITY OF BILIRAN</p>	<p>PREPARED BY:</p> <p>ENGR. G.S. SERRANO DIVISION MANAGER C-PECCM DEPT.</p>	<p>APPROVED BY:</p> <p>ENGR. ELLALUIS MADRALAZO GENERAL MANAGER</p>	<p>NOTED BY:</p>	<p>SHEET CONTENT:</p> <p>AS SHOWN</p>
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<b>TITLE:</b> WATER SUPPLY SYSTEM FOR YOLANDA AFFECTED MUNICIPALITY USING PROGRAM ASSISTANCE: MUNICIPALITY OF BILIRAN	<b>PREPARED BY:</b> ENGR. <i>[Signature]</i> <b>MARK S. SERENO</b> DIVISION MANAGER-C/PECM DEPT.	<b>APPROVED BY:</b> ENGR. <i>[Signature]</i> <b>EULALIO S. MADERAZO</b> GENERAL MANAGER	<b>NOTED BY:</b>	<b>SHEET CONTENT:</b> AS SHOWN
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**LOCATION OF THE PROPOSED SPRING AND PIPELINES FOR VISTA DEL MAR VILLAGE AND  
JADE CROWNE MEADOWS, BRGY. CABIBIHAN, BILIRAN**

Note: The Bidder should coordinate with the WD concerning the proposed location of reinforced concrete intake box (springs), pipelines (valves, fittings and appurtenances), reinforced concrete ground reservoir, treatment facility and water meters.

Installation of approximately 5,121 LM transmission lines will be installed from the proposed intake box located in Brgy. Maurang to the proposed storage facility located in Brgy. Jamorawon and to be interconnected to the tapping point in the entrance of the two (2) NHA sites in Brgy. Cabibihan.



PROPOSED  
 SPRING SOURCE  
 11°32'45.90N,  
 124°33'30.90E  
 ELEV. 259.0 M.

PROPOSED 5000 LM 150MM Ø UPVC PIPELINE FROM SPRING INTAKE BOX TO JADE CROWNE MEADOWS

VISTA DEL MAR  
 11°34'41.03N,  
 124°32'59.88E  
 ELEV. 37 M. -41 M.

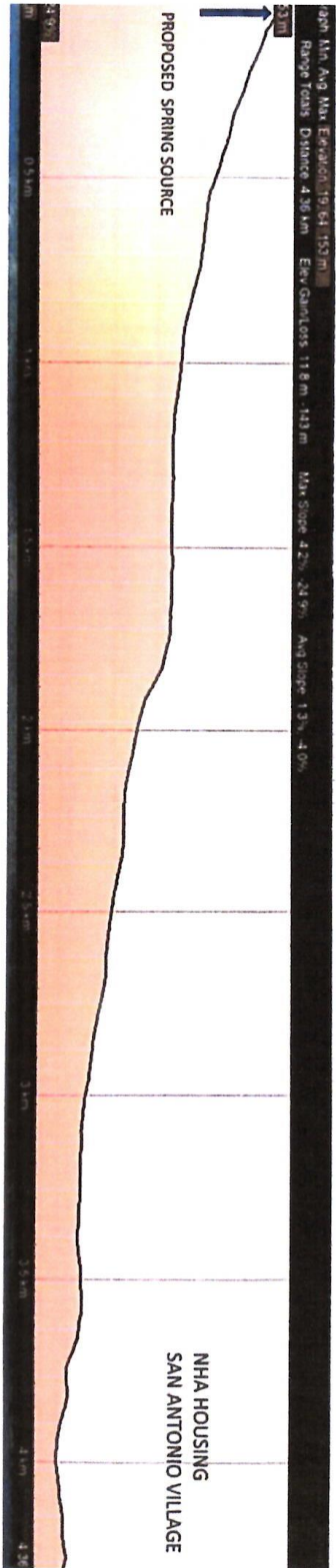
JADE CROWNE  
 MEADOWS  
 11°35'2.29N,  
 124°32'53.94E  
 ELEV. 41 M. -66 M.



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**C-1**  
**SCHMATIC DIAGRAM**  
 SCALE NTS.

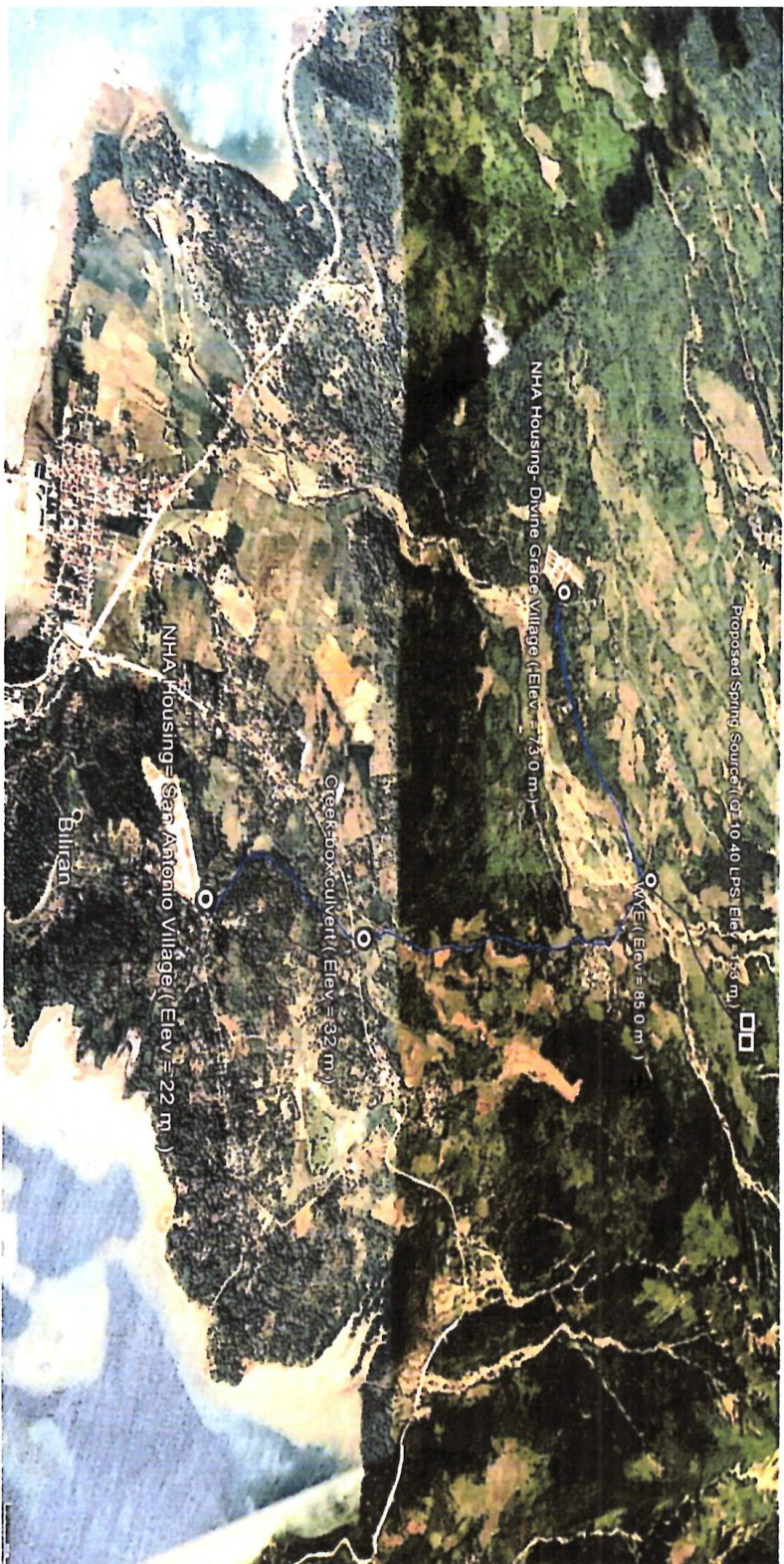
PROJECT TITLE: WATER SUPPLY SYSTEM FOR VOLANDA FE. MA. EN. T. H. C. (SINIF. 200-C-24-1)	PREPARED BY:  ENGR. MARK S. SOPENA DIVISION MANAGER - CEPEM DEPT.	APPROVED BY:  ENGR. FIVALDO MADERAZO GENERAL MANAGER	NOTED BY:	SHEET CONTENT: AS SHOWN	SHEET NO. C-1 / 1
PROJECT LOCATION: MUNICIPALITY OF CIBIRAN					



TRANSMISSION LINE FROM PROPOSED SPRING SOURCE (11°30'02.52"N, 124°29'25.18"E) BRGY. HUGPA TO SAN ANTONIO VILLAGE, BRGY. ENAGE (11°28'17.95"N, 124°29'10.25"E)



<b>TITLE:</b> UPPLY SYSTEM FOR YOLANDA FNT HC USING PROGRVIA LOCATION: MUNICIPALITY OF BILIRAN	<b>PREPARED BY:</b>  ENGR. R. S. SERRANO DIVISION MANAGER C-PECHM DEPT.	<b>APPROVED BY:</b>  ENGR. RIVALDO S. MADRAZO GENERAL MANAGER	<b>NOTED BY:</b>	SHEET CONTENT: AS SHOWN
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<b>TITLE:</b> WATER SUPPLY SYSTEM FOR YOLANDA AFFECTED MUNICIPALITY USING PROGRAM LOCATION: MUNICIPALITY OF BILIRAN	<b>PREPARED BY:</b> ENGR. <i>[Signature]</i> <b>MARK S. SERENO</b> DIVISION MANAGER C-PECOM DEPT.	<b>APPROVED BY:</b> ENGR. <i>[Signature]</i> <b>EULALIO S. MADERAZO</b> GENERAL MANAGER	<b>NOTED BY:</b>	<b>SHEET CONTENT:</b> AS SHOWN
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## ***Section VIII. Bill of Quantities (Bid Forms)***

## **Bill of Quantities**

**TO : NAVAL WATER DISTRICT  
Republic of the Philippines**

Attention: ENGR. MARK S. SEREÑO  
BAC Chairman

Subject: "DESIGN AND BUILD" CONTRACT FOR THE CONSTRUCTION OF WATER SUPPLY SYSTEM PROJECT FOR ALMERIA, BILIRAN AND CAIBIRAN (BILIRAN) FOR NHA PERMANENT RESETTLEMENT SITES IN YOLANDA AFFECTED WATER DISTRICTS AND MUNICIPALITIES

Gentlemen:

Pursuant to your Invitation to Bids for the above-mentioned project, subject to all conditions and requirements of your Drawings, Specifications and related Contract. Documents which, so far as they relate to this Bid are made part thereof. We/I will accomplish all necessary works and furnish all necessary plants, tools, appliances, labor and materials in accordance with the Drawings and Specifications and related Contract Documents and complete the work for the following schedule of prices, including all Philippine taxes, totaling:

- Part 1 : Design and Build Contract for **Almeria NHA Permanent Resettlement** areas in Yolanda Affected Municipalities Water Supply System Improvement Project.
- Part 2 : Design and Build Contract for **Biliran NHA Permanent Resettlement** areas in Yolanda Affected Municipalities Water Supply System Improvement Project.
- Part 3 : Design and Build Contract for **Caibiran NHA Permanent Resettlement** areas in Yolanda Affected Municipalities Water Supply System Improvement Project.

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Pesos (P \_\_\_\_\_)

Note: Quantities estimated are for the purpose of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.

**Product Name: *Design and Build Contract for Almeria NHA Permanent Resettlement areas in Yolanda Affected Municipalities Water Supply System Improvement Project***

**Location :Site 1 and Site 2, Brgy..Jamorawon, Almeria,Biliran**

## SECTION VIII - BILL OF QUANTITIES

Part No. 1 of 3

Part Description: NHA Housing Project Almeria

(Columns (1), (2), (3) and (4) are to be filled up by the Procuring Entity)

(Columns (5) and (6) are to be filled up by the Bidder)

Pay Item No	Description	Unit	Quantity	Unit Price (Pesos)	Total Amount (Pesos)
<b>PART I</b>	<b>DESIGN &amp; BUILD SCHEME LUMP SUM BID WORK ITEMS</b>				
<b>1</b>	DETAILED DESIGN (Conduct Detailed Engineering in accordance with the Contract that shall include among others survey, site investigation, preparation of construction plans, preparation of quantity estimates with detailed unit price analysis, preparation of program of work, detailed construction methods, materials and construction specifications, construction schedule, construction methods, preparation of design report, acquisition of permits and other works as required under the Contract)	1	LS	In Words: _____  In Figures: _____	In Words: _____  In Figures: _____
<b>2</b>	Construction of one (1) 3.0 m x 3.0 m x 3.0 m reinforced concrete intake box (27 cu m)	1	LS	In Words: _____  In Figures: _____	In Words: _____  In Figures: _____
<b>3</b>	<b>Installation of approximately 4,335 LM of transmission/distribution pipelines with a pipe diameter ranging from 100mm Ø to 100mm Ø, including the required</b>			In Words: _____  In Figures: _____	In Words: _____  In Figures: _____

	<b>fittings</b> <b>-100mm diam uPVC Pipes</b> <b>(Series 10)</b> <b>-150mm Ø uPVC Pipes</b> <b>(Series 8)</b> <b>-150mm Ø uPVC Pipes</b> <b>(Series 10) and</b> <b>construction of break</b> <b>pressure chamber</b>	1,190 1,575 1,570	LM LM LM		
<b>4</b>	Various sizes of Valves, fittings and appurtenances (valve sizes from 50mm Ø to 100mm Ø)	1	LM	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>5</b>	Flowmeters	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>6</b>	63.20 cu m Reinforced concrete ground reservoir	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>7</b>	Treatment facilities and its accessories	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>8</b>	Pavement Demolition (road/shoulder, t=200mm) and Restoration	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>PART I</b>	<b>SUB- TOTAL FOR PART I –DESIGN AND BUILD CONTRACT</b>			In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>PART II</b>	<b>SPECIAL ITEMS/REQUIREMENTS</b>				
<b>1</b>	Mobilization and Demobilization				
<b>1.A</b>	Civil works construction	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
<b>1.B</b>	Design and build	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
	Permit, Fees, Bonds,			In words: _____ _____	In words: _____ _____

2	Guaranties/Warranties & Insurances	1	Lot	_____ _____ In figures: _____	_____ _____ In figures: _____
3	Project and COA sign board (3 each sign board)	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
<b>PART II</b>	<b>SUB- TOTAL BID COST FOR PART II – SPECIAL ITEMS/REQUIREMENTS</b>			In words: _____ _____ In figures: _____	
<b>TOTAL BID COST (SUM OF PART I TO II)</b>		In Words: _____ In Figures: _____			

**Notes:**

1. In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.
2. Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.
3. Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.

**Notes:**

1. In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.
2. Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.
3. Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.

**Notes:**

1. In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.
2. Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.
3. Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.

**Product Name:** Design and Build Contract for Biliran NHA Permanent Resettlement areas in Yolanda Affected Municipalities Water Supply System Improvement Project

**Location :**San Antonio Village, Brgy.Villa Enage and Divine Grace Village, Brgy. Burabod, Biliran, Biliran

## SECTION VIII - BILL OF QUANTITIES

Part No. <u>2 of 3</u>				Part Description: <u>NHA Housing Project Biliran</u>	
(Columns (1), (2), (3) and (4) are to be filled up by the Procuring Entity)				(Columns (5) and (6) are to be filled up by the Bidder)	
Pay Item No	Description	Unit	Quantity	Unit Price (Pesos)	Total Amount (Pesos)
<b>PART I</b>	<b>DESIGN &amp; BUILD SCHEME LUMP SUM BID WORK ITEMS</b>				
<b>1</b>	DETAILED DESIGN (Conduct Detailed Engineering in accordance with the Contract that shall include among others survey, site investigation, preparation of construction plans, preparation of quantity estimates with detailed unit price analysis, preparation of program of work, detailed construction methods, materials and construction specifications, construction schedule, construction methods, preparation of design report, acquisition of permits and other works as required under the Contract)	1	LS	In Words: _____  In Figures: _____	In Words: _____  In Figures: _____
<b>2</b>	Construction of one 4.0 m x 4.0 m x 3.931 m reinforced concrete intake box (62.90 cu m)	1	LS	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>3</b>	Installation of approximately 5,820 LM of transmission/distribution pipelines with a pipe diameter ranging from 100mm Ø to 150mm Ø, including the required fittings <b>-100mm Ø uPVC Pipes (Series 10)</b> <b>-100mm uPVC Pipes (Series 8) and construction of break pressure chamber</b>	4,740	LM	1,080	LM
<b>4</b>	Various sizes of Valves, fittings and appurtenances (valve sizes from 50mm Ø	1	LM	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____



	to 100mm Ø				
5	Flowmeters	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
6	100 cu m Reinforced concrete ground reservoir	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
7	Water Meters (1,265 Water Meters)	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
8	Treatment facilities and its accessories	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
9	Pavement Demolition (road/shoulder, t=200mm) and Restoration	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>PART I</b>	<b>SUB- TOTAL FOR PART I –DESIGN AND BUILD CONTRACT</b>			In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>PART II</b>	<b>SPECIAL ITEMS/REQUIREMENTS</b>				
1	Mobilization and Demobilization				
1.A	Civil works construction	1	Lot	In words: _____ _____ In figures: _____	In words: _____ _____ In figures: _____
1.B	Design and build	1	Lot	In words: _____ _____ In figures: _____	In words: _____ _____ In figures: _____
2	Permit, Fees, Bonds, Guaranties/Warranties & Insurances	1	Lot	In words: _____ _____ In figures: _____	In words: _____ _____ In figures: _____
3	Project and COA sign board (3 each sign board)	1	Lot	In words: _____ _____ _____	In words: _____ _____ _____

				In figures: _____	In figures: _____
<b>PART II</b>	<b>SUB- TOTAL BID COST FOR PART II – SPECIAL ITEMS/REQUIREMENTS</b>			In words: _____ _____	In figures: _____
<b>TOTAL BID COST (SUM OF PART I TO II)</b>			In Words: _____ In Figures: _____		

**Notes:**

1. In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.
2. Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.
3. Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.

**Product Name:** Design and Build Contract for Caibiran NHA Permanent Resettlement areas in Yolanda Affected Municipalities Water Supply System Improvement Project

**Location :** Vista Del Mar and Jade Browne Meadows, Brgy. Cabibihan, Caibiran, Biliran

## SECTION VIII - BILL OF QUANTITIES

Part No. **3 of 3**

Part Description: **NHA Housing Project Caibiran**

(Columns (1), (2), (3) and (4) are to be filled up by the Procuring Entity)

(Columns (5) and (6) are to be filled up by the Bidder)

Pay Item No	Description	Unit	Quantity	Unit Price (Pesos)	Total Amount (Pesos)
<b>PART I</b>	<b>DESIGN &amp; BUILD SCHEME LUMP SUM BID WORK ITEMS</b>				
<b>1</b>	DETAILED DESIGN (Conduct Detailed Engineering in accordance with the Contract that shall include among others survey, site investigation, preparation of construction plans, preparation of quantity estimates with	1	LS	In Words: _____	In Words: _____

	detailed unit price analysis, preparation of program of work, detailed construction methods, materials and construction specifications, construction schedule, construction methods, preparation of design report, acquisition of permits and other works as required under the Contract)			In Figures: _____	In Figures: _____
<b>2</b>	Construction of one 3.0 m x 3.0 m x 3.0 m reinforced concrete intake box (27 cu m)	1	LS	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>3</b>	Installation of approximately 5,121 LM of transmission/distribution pipelines with a pipe diameter ranging from 100mm Ø to 150mm Ø, including the required fittings 100mm Ø uPVC Pipes (Series 10) 150mm Ø uPVC Pipes (Series 10) and construction of break pressure chamber	121 5,000	LM LM	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>4</b>	Various sizes of Valves, fittings and appurtenances (valve sizes from 50mm Ø to 100mm Ø)	1	LM	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>5</b>	Flowmeters	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>6</b>	100 cu m Reinforced concrete ground reservoir	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>7</b>	Treatment facilities and its accessories	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>8</b>	Water Meters (970 Water Meters)	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____

9	Pavement Demolition (road/shoulder, t=200mm) and Restoration	1	Lot	In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>PART I</b>	<b>SUB- TOTAL FOR PART I –DESIGN AND BUILD CONTRACT</b>			In Words: _____ In Figures: _____	In Words: _____ In Figures: _____
<b>PART II</b>	<b>SPECIAL ITEMS/REQUIREMENTS</b>				
1	Mobilization and Demobilization				
1.A	Civil works construction	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
1.B	Design and build	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
2	Permit, Fees, Bonds, Guaranties/Warranties & Insurances	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
3	Project and COA sign board (3 each sign board)	1	Lot	In words: _____ _____ _____ In figures: _____	In words: _____ _____ _____ In figures: _____
<b>PART II</b>	<b>SUB- TOTAL BID COST FOR PART II – SPECIAL ITEMS/REQUIREMENTS</b>			In words: _____ _____ In figures: _____	
<b>TOTAL BID COST (SUM OF PART I TO II)</b>		In Words: _____ In Figures: _____			

## TOTAL BID PRICE SUMMARY

TOTAL PRICE  
PHIL. PESO

**PART 1**

Design and Build Contract for **Almeria NHA Permanent Resettlement** areas in Yolanda Affected Municipalities Water Supply System Improvement Project.

₱ \_\_\_\_\_

**PART 2**

Design and Build Contract for **Biliran NHA Permanent Resettlement** areas in Yolanda Affected Municipalities Water Supply System Improvement Project.

₱ \_\_\_\_\_

**PART 3**

Design and Build Contract for **Caibiran NHA Permanent Resettlement** areas in Yolanda Affected Municipalities Water Supply System Improvement Project.

₱ \_\_\_\_\_

**TOTAL OF PARTS 1 TO 3**

₱ \_\_\_\_\_

**SUMMARY UNDER LUMP SUM AND UNIT BID PRICE ITEMS (Almeria NHA Permanent Resettlement Areas in Yolanda Affected Municipalities Water Supply System Project)**

**PART I : DESIGN AND BUILD**

<b>PART I : DESIGN AND BUILD</b>		<b>TOTAL COST</b>
<b>1</b>	DESIGN WORK	
<b>2</b>	REINFORCED CONCRETE INTAKE BOX	
<b>3</b>	PIPELINES AND BREAK PRESSURE CHAMBER	
<b>4</b>	VALVES AND FITTINGS	
<b>5</b>	FLOWMETERS	
<b>6</b>	REINFORCED CONCRETE GROUND RESERVOIR	
<b>7</b>	TREATMENT FACILITIES AND ITS ACCESSORIES	
<b>8</b>	PAVEMENT DEMOLITION AND RESTORATION	
<b>SUB- TOTAL BID COST FOR PART I</b>		
<b>PART II : SPECIAL ITEMS/REQUIREMENTS</b>		
	SPECIAL ITEMS/REQUIREMENTS	
<b>SUB- TOTAL BID COST FOR PART II</b>		
<b>TOTAL BID COST (TOTAL OF PART I TO PART II) INCLUDING ALL TAXES</b>		

**Notes**

- In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.*
- Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.*
- Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.*

**SUMMARY UNDER LUMP SUM AND UNIT BID PRICE ITEMS (Biliran NHA Permanent Resettlement Areas in Yolanda Affected Municipalities Water Supply System Project in Brgys. Villa Enage and Burabod**

**PART I : DESIGN AND BUILD**

<b>PART I : DESIGN AND BUILD</b>		<b>TOTAL COST</b>
1	DESIGN WORK	
2	REINFORCED CONCRETE INTAKE BOX	
3	PIPELINES AND BREAK PRESSURE CHAMBER	
4	VALVES AND FITTINGS	
5	FLOWMETERS	
6	REINFORCED CONCRETE GROUND RESERVOIR	
7	WATER METERS	
8	TREATMENT FACILITIES AND ITS ACCESSORIES	
9	PAVEMENT DEMOLITION AND RESTORATION	
<b>SUB- TOTAL BID COST FOR PART I</b>		
<b>PART II : SPECIAL ITEMS/REQUIREMENTS</b>		
	SPECIAL ITEMS/REQUIREMENTS	
<b>SUB- TOTAL BID COST FOR PART II</b>		
<b>TOTAL BID COST (TOTAL OF PART I TO PART II) INCLUDING ALL TAXES</b>		

**Notes:**

1. *In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.*
2. *Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.*
3. *Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.*

**SUMMARY UNDER LUMP SUM AND UNIT BID PRICE ITEMS (Caibiran NHA Permanent Resettlement Areas in Yolanda Affected Municipalities Water Supply System Project in Brgy. Cabibihan**

**PART I : DESIGN AND BUILD**

<b>PART I : DESIGN AND BUILD</b>		<b>TOTAL COST</b>
1	DESIGN WORK	
2	REINFORCED CONCRETE INTAKE BOX	
3	PIPELINES AND BREAK PRESSURE CHAMBER	
4	VALVES AND FITTINGS	
5	FLOWMETERS	
6	REINFORCED CONCRETE GROUND RESERVOIR	
7	TREATMENT FACILITIES AND ITS ACCESSORIES	
8	WATER METERS	
9	PAVEMENT DEMOLITION AND RESTORATION	
<b>SUB- TOTAL BID COST FOR PART I</b>		
<b>PART II : SPECIAL ITEMS/REQUIREMENTS</b>		
	SPECIAL ITEMS/REQUIREMENTS	
<b>SUB- TOTAL BID COST FOR PART II</b>		
<b>TOTAL BID COST (TOTAL OF PART I TO PART II) INCLUDING ALL TAXES</b>		

**Notes:**

- In case of discrepancy between the amount in words and the amount in figures, amount in words shall prevail.*
- Unit bid prices in Bid Forms shall prevail over the detailed cost estimates in Breakdown of Prices.*
- Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed.*



## INFORMATION REQUIRED OF BIDDERS

The Bidder shall furnish all information required by Schedules A to C. Failure to comply with this requirement will render the proposal informal and may cause its rejection.

Schedule A : Breakdown of Prices

Schedule B : Documents Furnished with the Bid

Schedule C : Construction PERT/CPM & Bar Chart/S-Curve Schedule

Notes:

Schedules **A & B** inclusive shall be submitted with the Bid on the day Bids are opened, otherwise, the Bid may be rejected.

Schedule **C** shall be submitted within fifteen (15) calendar days from receipt of the Notice of Award.

All Documents are to be submitted in proper form, order, duly signed and stamped at **the end of each Schedule.**

### SCHEDULE A: BREAKDOWN OF PRICES

The Bidder shall completely fill up the Bidder's Breakdown of Lump Sum Prices (including all taxes), herein below provided by inserting the amount in figures for each item in the space provided. **The Breakdown shall be submitted together with the bid and shall form part of the bid form.** The amounts shall represent the true breakdown of the bid price of the Lump Sum Prices shown in the Bid Form in Philippine Peso. These amounts will be used in preparing monthly estimates. All breakdowns should be balanced and consistent with the bid amount in the Section VIII – Bill of Quantities (Bid Form). The total amount indicated in the forms below for each Unit Prices and Lump Sum Bid Prices must equal the bid prices shown in the Section VIII – Bill of Quantities (Bid Form), otherwise, the unit/Lump sum prices in the bid form (BOQ) shall prevail.

**PART I: UNDER DESIGN AND BUILD SCHEME LUMP SUM BID ITEMS (including all Taxes)**

**1.0 Almeria, Biliran (Pabahay Phase 1 and Pabahay Phase 2, Brgy. Jamorawon)**

No.	Item	Qty	Unit	Unit Price Materials	Unit Price Installation	Total Unit Price
<b>1</b>	<b>DESIGN WORKS</b>					
	DETAILED DESIGN (Conduct Detailed Engineering in accordance with the Contract that shall include among others survey, site investigation, preparation of construction plans, preparation of quantity estimates with detailed unit price analysis, preparation of program of work, detailed construction methods, materials and construction specifications, construction schedule, construction methods, preparation of design report, acquisition of permits and other works as required under the Contract)		LS			
	<b>Sub- Total</b>					
<b>2</b>	<b>CONSTRUCTION WORKS</b>					
<b>2.1</b>	<b>REINFORCED CONCRETE INTAKE BOX</b>					
2.1.1.	Site Preparation	1	Lot			
2.1.2.	Earthworks					
	Excavation		cu.m.			
	Backfilling		cu.m.			
2.1.3.	Concrete Works (Class A)					
	a. Column and footing (C1F1)		cu.m.			
	b. Wall Footing		cu.m.			
	c. Roof Beams		cu.m.			

	d. Floor Slab		cu.m.			
	e. Roof slab		cu.m.			
	e. Walls		cu.m.			
2.1.4.	Masonry Works					
	a. Mortar & Plastering		sq.m.			
2.1.5.	Reinforcement					
	Reinforcing Steel Bars		kgs.			
2.1.6.	Formworks		sq.m.			
2.1.7.	Scaffolding Works		sq.m.			
2.1.8.	Water Proofing		sq.m.			
	<b>Sub- Total</b>					
2.2	<b>PIPELAYING, VALVING AND BLOW-OFF ASSEMBLY AND MISCELLANEOUS WORKS</b>					
2.2.1.	<b><u>150MMØ UPVC PIPES, S-8</u></b>					
a.	100mm Ø X 6.0 m uPVC Pipes, S-8 w/ RR	1	LM			
b.	Fittings	1	LM			
c.	Warning Tape	1	LM			
d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
	<b>Sub- Total</b>					
2.2.2	<b><u>150 MMØ UPVC PIPES, S-10</u></b>					
a.	150mm Ø X 6.0 m uPVC Pipes, S-10 w/ RR	1	LM			

b.	Fittings	1	LM			
c.	Warning Tape	1	LM			
d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
	<b>Sub-Total</b>					
2.2.3	<b><u>100 MMØ UPVC PIPES, S-10</u></b>					
a.	100mm Ø X 6.0 m uPVC Pipes, S-10 w/ RR	1	LM			
b.	Fittings	1	LM			
c.	Warning Tape	1	LM			
d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
	<b>Sub- Total</b>					
2.2.4	<b>BREAK PRESSURE CHAMBER</b>					
a.	Excavation		cu. m.			
b.	Class A mixture cement 40 kgs		Bags			
c.	10 mm Ø Reinforcement bars		Kg			
d.	16 mm Ø Reinforcement bars		Kg			
e.	Sand		cu. m.			
f.	Gravel		cu. m.			
g.	50 mm Ø GI pipe with insect screen		m			
h.	150 mm Ø Overflow pipe 90 <sup>0</sup>		m			

	<b>Sub- Total</b>					
<b>2.3</b>	<b>VALVING ASSEMBLY</b>					
2.3.1	100mmØ Gate Valve	1	Set			
2.3.2	75mmØ Gate Valve	1	Set			
2.3.3	50mmØ Gate Valve	1	Set			
2.3.4	50mmØ Blow-off Assembly	1	Assy			
2.3.5	75mmØ Blow-off Assembly	1	Assy			
	<b>Sub- Total</b>					
<b>2.4</b>	<b>FLOWMETERS</b>					
	100mmØ Flowmeter	1	Assy.			
	<b>Sub- Total</b>					
<b>2.5</b>	<b>HYPOCHLORINATOR/TREATMENT FACILITY</b>					
2.5.1	Hypochlorinator feeder pump and injector assembly		Set			
2.5.2	Mixing tank		Set			
2.5.3	Chlorine Powder/Granules		Container			
2.5.4	Power Supply (Cables, Conduits Circuit Breaker and Outlet)		Lot			
	<b>Sub- Total</b>					
<b>2.6</b>	<b>REINFORCED CONCRETE GROUND RESERVOIR</b>					
2.6.1	Site Preparation	1	Lot			
2.6.2	Earthworks					
	Excavation		cu.m.			
	Backfilling		cu.m.			

2.6.3	Concrete Works (Class A)					
	a. Column and footing (C1F1)		cu.m.			
	b. Wall Footing		cu.m.			
	c. Roof Beams		cu.m.			
	d. Floor Slab		cu.m.			
	e. Roof slab		cu.m.			
	e. Walls		cu.m.			
2.6.4	Masonry Works					
	a. Mortar & Plastering		sq.m.			
2.6.5	Reinforcement					
	Reinforcing Steel Bars		kgs.			
2.6.6	Formworks		sq.m.			
2.6.7	Scaffolding Works		sq.m.			
2.6.8	Water Proofing		sq.m.			
	<b>Sub- Total</b>					
2.7	<b>CONCRETE PAVEMENT DEMOLITION AND RESTORATION</b>					
2.7.1	Concrete pavement demolition	1	sq.m.			
2.7.2	Concrete pavement restoration	1	cu.m.			
	<b>Sub-Total</b>					
2.8	<b>SPECIAL ITEMS/GENERAL REQUIREMENTS</b>					
2.8.1	Mobilization/Demobilization	1	Lot			
a.	Water supply construction	1	Lot			
b.	Design and build	1	Lot			

2.8.2	Permit, Fees, Bonds, Guaranties/Warranties & Insurances	1	Lot			
2.8.3	Project and COA sign board	5	Pcs			
	<b>Sub- Total</b>					
	<b>TOTAL (ALMERIA)</b>					

**PART I: UNDER DESIGN AND BUILD SCHEME LUMP SUM BID ITEMS (including all Taxes)**

**2.0 Biliran, Biliran (San Antonio Village, Brgy. Villa Enage and Divine Grace Village, Brgy. Burabod)**

No.	Item	Qty	Unit	Unit Price Materials	Unit Price Installation	Total Unit Price
<b>1</b>	<b>DESIGN WORKS</b>					
	DETAILED DESIGN (Conduct Detailed Engineering in accordance with the Contract that shall include among others survey, site investigation, preparation of construction plans, preparation of quantity estimates with detailed unit price analysis, preparation of program of work, detailed construction methods, materials and construction specifications, construction schedule, construction methods, preparation of design report, acquisition of permits and other works as required under the Contract)		LS			
	<b>Sub- Total</b>					
<b>2</b>	<b>CONSTRUCTION WORKS</b>					
<b>2.1</b>	<b>REINFORCED CONCRETE INTAKE BOX</b>					
2.1.1.	Site Preparation	1	Lot			
2.1.2.	Earthworks					
	Excavation		cu.m.			
	Backfilling		cu.m.			

Submitted by:

Name & Signature and Official Stamp of Bidder/Bidder's Representative: \_\_\_\_\_

Date: \_\_\_\_\_

Position: \_\_\_\_\_

Name of Bidder: \_\_\_\_\_



2.1.3.	Concrete Works (Class A)					
	a. Column and footing (C1F1)		cu.m.			
	b. Wall Footing		cu.m.			
	c. Roof Beams		cu.m.			
	d. Floor Slab		cu.m.			
	e. Roof slab		cu.m.			
	e. Walls		cu.m.			
2.1.4.	Masonry Works					
	a. Mortar & Plastering		sq.m.			
2.1.5.	Reinforcement					
	Reinforcing Steel Bars		kgs.			
2.1.6.	Formworks		sq.m.			
2.1.7.	Scaffolding Works		sq.m.			
2.1.8.	Water Proofing		sq.m.			
	<b>Sub- Total</b>					
2.2	<b>PIPELAYING, VALVING AND BLOW-OFF ASSEMBLY AND MISCELLANEOUS WORKS</b>					
2.2.1.	<b><u>150MMØ UPVC PIPES, S-8</u></b>					
a.	150mm Ø X 6.0 m uPVC Pipes, S-8 w/ RR	1	LM			
b.	Fittings	1	LM			
c.	Warning Tape	1	LM			

Submitted by:

Name & Signature and Official Stamp of Bidder/Bidder's Representative: \_\_\_\_\_

Date: \_\_\_\_\_

Position: \_\_\_\_\_

Name of Bidder: \_\_\_\_\_

d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
<b>Sub- Total</b>						
2.2.2	<b><u>100 MMØ UPVC PIPES, S-10</u></b>					
a.	100mm Ø X 6.0 m uPVC Pipes, S-10 w/ RR	1	LM			
b.	Fittings	1	LM			
c.	Warning Tape	1	LM			
d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
<b>Sub- Total</b>						
2.2.3	<b>BREAK PRESSURE CHAMBER</b>					
a.	Excavation		cu. m.			
b.	Class A mixture cement 40 kgs		Bags			
c.	10 mm Ø Reinforcement bars		Kg			
d.	16 mm Ø Reinforcement bars		Kg			
e.	Sand		cu. m.			
f.	Gravel		cu. m			
g.	50 mm Ø GI pipe with insect screen		m			
h.	150 mm Ø Overflow pipe 90 <sup>0</sup>		m			

Submitted by:

Name & Signature and Official Stamp of Bidder/Bidder's Representative: \_\_\_\_\_

Date: \_\_\_\_\_

Position: \_\_\_\_\_

Name of Bidder: \_\_\_\_\_

<b>Sub- Total</b>						
<b>2.3</b>	<b>VALVING ASSEMBLY</b>					
2.3.1	100mmØ Gate Valve	1	Set			
2.3.2	75mmØ Gate Valve	1	Set			
2.3.3	50mmØ Gate Valve	1	Set			
2.3.4	50mmØ Blow-off Assembly	1	Assy			
2.3.5	75mmØ Blow-off Assembly	1	Assy			
<b>Sub- Total</b>						
<b>2.4</b>	<b>FLOWMETERS</b>					
	100mmØ Flowmeter	1	Assy			
<b>Sub- Total</b>						
<b>2.5</b>	<b>REINFORCED CONCRETE GROUND RESERVOIR</b>					
2.5.1	Site Preparation	1	Lot			
2.5.2	Earthworks					
	Excavation		cu.m.			
	Backfilling		cu.m.			
2.5.3	Concrete Works (Class A)					
	a. Column and footing (C1F1)		cu.m.			
	b. Wall Footing		cu.m.			
	c. Roof Beams		cu.m.			
	d. Floor Slab		cu.m.			
	e. Roof slab		cu.m.			

Submitted by:

Name & Signature and Official Stamp of Bidder/Bidder's Representative: \_\_\_\_\_

Date: \_\_\_\_\_

Position: \_\_\_\_\_

Name of Bidder: \_\_\_\_\_

	e. Walls		cu.m.			
2.5.4.	Masonry Works					
	a. Mortar & Plastering		sq.m.			
2.5.5.	Reinforcement					
	Reinforcing Steel Bars		kgs.			
2.5.6.	Formworks		sq.m.			
2.5.7.	Scaffolding Works		sq.m.			
2.5.8.	Water Proofing		sq.m.			
	<b>Sub- Total</b>					
2.6	<b>WATER METERS</b>					
	Water Meters	1	Assy			
	<b>Sub- Total</b>					
2.7	<b>TREATMENT FACILITY/ HYPOCHLORINATOR</b>					
2.7.1	Hypochlorinator feeder pump and injector assembly		Set			
2.7.2	Mixing tank		Set			
2.7.3	Chlorine Powder/Granules		Container			
2.7.4	Power Supply (Cables, Conduits Circuit Breaker and Outlet)		Lot			
	<b>Sub- Total</b>					
2.8	<b>CONCRETE PAVEMENT AND DEMOLITON</b>					
2.8.1.	Concrete pavement demolition	1	sq.m			

Submitted by:

Name & Signature and Official Stamp of Bidder/Bidder's Representative: \_\_\_\_\_

Date: \_\_\_\_\_

Position: \_\_\_\_\_

Name of Bidder: \_\_\_\_\_

2.8.2	Concrete pavement restoration	1	cu.m.			
	<b>Sub- Total</b>					
2.9	<b>SPECIAL ITEMS/GENERAL REQUIREMENTS</b>					
2.9.1	Mobilization/Demobilization	1	Lot			
a.	Water supply Construction	1	Lot			
b.	Design and build	1	Lot			
2.9.2	Permit, Fees, Bonds, Guaranties/Warranties & Insurances	1	Lot			
2.9.3	Project and COA sign board	5	Pcs			
	<b>Sub- Total</b>					
	<b>TOTAL (BILIRAN)</b>					

*Submitted by:*

*Name & Signature and Official Stamp of Bidder/Bidder's Representative:* \_\_\_\_\_

*Date:* \_\_\_\_\_

*Position:* \_\_\_\_\_

*Name of Bidder:* \_\_\_\_\_

**PART I: UNDER DESIGN AND BUILD SCHEME LUMP SUM BID ITEMS (including all Taxes)**

**3.0 Caibiran, Biliran (Vista Del Mar and Jade Crowne Meadows, Brgy. Cabibihan)**

No.	Item	Qty	Unit	Unit Price Materials	Unit Price Installation	Total Unit Price
<b>1</b>	<b>DESIGN WORKS</b>					
	DETAILED DESIGN (Conduct Detailed Engineering in accordance with the Contract that shall include among others survey, site investigation, preparation of construction plans, preparation of quantity estimates with detailed unit price analysis, preparation of program of work, detailed construction methods, materials and construction specifications, construction schedule, construction methods, preparation of design report, acquisition of permits and other works as required under the Contract)		LS			
	<b>Sub- Total</b>					
<b>2</b>	<b>CONSTRUCTION WORKS</b>					
<b>2.1</b>	<b>REINFORCED CONCRETE INTAKE BOX</b>					
2.1.1.	Site Preparation	1	Lot			
2.1.2.	Earthworks					
	Excavation		cu.m.			
	Backfilling		cu.m.			
2.1.3.	Concrete Works (Class A)					
	a. Column and footing (C1F1)		cu.m.			
	b. Wall Footing		cu.m.			

	c. Roof Beams		cu.m.			
	d. Floor Slab		cu.m.			
	e. Roof slab		cu.m.			
	e. Walls					
2.1.4.	Masonry Works					
	a. Mortar & Plastering		sq.m.			
2.1.5.	Reinforcement					
	Reinforcing Steel Bars		kgs.			
2.1.6.	Formworks		sq.m.			
2.1.7.	Scaffolding Works		sq.m.			
2.1.8.	Water Proofing		sq.m.			
	<b>Sub- Total</b>					
2.2	<b>PIPELAYING, VALVING AND BLOW-OFF ASSEMBLY AND MISCELLANEOUS WORKS</b>					
2.2.1.	<b><u>150MMØ UPVC PIPES, S-10</u></b>					
a.	150mm Ø X 6.0 m uPVC Pipes, S-10 w/ RR	1	LM			
b.	Fittings	1	LM			
c.	Warning Tape	1	LM			
d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
	<b>Sub- Total</b>					
2.2.2	<b><u>100 MMØ UPVC PIPES, S-10</u></b>					
a.	100 mm Ø X 6.0 m uPVC Pipes, S-10 w/ RR	1	LM			

b.	Fittings	1	LM			
c.	Warning Tape	1	LM			
d.	Excavation	1	LM			
e.	Laying/ Jointing	1	LM			
f.	Backfilling, Compaction, Hydrotesting and Disinfection	1	LM			
	<b>Sub- Total</b>					
<b>2.2.3</b>	<b>BREAK PRESSURE CHAMBER</b>					
a.	Excavation		cu. m.			
b.	Class A mixture cement 40 kgs		bags			
c.	10 mm $\varnothing$ Reinforcement bars		Kg			
d.	16 mm $\varnothing$ Reinforcement bars		Kg			
e.	Sand		cu.m.			
f.	Gravel		cu.m.			
g.	50 mm $\varnothing$ GI pipe with insect screen		m			
h.	150 mm $\varnothing$ Overflow pipe 90 <sup>0</sup>		m			
	<b>Sub- Total</b>					
<b>2.4</b>	<b>VALVING ASSEMBLY</b>					
2.4.1	100mm $\varnothing$ Gate Valve	1	Set			
2.4.2	75mm $\varnothing$ Gate Valve	1	Set			
2.4.3	50mm $\varnothing$ Gate Valve	1	Set			
2.4.4	50mm $\varnothing$ Blow-off Assembly	1	Assy			
2.4.5	75mm $\varnothing$ Blow-off Assembly	1	Assy			
<b>2.5</b>	<b>FLOWMETERS</b>					



	100mmØ Flowmeter	1	Assy			
	<b>Sub- Total</b>					
<b>2.6</b>	<b>TREATMENT FACILITY/HYPOCHLORINATOR</b>					
2.6.1	Hypochlorinator feeder pump and injector assembly		Set			
2.6.2	Mixing tank		Set			
2.6.3	Chlorine Powder/Granules		Container			
2.6.4	Power Supply (Cables, Conduits Circuit Breaker and Outlet)		Lot			
	<b>Sub- Total</b>					
<b>2.7</b>	<b>REINFORCED CONCRETE GROUND RESERVOIR</b>					
2.7.1.	Site Preparation	1	Lot			
2.7.2.	Earthworks					
	Excavation		cu.m.			
	Backfilling		cu.m.			
2.7.3.	Concrete Works (Class A)					
	a. Column and footing (C1F1)		cu.m.			
	b. Wall Footing		cu.m.			
	c. Roof Beams		cu.m.			
	d. Floor Slab		cu.m.			
	e. Roof slab		cu.m.			
	e. Walls		cu.m			
2.7.4.	Masonry Works					
	a. Mortar & Plastering		sq.m.			

2.7.5.	Reinforcement					
	Reinforcing Steel Bars		kgs.			
2.7.6.	Formworks		sq.m.			
2.7.7.	Scaffolding Works		sq.m.			
2.7.8.	Water Proofing		sq.m.			
	<b>Sub- Total</b>					
2.7	<b>WATER METERS</b>					
	Water Meters	1	Assy			
	<b>Sub- Total</b>					
2.8	<b>CONCRETE DEMOLITION AND RESTORATION</b>					
2.8.1.	Concrete pavement demolition	1	sq.m.			
2.8.2	Concrete pavement restoration	1	cu.m.			
	<b>Sub- Total</b>					
2.9	<b>SPECIAL ITEMS/GENERAL REQUIREMENTS</b>					
2.9.1	Mobilization/Demobilization	1	Lot			
a.	Water supply Construction	1	Lot			
b.	Design and build	1	Lot			
2.9.2	Permit, Fees, Bonds, Guaranties/Warranties & Insurances	1	Lot			
2.9.3	Project and COA sign board	5	Pcs			
	<b>Sub- Total</b>					
	<b>TOTAL (CAIBIRAN)</b>					
	<b>TOTAL PROJECT COST</b>					

## ***Section IX. BIDDING FORMS***



**Bid Form**

Date: \_\_\_\_\_

To: *[name and address of PROCURING ENTITY]*

Address: *[insert address]*

We, the undersigned, declare that:

- (a) We have examined and have no reservation to the Bidding Documents, including Addenda, for the Contract *[insert name of contract]*;
- (b) We offer to execute the Works for this Contract in accordance with the Bid and Bid Data Sheet, General and Special Conditions of Contract accompanying this Bid;  
The total price of our Bid, excluding any discounts offered in item (d) below is: *[insert information]*;  
The discounts offered and the methodology for their application are: *[insert information]*;
- (c) Our Bid shall be valid for a period of *[insert number]* days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (d) If our Bid is accepted, we commit to obtain a Performance Security in the amount of *[insert percentage amount]* percent of the Contract Price for the due performance of the Contract;
- (e) Our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from the following eligible countries: *[insert information]*;
- (f) We are not participating, as Bidders, in more than one Bid in this bidding process, other than alternative offers in accordance with the Bidding Documents;
- (g) Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the Contract, has not been declared ineligible by the Funding Source;
- (h) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal Contract is prepared and executed; and
- (i) We understand that you are not bound to accept the Lowest Evaluated Bid or any other Bid that you may receive.

Name: \_\_\_\_\_

In the capacity of: \_\_\_\_\_

Signed: \_\_\_\_\_

Duly authorized to sign the Bid for and on behalf of: \_\_\_\_\_

Date: \_\_\_\_\_

## Omnibus Sworn Statement

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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 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 of *[Name of Bidder]*, I have full power and authority to do, execute and perform any and all acts necessary to represent it in the bidding for *[Name of the Project]* of the *[Name of the PROCURING ENTITY]*;

*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 and/or to represent the *[Name of Bidder]* in the bidding as shown in the attached *[state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate issued by the corporation or the members of the joint venture)]*;

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;

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:* I am 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 following responsibilities as a Bidder:
  - a) Carefully examine all of the Bidding Documents;
  - b) Acknowledge all conditions, local or otherwise, affecting the implementation of the Contract;
  - c) Made an estimate of the facilities available and needed for the contract to be bid, if any; and
  - d) Inquire or secure Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

IN WITNESS WHEREOF, I have hereunto set my hand this \_\_ day of \_\_, 20\_\_ at \_\_\_\_\_, Philippines.

\_\_\_\_\_  
Bidder's Representative/Authorized Signatory

