Republic of the Philippines
NATIONAL IRRIGATION ADMINISTRATION
Cordillera Administrative Region (CAR)
Wangal, La Trinidad, Benguet

PHILIPPINE BIDDING DOCUMENTS

CW – ABRA – 10 – 2023/ CLUSTER 07- CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS

San Juan, and Lacub, Abra

Sixth Edition
July 2020

TABLE OF CONTENTS

Glossary of
Terms, Abbreviations, and Acronyms

ABC – Approved Budget for the Contract.

ARCC – Allowable Range of Contract Cost.

BAC – Bids and Awards Committee.

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

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

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

BIR – Bureau of Internal Revenue.

BSP – Bangko Sentral ng Pilipinas.

CDA – Cooperative Development Authority.

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

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

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

DOLE – Department of Labor and Employment.

DTI – Department of Trade and Industry.

Foreign-funded Procurement or Foreign-Assisted Project – Refers to procurement whose funding source is from a foreign government, foreign or international financing institution as

specified in the Treaty or International or Executive Agreement. (2016 revised IRR, Section 5[b]).
GFI – Government Financial Institution.

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

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

GOP – Government of the Philippines.

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

LGUs – Local Government Units.

NFCC – Net Financial Contracting Capacity.

NGA – National Government Agency.

PCAB – Philippine Contractors Accreditation Board.

PhilGEPS - Philippine Government Electronic Procurement System.

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

PSA – Philippine Statistics Authority.

SEC – Securities and Exchange Commission.

SLCC – Single Largest Completed Contract.

UN – United Nations.

Section I. Invitation to Bid

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION
CORDILLERA ADMINISTRATIVE REGION (CAR)
WANGAL, LA TRINIDAD, BENGUET

Invitation to Bid for *CW-ABRA-10-2023/CLUSTER 07-CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS*

1. The *National Irrigation Administration-Cordillera Administrative Region (NIA-CAR)*, through the *General Appropriation Act 2023* intends to apply the sum of ***Eleven Million Two Hundred Sixteen Thousand Ten Pesos and Twenty-Three Centavos (Php 11,216,010.23)*** being the Approved Budget for the Contract (ABC) to payments under the contract for ***CW-ABRA-10-2023/CLUSTER 07-CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS***. Bids received in excess of the ABC shall be automatically rejected at bid opening.

	ABC
***GAANG-TAGAYTAY SIP**, San Juan, Abra*	8,986,344.15
***BALAOANG SIP,** Lacub, Abra*	2,229,666.08
TOTAL ABC	11,216,010.23

2. The *National Irrigation Administration-Cordillera Administrative Region (NIA-CAR)* now invites bids for the above Procurement Project. Completion of the Works requires ***120 Calendar Days, inclusive of 17 pre-determined unworkable days (rainy days) and existing indigenous practices***. 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).

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

4. Interested bidders may obtain further information from *National Irrigation Administration-Cordillera Administrative Region (NIA-CAR)* and inspect the Bidding Documents at the address given below during office hours, ***8:00 A.M. – 5:00 P.M. from Monday to Friday.***

5. A complete set of Bidding Documents may be acquired by interested bidders on ***March 07, 2023 to 08:30 AM of March 27, 2023*** from given address and website/s below *and 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.*

6. The *National Irrigation Administration-Cordillera Administrative Region Bids and Awards Committee (NIA-CAR BAC)* will hold a Pre-Bid Conference[1] on ***March 15, 2023, 09:00 A.M.*** at *NIA-CAR Farmers Training Center, NIA-CAR Compound, Wangal, La Trinidad, Benguet and*/or through videoconferencing/webcasting *via Google Meet,* which shall be open to bidders.

7. Bids must be duly received by the BAC Secretariat manual submission at *NIA-CAR BAC Secretariat Office, 1st floor Administrative Building, Wangal, La Trinidad, Benguet* on or before ***March 27, 2023, 08:30 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 15.

9. Bid opening shall be on ***March 27, 2023*** at *NIA-CAR Training Hall, 1st Floor Cordillera Farmer's Training Center, Wangal, La Trinidad, Benguet* and/or through *Google Meet.* Bids will be opened in the presence of the bidders' representatives who choose to attend the activity. Bid opening for all contracts scheduled on ***March 27, 2023 will start at 08:45 AM***, and shall be conducted successively one after the other, in the order that follows:

    1. **CW-ABRA-04-2023 / CLUSTER 01** – CONSTRUCTION OF VARIOUS RESTORATION OF COMMUNAL IRRIGATION SYSTEMS
    2. **CW-ABRA-05-2023 / CLUSTER 02** – CONSTRUCTION OF VARIOUS RESTORATION OF COMMUNAL IRRIGATION SYSTEMS
    3. **CW-ABRA-06-2023 / CLUSTER 03** – CONSTRUCTION OF VARIOUS REPAIR OF COMMUNAL IRRIGATION SYSTEMS
    4. **CW-ABRA-07-2023 / CLUSTER 04 –** CONSTRUCTION OF VARIOUS REPAIR OF COMMUNAL IRRIGATION SYSTEMS
    5. **CW-ABRA-08-2023 / CLUSTER 05** – CONSTRUCTION OF VARIOUS ESTABLISHMENT PUMP IRRIGATION PROJECTS – SOLAR
    6. **CW-ABRA-09-2023 / CLUSTER 06** – CONSTRUCTION OF VARIOUS ESTABLISHMENT OF GROUND WATER PUMP IRRIGATION PROJECTS – SOLAR
    7. **CW-ABRA-10-2023 / CLUSTER 07** – CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS
    8. **CW-ABRA-11-2023 / CLUSTER 08** – CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS
    9. **CW-ABRA-12-2023 / ABRA RIS**
    10. **CW-ABRA-13-2023 / ABRA RIS**
    11. **CW-ABRA-14-2023 / ABRA RIS**
    12. **NCG-CAR-OE-02-2023** / SUPPLY, DELIVERY AND INSTALLATION OF CUBICLES AND FURNITURES FOR USE OF ABRA SATELLITE OFFICE

10. If at the time of post-qualification procedure, the BAC verifies that any of the deficiencies is due to the contractor's fault or negligence pursuant to 34.3 (b)(ii) of the RA 9184 and its 2016 Revised Implementing Rules and Regulations, the Procuring Entity shall disqualify the contractor from the award without any right to reimburse fees and incidental cost paid for the procurement of infrastructure contract subject of the bid.

11. The *National Irrigation Administration-Cordillera Administrative Region (NIA-CAR)* 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.

12. For further information, please refer to:

BAC Secretariat
NIA-CAR, Wangal, La Trinidad, Benguet
Tel (074) 422-2435
Email: niacarbac@gmail.com

13. You may visit the following websites:
For downloading of Bidding Documents: *PhilGEPS Website and NIA-CAR Website*

March 6, 2023

FRANK F. FANGED, Ph.D.
Vice Chairperson
Bids and Awards Committee

Section II. Instructions to Bidders

1. Scope of Bid

The Procuring Entity, *National Irrigation Administration-Cordillera Administrative Region (NIA-CAR)* invites Bids for the ***CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS***, with Project Identification Number ***CW-ABRA-10-2023/CLUSTER 07.***

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

2. Funding Information

2.1. The GOP through *General Appropriation Act 2023 under* ***SIP*** in the amount of *Twelve Million Five Hundred Thousand Pesos (Php 12,500,000.00).*

2.2. The source of funding is:

a. GOCC and GFIs, the proposed Corporate Operating Budget.

3. Bidding Requirements

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

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

The Bidder, by the act of submitting its Bid, shall be deemed to have inspected the site, determined the general characteristics of the contracted Works and the conditions for this Project, such as the location and the nature of the work; (b) climatic conditions; (c) transportation facilities; (c) nature and condition of the terrain, geological conditions at the site communication facilities, requirements, location and availability of construction aggregates and other materials, labor, water, electric power and access roads; and (d) other factors that may affect the cost, duration and execution or implementation of the contract, project, or work and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

4. Corrupt, Fraudulent, Collusive, Coercive, and Obstructive Practices

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

5. Eligible Bidders

5.1. Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.

5.2. The Bidder must have an experience of having completed a Single Largest Completed Contract (SLCC) that is similar to this Project, equivalent to at least

fifty percent (50%) of the ABC adjusted, if necessary, by the Bidder to current prices using the PSA's CPI, except under conditions provided for in Section 23.4.2.4 of the 2016 revised IRR of RA No. 9184.

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

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

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

6. Origin of Associated Goods

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

7. Subcontracts

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

The Procuring Entity has prescribed that:

a. Subcontracting is not allowed.

8. Pre-Bid Conference

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

9. Clarification and Amendment of Bidding Documents

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

10. Documents Comprising the Bid: Eligibility and Technical Components

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

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

10.3. A valid PCAB License is required, and in case of joint ventures, a valid special PCAB License, and registration for the type and cost of the contract for this Project. Any additional type of Contractor license or permit shall be indicated in the **BDS**.

10.4. A List of Contractor's key personnel (e.g., Project Manager, Project Engineers, Materials Engineers, and Foremen) assigned to the contract to be bid, with their complete qualification and experience data shall be provided. These key personnel must meet the required minimum years of experience set in the **BDS**.

10.5. A List of Contractor's major equipment units, which are owned, leased, and/or under purchase agreements, supported by proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the project, as the case may be, must meet the minimum requirements for the contract set in the **BDS**.

11. Documents Comprising the Bid: Financial Component

11.1. The second bid envelope shall contain the financial documents for the Bid as specified in **Section IX. Checklist of Technical and Financial Documents**.

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

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

12. Alternative Bids

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

13. Bid Prices

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

14. Bid and Payment Currencies

14.1. Bid prices may be quoted in the local currency or tradeable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.

14.2. Payment of the contract price shall be made in:

a. Philippine Pesos.

15. Bid Security

15.1. The Bidder shall submit a Bid Securing Declaration or any form of Bid Security in the amount indicated in the **BDS**, which shall be not less than the percentage of the

ABC in accordance with the schedule in the **BDS**.

15.2. The Bid and bid security shall be valid until ***July 24, 2023***. 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 15 shall be submitted for each contract (lot) separately.

19.3. In all cases, the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184 must be sufficient for the total of the ABCs for all the lots participated in by the prospective Bidder.

20. Post Qualification

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

21. Signing of the Contract

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

Section III. Bid Data Sheet

Bid Data Sheet

<table>
<tr><th>ITB Clause</th><th></th></tr>
<tr><td>5.1</td><td>For this purpose, only bids of bidders with valid Certificate of Well Driller Registration issued by National Water Resources Board (NWRB) will be evaluated.</td></tr>
<tr><td>5.2</td><td>For this purpose, contracts similar to the Project refer to contracts which have the same major categories of work, which shall be:
Diversion Works, Protection Works, Canalization Works, Canal Structure Works, Well Drilling Works.</td></tr>
<tr><td>7.1</td><td>Sub-contracting is not allowed.</td></tr>
<tr><td>10.3</td><td>Not Applicable.</td></tr>
<tr><td>10.4</td><td>The key personnel must meet the required minimum years of experience set below:
<table>
<tr><th>Key Personnel</th><th>General Experience</th><th>Relevant Experience</th></tr>
<tr><td>Project Engineer</td><td>A licensed Civil Engineer with at least one (1) year experience as Project Engineer</td><td>--do--</td></tr>
<tr><td>Mechanical Engineer</td><td>With at least one (1) year experience on General Building/ Engineering</td><td>--do--</td></tr>
<tr><td>Electrical Engineer</td><td>With at least one (1) year experience on General Building/ Engineering</td><td>--do--</td></tr>
<tr><td>Material Engineer</td><td>With at least one (1) year experience as Materials Engineer duly accredited by the DPWH</td><td>--do--</td></tr>
<tr><td>Foreman</td><td>With at least one (1) year experience as Foreman</td><td>--do--</td></tr>
<tr><td>Safety Officer</td><td>Undergone Construction Safety and Health Training</td><td>--do--</td></tr>
</table></td></tr>
<tr><td>10.5</td><td>The minimum major equipment requirements are the following:
<table>
<tr><th colspan="2">Equipment</th><th>Capacity</th><th>Number of Units</th></tr>
<tr><td>1.</td><td>Dump Truck</td><td>3 cu.m</td><td>7</td></tr>
<tr><td>2.</td><td>Butt Fusion with Generator Set</td><td></td><td>1</td></tr>
<tr><td>3.</td><td>Rotary Drilling Rig</td><td></td><td>1</td></tr>
</table></td></tr>
<tr><td>12</td><td>Not applicable.</td></tr>
</table>

15.1	The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts: a. The amount of not less than *Php 224,320.20,* if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit; b. The amount of not less than *Php 560,800.51,* if bid security is in Surety Bond.
19.2	Partial bids are not allowed.
20	*Not applicable.*
21	Additional contract documents relevant to the Project that are required by existing laws and/or the Procuring Entity are: 1. Construction Schedule, PERT-CPM and S- curve, 2. Manpower Schedule, 3. Construction Methods, 4. Equipment Utilization Schedule, 5. Construction Safety and Health Program approved by the DOLE

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	*Not Applicable*
3.1	*Full*
6	The site investigation reports are: *none required*
7.2	*In case of permanent structures, such as buildings of types 4 and 5 as classified under the National Building Code of the Philippines and other structures made of steel, iron, or concrete which comply with relevant structural codes (e.g., DPWH Standard Specifications), such as, but not limited to, steel/concrete bridges, flyovers, aircraft movement areas, ports, dams, tunnels, filtration and treatment plants, sewerage systems, power plants, transmission and communication towers, railway system, and other similar permanent structures:* Fifteen (15) years. *In case of semi-permanent structures, such as buildings of types 1, 2, and 3 as classified under the National Building Code of the Philippines, concrete/asphalt roads, concrete river control, drainage, irrigation lined canals, river landing, deep wells, rock causeway, pedestrian overpass, and other similar semi-permanent structures:* Five (5) years. *In case of other structures, such as Bailey and wooden bridges, shallow wells, spring developments, and other similar structures:* Two (2) years.
10	No dayworks are applicable to the contract.
11.1	The Contractor shall submit the Program of Work to the Procuring Entity's Representative within *10* days of delivery of the Notice of Award.
11.2	The amount to be withheld for late submission of an updated Program of Work is Php 10,000.00.
13	The amount of the advance payment is 15% of the Contract Price and to be recouped every progress billing, to be made as per herein schedule: For Contract Price above Php 10,000,000.00: a. First (1st) Installment – 7.5% of the Contract Price – upon submission to and acceptance by NIA of an Irrevocable Standby Letter of Credit of equivalent value issued by a commercial bank, a bank guarantee or surety bond, callable upon demand, issued by a surety or insurance company duly accredited by the Insurance Commission and confirmed by NIA. b. Second (2nd) Installment – 7.5% of the Contract Price – upon submission to and acceptance by NIA of an Irrevocable Standby Letter of Credit of equivalent value issued by a commercial bank, a bank guarantee or surety bond, callable upon demand, issued by a surety or insurance company duly accredited by the Insurance Commission and confirmed by NIA (if amount is not included in the first Installment), and after Contractor has fully mobilized the initial equipment requirement and Key Personnel indicated in its Manpower Utilization Schedule and as specified in the Bid Documents. For Contract Price Php 10,000,000.00 and below: a. Full 15% of the Contract Price – upon submission to and acceptance by NIA of an Irrevocable Standby Letter of Credit of equivalent value issued by a commercial bank, a bank guarantee or surety bond, callable upon demand, issued by a surety or insurance company duly accredited by the Insurance Commission and confirmed by NIA and after Contractor has fully mobilized the initial equipment requirement and Key Personnel indicated in its Manpower Utilization Schedule and as specified in the Bid Documents.

	Advance payment shall be made within 60 calendar days from receipt of Notice to Proceed (NTP).
14	*Materials and equipment delivered on the site but not completely put in place shall not be included in the payment.*
15.1	*Not Applicable.*
	Not Applicable.
15.2	*Not Applicable.*

Section VI. Specifications

The technical specifications shall conform to the Philippine NIA STANDARD SPECIFICATION

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

TS-101 SCOPE

(a) Temporary Works

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

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

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

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

3) Workshops, warehouses, site offices, stockpile areas, storage areas from materials, equipment, spare parts, fuel and oil.

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

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

(b) Mobilization of Equipment

The Contractor shall mobilize and move into the Project Site within 20 calendar days after receipt of Notice to Proceed the required initial equipment requirement.

Notwithstanding the mobilization of the initial equipment requirements, the Contractor shall mobilize to the site the additional equipment requirement within 20 calendar days upon receipt of the approved Equipment Moving-in and Utilization Schedule.

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

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

(c) Demobilization

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

TS-102 BASIS OF PAYMENT

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

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

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

3. Twenty percent (20%) of the lump sum will be paid upon completion of the Contractor's temporary works.

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

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

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

SECTION XXXVII
HIGH DENSITY POLYETHYLENE PIPES

TS 3701 SCOPE

The work under this Section shall include furnishing or manufacture and delivery of the High Density Poly-Ethylene (HDPE) Pipes, laying or installation including jointing thru mechanical couplers or butt fusion of the HDPE Pipes as shown on the Drawings. All HDPE Pipes, Mechanical Couplers and other accessories for its installation shall be furnished by the Contractor.

TS 3702 MATERIALS

All materials and accessories used in the manufacture of the HDPE Pipe materials and other accessories shall conform to the latest applicable standards and specifications on High Density Poly-Ethylene pipes materials issued by the American Society for Testing Materials (ASTM), and other official bodies and institutions that issues standards or specifications.

TS 3703 MANUFACTURE OF HDPE PIPES

The Contractor thru manufacturer/supplier shall fabricate HDPE Pipes in accordance

with these Specifications.

1. **PIPE DIAMETER**

Pipe diameters stated in the bill of quantities shall be the nominal size of the pipe. Corresponding Nominal Outside Diameter shall be in accordance with the following table:

NOMINAL SIZE (inch)	NOMINAL OUTSIDE DIAMETER (mm)
3/8”	16
1/2”	20
3/4”	25
1”	32
1 – 1/4”	40
1 – 1/2”	50
2”	63
2 – 1/2”	75
3”	90
4”	110
NOMINAL SIZE (inch)	NOMINAL OUTSIDE DIAMETER (mm)
6”	160
8”	225
10”	280
12”	315
14”	355
16”	400
18”	450

2. **HYDROSTATIC DESIGN STRESS**

Hydrostatic Design Stress is the estimated maximum tensile stress in the wall of the pipe in circumferential orientation due to internal hydrostatic water pressure that can be applied continuously with a high degree of certainty that failure of the pipe will not occur.

The **Hydrostatic Design Stress** to be considered in the manufacture of the pipe shall be a **minimum of 5515 Kilopascals (KPa) or 5.5 Megapascal (MPa)**. Certifications from accredited materials testing institutions that such value of hydrostatic design stress was used by the manufacturer in the manufacture of the subject pipes being ordered shall be submitted by the contractor to NIA and will be included as a basis in the acceptance of pipes delivered.

3. **STANDARD DIMENSION RATIO (SDR)**

Standard Dimension Ratio (SDR) is the ratio of the pipe diameter to its wall thickness. It is calculated by dividing the average outside diameter of the pipe by the minimum wall thickness. If the wall thickness calculated by this formula is less than 0.062 in. (1.6mm), it shall be arbitrarily increased to 0.062 in. The SDR values shall be rounded to the nearest 0.05. The SDR value shall be provided by the NIA as indicated in the Bill of Quantities.

The equation of the Standard Dimension Ratio:

$$SDR = \frac{OD}{t}$$

Where :

SDR = Standard Dimension Ratio
OD = Nominal Outside Diameter
t = Minimum Wall Thickness

4. **PRESSURE RATING / WORKING PRESSURE**

Pressure Rating or Working pressure is the estimated maximum pressure that the water in the pipe can exert continuously with a high degree of certainty that failure will not occur.

Pressure Rating or Working pressure, in relation to SDR value and Hydrostatic Design stress as provided above shall be in accordance to the following table:

Standard Dimension Ratio (SDR)	**Pressure Rating/Working Pressure (KPa)**
9	**1380**
11	**1100**
13.5	**880**
17	**690**
24	**480**
30	**380**

Considering flexibility of HDPE pipes, SDR 30 shall only be applied to bigger sizes from 4" Ø and above.

5. **RELATION BETWEEN SDR, HYDROSTATIC DESIGN STRESS AND PRESSURE RATING**

The expression, commonly known as the ISO equation, is used to relate these three items:

$$P = \frac{2S}{SDR - 1}$$

Where:

P = Pressure Rating or Working Pressure
S = Hydrostatic Design Stress, 5515 KPa
SDR = Standard Dimension Ratio

Using the ISO equation and given the SDR value and nominal size of the pipe to be ordered as stated in the Bill of Quantities, the manufacturer will be able to determine the required minimum wall thickness of the pipe. Such result shall be the basis in the manufacture of the pipe being ordered.

The inner wall of the pipe shall be generally smooth to minimize roughness coefficients or friction factors for conveyance losses and to minimize abrasion resistance on sediment loads. Likewise, the outer wall shall be generally smooth to minimize buckling induced by external loads.

The pipe product shall be marked at every meter indicating brand name/manufacturer, project name, nominal size, length, thickness and resin used including Standard Dimension Ratio (SDR) number.

Considering that some pipes will be installed above grounds, the manufacturer/supplier shall ensure that the product is resistant to weathering factors such as temperature changes and ultraviolet radiations. Thus, pipes are to be manufactured with a minimum of 2% concentration of finely divided and evenly dispersed carbon black

material to ensure the protection from the harmful effects of UV radiations. Certifications from accredited materials testing institutions that the pipe products contains at least minimum of 2% carbon black shall be submitted by the contractor to NIA and will be included as a basis in the acceptance of pipes delivered.

TS-3704 INSPECTION, SAMPLING AND TESTING

HDPE Pipes purchased by Contractor shall be sampled for testing after delivery to Contractor's Stockyard.

Samples for tests, not more than three pieces shall be taken at random among the HDPE Pipes in a lot. A lot shall consist of 50 pieces of the same size delivered at a time to Contractor's stockyard.

The lot represented by the samples tested which failed to meet the specified requirements shall be rejected and Contractor shall immediately remove from the stockyard the HDPE Pipes comprising the lot.

The Cost for sampling and testing shall be at the expense of the Contractor. HDPE Pipes with injurious defects revealed subsequent to acceptance of HDPE Pipes at Contractor's stockyard shall be rejected.

TS 3705 REJECTION

HDPE Pipes shall be subject to rejection on account of failure to meet any of the specification requirements. Individual sections of the HDPE Pipes may be rejected due to the following:

1.Fractures or cracks passing through the wall.
2. Defects that indicate imperfect proportioning, making and molding.
3. Damaged ends, where such damage would prevent making a satisfactory joint.

TS 3706 MARKING

The following information shall be clearly marked on each section of HDPE Pipes delivered:

1. HDPE Pipes diameter.
2. Date manufactured.

TS 3707 TRANSPORTATION AND DELIVERY

Contractor shall load and transport the HDPE Pipes to the installation site in a manner as to avoid damage to pipes. Any HDPE Pipe damaged during loading from Contractor's stockyard site, or when in transit to the delivery site, or during unloading, or during installation will be rejected.

TS 3708 EXCAVATION

Excavation for HDPE Pipes shall be performed in accordance with Section VI, Structure Excavation. Notwithstanding the provisions of Section VI, where rock or other unyielding materials will be encountered, the rock or unyielding materials shall be similarly removed to a depth not less than 15 cm. below the established grade and shall be refilled with suitable materials thoroughly compacted throughout.

TS 3708 LAYING OR INSTALLATION OF HDPE PIPES

The HDPE Pipes shall be laid carefully, ends fully and closely jointed. Each pipe section shall be securely attached to the adjoining sections. Any pipe which is not in true alignment or which shows any undue settlement after being laid, or is damaged shall be removed and relaid or replaced without extra compensation.

TS 3709 BACKFILLING

After the HDPE Pipes have been installed and butt fusion or mechanical coupler sufficiently set, selected materials from excavation or borrow shall be placed alongside the pipes in layer not exceeding 15 centimeters in thickness and compacted thoroughly. The backfilling of pipes shall be done simultaneously at both sides and shall conform with the provisions prescribed in Section XII, Structure Backfill. When the construction calls for placing high embankment over the pipes, special instruction regarding the method of backfilling shall be given by the Engineer.

TS 3710 METHOD OF MEASUREMENT

HDPE Pipes of the various sizes specified in the Bill of Quantities will be measured by the number of pieces or by number of linear meter of pipe as specified in the Bill of Quantities furnished and acceptably installed, jointed and provided with mechanical coupler.

TS 3711 BASIS OF PAYMENT

The HDPE pipes measured as provided above will be paid at the contract unit price per linear meter of the respective sizes of HDPE Pipes, which price and payment shall constitute full compensation for furnishing all materials, labor, tools, equipment, supplies and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section.

The cost of Mechanical Coupler will be paid at the contract unit price per piece.

Excavation and backfilling works are not considered subsidiary works under this Section, hence, payments shall be made under “Structure Excavation” and “Structure Backfill”, respectively, in the Bill Of Quantities.

SECTION VI

STRUCTURE EXCAVATION

TS-601 SCOPE

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

TS-602 CLASSIFICATION

Structure excavation shall be classified in accordance with Section IV, Paragraph 402.

TS-603 CONSTRUCTION REQUIREMENTS

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

TS-604 METHOD OF CONSTRUCTION

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

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

On excavation of common materials the foundation bed upon which structures are to be placed shall be finished accurately to the established lines and grades after a thorough compaction and trimming of the foundation with the use of suitable tools and equipment. As soon as the foundation excavations have been trimmed to their final level, it should be protected from degradation by weathering. Should the foundation material soften through exposure then the soft material shall be removed and replaced at the Contractor's expense. If at any point, material is excavated beyond the lines and grades of any part of the structure, the over-excavation shall be filled with selected materials approved by the Engineer and shall be placed in layers of not more than 20 centimeters thick, moistened and thoroughly compacted by special roller, mechanical tampers or by other approved methods. A density not less than 90% of the maximum dry density determined by ASTM test D 698 is required. The cost of filling over-excavation ordered by the Engineer shall be borne by the Contractor.

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

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

When excavation of rock materials reaches the surface upon or against which concrete is to be placed, blasting shall be stopped and the remaining mass of rock shall be carefully removed by means of jack hammer or any appropriate hand tool. The point beyond which blasting will not be allowed shall be determined by the Engineer. All damages to the rock foundation caused by improper blasting operation shall be repaired by the Contractor at his own expense in a manner acceptable to the Engineer.

All foundations for bridge pier footings shall be excavated to such depth as may be necessary to secure stable bearing for the structure. Whenever the safe bearing power of the soil as uncovered is less than that called for on the Drawings, piling or appropriate spread footings will be used. The elevations of the bottoms of footings, as shown on the Drawings shall be considered as approximate, and the Engineer may order, in writing, such changes in elevations and dimensions of footings as may be necessary to ensure a satisfactory foundation. Bearing tests, upon written order of the Engineer, shall be taken to determine the supporting power of the soil. Cost of bearing test will be paid as "Extra Work".

If, in the opinion of the Engineer, the material at the base of the excavation is unsuitable for foundation he shall instruct the Contractor to either a) Carry out additional excavation to a depth of 50 cm. below the proposed bottom of concrete shown on the Drawings and to maximum depth of 60 cm. outside of the outermost lines of said base and replace with backfill compacted to at least 90% of the maximum dry density or b) strengthen the soft material by ramming in gravel and cobbles until a firm foundation is obtained. Measurement and payment for the backfill shall be made under Section XII, "Structure Backfill".

TS-605 METHOD OF MEASUREMENT

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

TS-606 BASIS OF PAYMENT

The volume measured as provided above will be paid per cubic meter, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, equipment, tools and incidentals and subsidiary works necessary to complete the work described under this Section.

For diversion works, canal siphons and bridge structure excavations, the cost of dewatering operation unless otherwise specified in the Bill of Quantities shall be paid under a separate item in the Bill of Quantities. For all other structure excavations, dewatering operations involved are considered subsidiary works and the cost thereof shall be considered included in the unit price of structure excavation.

The Contractor shall be paid sixty percent (60%) of the pay quantities of the actual excavation acceptably accomplished in accordance with the pay lines a shown on the Drawings or as directed by the Engineer. The remaining forty percent (40%) will be paid upon pouring of concrete for the foundation or upon placing of riprap, gravel blanket or grouted riprap in accordance with the Drawings and Specifications.

SECTION XV
C O N C R E T E

TS-1501 GENERAL

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

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

TS-1502 CONCRETE COMPOSITION

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

TS-1503 CEMENT

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

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

(c) Payment. Payment for cement shall be considered included in the contract unit price f **TS-1504 ADMIXTURES**

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

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

1. Air entraining agent

2. Water reducing admixtures

3. Water reducing and retarding admixtures

4. Water reducing and accelerating admixtures

Admixtures shall be furnished in a powder or liquid form. If furnished in a solution it shall contain at least 50% solids and a mold inhibitor. The admixture effect on the properties of Portland cement concrete mixtures must meet the requirements of ASTM C-494.
or the various items for concrete in the Bill of Quantities for which cement is used.

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

Air Entraining Agent. Concrete produced with water reducing agents shall contain

four to six percent of entrained air by volume. The air entraining agent shall conform to the requirements of ASTM: C260, and shall be tested in accordance with ASTM: C233. The total circulated air content of the concrete as discharged from the mixer shall be as follows:

Coarse Aggregate Maximum Size	Total Air-Percent by Volume of Concrete
2 cm	5 ± 1
3.8 cm	4 ± 1

The agent in solution shall be maintained at uniform strength and shall be added to the batch in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement. When a retarder dispensing agent is used in the concrete, the portion of the mixing water containing the air-entraining agent shall be introduced separately into the mixer.

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

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

Lignosulfonic Type - 0.27 to 0.37 percent of solid crystalline ligning, by weight, of cement.

Hyroxylated Carboxylic Acid Type - 0.25 to 0.50 percent of liquid, by weight Of cement

Water Reducing and Accelerating Admixture. The ASTM Designation for this admixture is Type E. Water reducing and accelerating admixture may be used by the Contractor for speeding up precasting and post-tensioning operations for precast and pre-stressed beams, girders, slabs and bearing pads, if approved.

TS-1505 WATER

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

TS-1506 FINE AGGREGATES

(a) General

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

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

(b) Quality

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

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

Sieve Designation US Standard Square M e s h	Percent by Weight Passing Individual S i z e s
3/8" (9.50 mm)	100
No. 4 (4.75 mm)	95 - 100
No. 8 (2.36 mm)	85 - 95
No. 16 (1.18 mm)	60 - 85
No. 30 (600 um)	25 - 60
No. 50 (300 um)	10 - 30
No. 100 (150 um)	2 - 10
No. 200	0 - 5

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

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

3. Deleterious Substances. The maximum percentages of deleterious substance in the fine aggregates as delivered to the mixer shall not exceed the following values.

	Percent by Weight
Materials passing No. 200 Screen (Designation 16)*	3
Shale (Designation 17)	1
Clay (Designation13)	1
Total of the other deleterious substance	2

(such as alkali, mica, soft flaky particles and loam)	

*The designation in parenthesis refers to methods of testing described in the seventh (7^{th}) edition of the US Bureau of Reclamation Concrete Manual and ASTM.

The sum of the percentages of all deleterious substances shall not exceed 5% by weight. Fine aggregates procuring a color darker than the standard in the kilometric test for organic impurity (USBR Designation. 14 or ASTM C-40) may be rejected. Fine aggregate having specific gravity (USBR Designation. 9 or ASTM C-128 saturated surface dry basis) of less than 2.60 may be rejected. The fine aggregate may be rejected if the portion retained on No. 50 (300 um) screen, when subjected to five cycles of sodium sulfate test for soundness (USBR Designation. 19 or ASTM C – 88) shows as average loss of more than 18 % by weight. Fine aggregates delivered to the batch for any one sample or more than 0.10% for an average of at least 9 out of 10 consecutive test samples of finished sand, when sample is taken hourly. The percent soluble sulfate in fine aggregates shall be determined in accordance with the method of test prescribed in subparagraph 4. below.

4. Sampling. Sampling of fine and coarse aggregates shall be done in accordance with the appropriate requirements of Section 12, of ASTM C-33, The source from which fine and coarse aggregates is to be obtained shall be selected well in advance if the time when the materials will be required in the work. Unless otherwise specified, all test samples shall be taken under the supervision of the Engineer in sufficient time as approved to permit adequate testing and examination of results sufficiently in advance of the time for use in concrete. Routine control test and analysis of the fine and coarse aggregates at various stages in the processing operation as containing approval of all materials from the source and the Contractor will be held responsible for the specified quality of all such materials used in the work.

(c). Storage

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

(d). Measurement and Payment

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

TS-1507 COARSE AGGREGATES

(a). General

The term “Coarse Aggregate” is used to designate aggregate of such sizes as to fall within the range of 3/16 inch to inches (0.5 cm. To 7.5 cm) or any size or range of sizes with in such limits. The coarse aggregates shall be reasonably well graded within the nominal size range hereinafter specified. Coarse aggregate for concrete shall be furnished by the Contractor and shall consists of crushed rock or mixture of natural gravel and crushed rock as provided in Paragraph TS - 608. Coarse aggregate, as delivered to the batching plant shall have a uniform and stable moisture content. Any rewashing found necessary to provide clean aggregates shall be done prior to finish

screening. Rewashing shall not be performed in finish screens.
(b). Quality

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

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

Sieve Sizes US Std. Sq. Mesh	Percent by Weight ½"Size ¾"Size 12.5mm 18mm	Passing Individual 1-1/2"size 2"Size 37.5 mm 50 mm	Size 3" Size 75 mm
6" (150 mm)	- -	- -	-
3" (75 mm)		- -	100
2 ½" (63 mm)	- -	- 100	90 – 100
2" (50 mm)	- -	100 95-100	35 - 70
1 ½" (37.5 mm)	- -	90– 100 -	0 - 15
1" (25 mm)		20 - 55 35-70	0 - 5
¾" (19 mm)	- -	0 - 15 -	-
½" (12.5 mm)	- 100	- 10-30	-
3/8" (9.5 mm)	100 90-100	0 – 5 -	-
No. 4 (4.75 mm)	90-100 -	- 0-5	
	40-70 20-55		
	0-15- 0-10		

Coarse aggregates shall contain not more than one and one half (1 ½) percent of materials passing the No. 200 sieve by meshing, nor more than 5 percent of soft fragments.
It shall have an abrasion loss of not more than 45 percent at 500 revolutions.
Unless otherwise directed, the maximum sizes of aggregates to be used in concrete for the various parts of the work shall be in accordance with the following :

General Use	Maximum Aggregate Diameter
Lean Concrete to control water intrusion and Other miscellaneous uses	1 ½" (37.5 mm)
Concrete for Footings, Walls, Slabs, Beams, 0.22 to 0.75 meters thick	1 ½" (37.5 mm)
Concrete for thin Walls, Slabs, Beams, less than 0.22 meters thick	¾" (19 mm)
Concrete for reinforced concrete pipes	½" (12.5 mm)

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

2. Particle Shape - The particle shape of the crushed coarse aggregate shall be generally spherical or cubical and reasonably free from flat or elongated particles. A flat or elongated particle is defined as a particle having a maximum dimension in excess of five times the minimum dimensions. Rocks which breaks down into such shape will not be approved for the

production of aggregates.

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

	Percent By Weight
Material Passing No. 200 (Screen Designation 16)*	½
Shale (Designation 18)	1
Clay Lumps (Designation 13)	½
Other deleterious substance	1

*The designations in parenthesis refers to methods of Testing described in the seventh edition of the U. S. Bureau of Reclamation Concrete Manual and ASTM.

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

1) Petrographic Examination - If more than 10% of poor aggregate particles can be identified in physical quality test and in case 20% of the particles would be classified with respect to the chemical quality (USRB Desig. 7 or ASTM C-295).
2) Sodium-Sulfate test for soundness (USBR Desig. 9 or ASTM C-88). If the weighted average loss, after 5 cycles is more than 10% by weight.

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

4) Sampling - All sampling of coarse aggregates shall be in accordance with Paragraph TS - 1509.

(c) Storage

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

(d) Measurement and Payment

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

TS-1508 PRODUCTION OF FINE AND COARSE AGGREGATES

(a) Source of Aggregates

Fine and coarse aggregates for concrete, and file aggregate for mortar and grout may be obtained by the Contractor from any approved source. Approval of all materials taken from the deposit,

and the Contractor shall maintain the specified quality of all such materials used in concrete works. If the aggregates are to be obtained from deposits or quarry sources not previously tested and approved by NIA, Contractor shall submit, for preliminary test and approval, a representative, 90 kgs. (approximately 200 lbs.) sample of the fine aggregate and of the 3/16 inch (0.5cm.) to ¾ inch (2 cm) size of coarse aggregate and of the and a 45 kgs. (approximately 100 lbs) sample of each of the other sizes of coarse aggregate proposed for use in the work, at least 90 days before the materials are required for use.

(b). Developing Aggregate Deposit

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

(c). Processing Raw Materials

The Contractor shall employ processing equipment which ensure well-shaped particle in all aggregate sizes and a minimum of particle which are flat or elongated. Processing of raw materials shall include screening, washing, and blending if necessary to produce fine and coarse aggregate meeting the requirements of Paragraphs TS - 605 and TS -607. Processing of aggregates produced from any sources shall be done at an approved site. Water used for washing aggregates shall conform to Paragraph 1305. To utilize the greatest practicable yield of suitable materials in the portion of the deposit being worked, the Contractor may crush oversize material and any excess materials of the size of coarse aggregate to be furnished, until the required quantity of each size has been secured, provided, that the crushed aggregates shall be blended uniformly with the uncrushed aggregates. Crushing and blending operations shall at all times be subject to approval by the Engineer.

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

(d). Moisture Control

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

TS-1509 AGGREGATE SAMPLING AND TESTING

Sampling of the aggregate materials approved for use in the work, shall be done by NIA in accordance with ASTM Sampling Method at 10 days in advance of the time when placing of concrete is expected to begin. Aggregate studies and tests will be made by NIA at its own

expense. It shall be the responsibility of the Contractor to designate the source(s) of aggregate early enough to give NIA sufficient time to obtain the necessary samples and subject them to tests.
The samples of aggregates shall be obtained and tested in accordance with the following ASTM standard methods :

	Concrete
Sampling aggregate	- D 75
Sieve Analysis	- C 136
Amount of material finer than 200 sieve	- C 117
Organic impurities	- C 40
Mortar Strength	- C 87
Soundness	- C 88
Soft Particles	- C 235
Abrasion Clay lumps	- C 131
	- C 142

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

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

TS-1510 CLASSIFICATION AND PROPORTIONING OF CONCRETE MIXTURES

(a) Classification and Design Mixtures

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

Class	Size of Maximum Dia. of Aggregate	Minimum Comprehensive Strength	Designated Size of Aggregate
Y	½" (12.5 mm)	3,000 psi	12.5mm to 4.75mm
AA	¾" (19 mm)	3,000 psi	19 mm to 4.75 mm
A	1½" (37.5mm)	3,000 psi	37.5mm to 4.75mm
B	2" (50 mm)	2,400 psi	50 mm to 4.75 mm
C	3" (75 mm)	2,400 psi	75 mm to 4.75 mm
Z	3" (75 mm)	3,000 psi	75 mm to 4.75 mm

(b) Cement Content

The minimum cement content per cubic Meter of concrete for the different classes or gradation of aggregates shall be in accordance with the following:

(c) Aggregate Content

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

Class and Gradation of Aggregates	Minimum Cement Content
X with 3/4" (19.0 mm)	375 kgs./cu.m
Y with ½" (12.5 mm)	350 kgs./cu.m
AA with ¾" (19.0 mm)	325 kgs./cu.m.
A with 1-1/2" (37.5 mm)	300 kgs./cu.m.
B with 2" (50.0 mm)	250 kgs./cu.m
C with 3" (75.0 mm)	225 kgs./cu.m.
Z with 3" (75.0 mm)	200 kgs./cu.m.
Blinding Conc. 1-1/2" (37.5 mm)	150 kgs,/cu.m.

(d) Consistency

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

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

The slump of the concrete at the time of placing shall not exceed 5 centimeters (2 inches) in heavy concrete sections and at top of walls, piers and parapets, 10 centimeters (4 inches) for pumped or air placed concrete, and 7.5 centimeters (3 inches) for concrete elsewhere.

The NIA reserves the right to require a lesser slump whenever concrete of lesser slump can be consolidated readily into place by means of the vibration specified in Paragraph TS - 1514.

(e) Notwithstanding the approval by NIA of the design mixtures and the above specified minimum cement content for different classes or gradation of aggregates, the Contractor shall be responsible that all the concrete meet the desired strength

TS 1511 MEASUREMENT OF MATERIALS

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

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

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

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

TS-1512 MIXING CONCRETE

(a) General

Concrete shall be machine mixed. Hand mixing shall be allowed only in cases of emergency when there is machine breakdown or malfunction, and in the construction of small structures where the total volume of concrete is less than 2 cubic meters. A written consent of the Engineer must be secured by the Contractor in both cases.

(b) Mixing at Site

Concrete shall be thoroughly mixed in a batch mixer of an approved capacity and type which will ensure a uniform and homogeneous mixing of the concrete materials.
The minimum mixing time for each batch, after all materials and water are introduced into the mixer, shall be as follows:

Capacity of Mixer	Mixing time
0.40 cu.m. or smaller	1-1/2 minutes
0.60 to 1.20 cu.m.	1-1/2 minutes
1.50 to 2.30 cu.m.	2 Minutes
3 cu.m.	2-1/2 minutes

Over mixing, requiring the introduction of additional water to preserve the required consistency, will not be permitted. Over mixed concrete shall be wasted.

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

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

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

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

Truck mixers and truck agitators shall be operated within a capacity not to exceed 63 or 80 percent, respectively of the gross volume of the drum and at a speed of rotation for mixing or agitating as designated by the manufacturer of the equipment. A truck mixer or truck agitator used for transporting concrete that has been completely mixed in a stationary mixer shall be operated within the limits of capacity and speed of rotation designated by the manufacturer for

agitating, except that the agitator capacity shall in no event exceed 80 % of gross drum volume.

When a stationary mixer is used for the complete mixing of the concrete, the mixing time for mixtures having capacity of 10 cubic yards ($7.6M^3$)or less shall not be less than 60 seconds. For mixers of more than 10 cubic yards ($7.6M^3$) capacity, the mixing time shall be determined by the Engineer. The time is valid provided mixer efficiency tests prove the concrete is satisfactory for uniformity and strength. Mixing time shall be measured from the time all cement and aggregates are in the *drum. The batch shall be so charged into the mixer that some water will enter in advance of cement and aggregates, and all water shall be in the drum by the end of the first on-fourth of the specified mixing time.*

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

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

When a truck mixer or truck agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within one (1) hour after the addition of the cement to the aggregates. Each batch of concrete delivered to the job site shall be accompanied by a time slip issued at the batching plant, bearing the time of charging of the mixer drum with cement and aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 30°C (85°F) or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. When a truck mixer is used for the complete mixing of the concrete, the mixing operation shall begin within 30 minutes after the cement has been added to the aggregates.

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

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

When non-agitating equipment is used for transportation of concrete the following requirement shall apply:

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

- The concrete shall be delivered to the site of the work in a thoroughly mixed and uniform mass and discharged with a satisfactory degree of uniformity. Slump tests of representative samples taken during the discharge shall not differ by more than 2 inches (50.8 mm). Discharge shall be completed within 30 minute after introduction of the mixing water to the cement and aggregates.

Concrete delivered in outdoor temperatures lower than 5°C (40°F) shall arrive at the work having

a temperature not less than 15.6°C (60°F) nor greater than 32.2°C (90°F).

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

TS 1513 RE-TEMPERING

Concrete, mortar and grout mixer which have developed initial set shall not used. Concrete, mortar and grout which, have partially hardened shall not be re-tempered or re-mixed.

TS-1514 SAMPLING AND TESTING OF CONCRETE

The Contractor shall provide the required samples of Concrete to be furnished by the Contractor without cost to NIA. Sampling will, in all cases be performed by or under the direct supervision of the Engineer and the Contractor shall provide without cost to NIA all available tools and labors as may be required. Concrete sampling shall be carried on during concrete operations at the rate of one standard sample for each 75 cubic meters of concrete of fraction thereof placed during each continuous placing operations but in no case shall there be less than one sample for each day concreting. Each standard sample shall consist of three (3) standard cylinders 6 – inch diameter by 12 inch high. The Contractor shall keep a record of the samples and the portion of the structures and volume represented which shall be available to NIA on demand.

Sampling shall conform to ASTM Designation C-172, preparation, storage, and curing to ASTM Designation C-31 and testing to ASTM Designation C-39. NIA shall have the sample tested by an approved testing laboratory at the expense of the Contractor.

TS-1514 CONVEYING AND PLACING CONCRETE

(a) General

Approval of the Engineer shall be obtained before starting any concrete pour. Concrete placement will not be permitted when, in the opinion of the Engineer, Conditions prevent proper placement and consolidation. Before concrete is placed, all saw dust, chips, and other construction debris and extraneous matters will be removed from the interior of forms, struts, stays, and braces, serving temporarily to hold the forms in correct shape and alignments pending the placing of concrete at their location, shall be moved when the concrete placing has reached and elevation rendering their services unnecessary as may be. These temporary members shall entirely removed from the forms and no to be buried in concrete. Surfaces existing concrete left after partial demolition against which new concrete coating or concrete dust by brushing or other effective means followed by through washing or jetting. Such surfaces shall be kept moist for at least 24 hours before pouring the new concrete.

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

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

(b) Concrete on Earth Foundation

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

(c) Concrete on Rock or Other Concrete

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

(d) Lift in Concrete

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

(e) Consolidation of Concrete

Consolidation of concrete shall be by the use of mechanical vibratory equipment. The vibrating equipment shall be of the internal type and shall at all times be adequate in number of units and the proper of each unit shall be capable to properly consolidate all concrete. The frequency of vibration shall not be less than 6,000 revolutions per minute. Form or surface vibrators shall not be used, unless otherwise specified in other Section of this Technical Specifications. The duration of vibration shall be limited to that necessary to produce satisfactory consolidating each layer of concrete the vibrating head shall be allowed to penetrate under the action of its own weight and revibrate the concrete in the upper potion of the underlying layer.

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

(f) Finishing of Concrete Lift Surfaces

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

(g) Placing Concrete Through Reinforcement

In placing concrete through reinforcement, care shall be taken that no segregation of the coarse

aggregate occurs. On the bottom of beams and slabs, where the congestion of steel near the forms makes placing difficult, a layer of mortar of the same cement-sand ratio as used in the concrete shall be first deposited to cover the surface.

(h) Depositing Concrete in Water

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

TS-1516 FORMS

(a) General

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

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

The tolerance limits specified in Paragraph 1523 and the surface irregularity limits specified in Paragraph 1521 are the maximum permissive limits of misalignment or irregularity surface which may occur despite workmanship effort to construct and maintain the forms to the specified surfaces. These limits pertain only to inadvertent and occasional irregularities, even though these irregularities are within the maximum permissive limits, will be rejected. Accordingly, these limits, shall not be construed to be tolerances for aligning forms or determining acceptability pf form materials.

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

Concrete in such stub walls shall be re-vibrated after adjacent floor concrete is placed.

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

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

(b) Form Sheathing and Lining

Wood sheathing or lining shall be of such kind of quality and shall be so treated or coated that there will be no chemical deterioration or discoloration of the formed surfaces. The type and condition of the form sheathing and lining, and the fabrication of forms for finishes F2, F3 and F4 shall be such that the form surfaces will be even and uniform. The ability of forms to withstand distortion caused by placement an vibration of concrete shall be such that formed surfaces will conform with applicable requirements of these specifications pertaining to finish of formed surfaces. Where finish F3 is specified, the sheathing or lining shall be placed so that the joint

marks on the concrete surfaces will be in general alignment, both horizontally and vertically.

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

Required finish of formed surface	Wood Sheathing or Lining	Steal Sheathing or Lining
F1	Any grade, surfaced on 2 edges (s2E) with no limits is to defects except imposed by other requirements of these specifications.	Steel Sheathing permitted Steel lining permitted.
F2	Selected lumber, surfaced on side and 2 edges (SIS2E) or plywood sheathing or lining	Steel sheathing permitted Steel lining permitted
F3	Selected lumber, surfaced on side (S4S) or plywood sheathing or lining	Steel sheathing permitted Steel lining not permitted
F4	For plane surfaces, selected lumber surfaced on 4 sides (S4S) T & G or plywood. For warped surfaces, the lumber shall be free from knots and other imperfections and which can be cut and bent accurately to the required curvatures without splintering or splitting. * Sheets not supported by a backing of wood boards. ** the lumber shall be free from wrap and knotholes and shall have no knots larger than 5 centimeters in diameter. All knots shall be sound and tight. There will be no pitch pockets, barb or lack of wood on the face of the lumber against which concrete is to be placed.	Steel sheathing permitted

(c) Form Ties

Embedded ties for holding forms shall remain embedded and, except for F1 finish, shall terminate within the concrete approximately two diameters of twice the minimum dimensions of the tie from the formed faces of the concrete. Embedded ties for F1 finish shall terminate within the concrete at the Contractor's option.

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

(d) Cleaning and Oiling of Forms

The surfaces of the forms in contact with the concrete shall be free from encrustations of mortar grout or other foreign materials when the concrete is placed. The surfaces of the forms to be in contact with the concrete shall be coated with an approved coating which will enable the ready release of the forms and will contaminate the concrete surfaces. Except as provided below, forms for surfaces which are to be painted shall be coated with straight, refined, pale, paraffin mineral oil, or other approved coating and the coating for steel forms shall consist of refined mineral oil suitably compounded for the purpose.

(e) Forms of Curved Surfaces

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

(f) Forms for Slopes or Battered Surfaces

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

(g) Forms for Open Channel Transitions

When warped surfaces of transitions are not back formed, natural or compacted earth shall be shaped to the specified surface and covered immediately with a plaster coat of cement-sand mortar at least 0.95 centimeter.

Form for the warped surfaces shall be tied securely to the floor slab and braced against spreading. In the upper surface, forms shall be butt and removed as specified in sub-paragraph (j), so as to enable ready access for placement, vibration, inspection, and repair and finishing of the concrete.

(h) Forms for Bridges

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

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

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

Forms for exposed surfaces shall be constructed of plywood or material which will produce an equivalent surface. Form panels shall be furnished and placed in uniform widths of not less than 90 centimeters and in uniform lengths of not less than 1.8 meters, except where the dimensions of the member formed are less than specified panel dimensions. Plywood panels shall be placed with the grain of the outer piles perpendicular to the studding of the joists, unless otherwise

permitted by the Engineer. Where the form panels are attached directly to the studding or joists, the panels shall not be less than 1.6 centimeters thick, and the studding or joists, shall be spaced not more than 30 centimeters center to center. Form panels less than 1.6 centimeters thick, which otherwise conform to the requirements specified in this Paragraph, may be used with a continuous backing of surface material 1.9 centimeters thick. Form panels more than 1.6 centimeters thick attached to studding or joists spaced at 30 centimeters center to center may be used, provided the deflection of the panel between studding or joists does not exceed that of a 1.6 centimeters panel attached to a studding or joists spaced at 30 centimeter center to center. All form panels shall be placed in a neat, symmetrical pattern subject to the approval of the Engineer.

(i) Falsework for Bridges and Other Superstructures

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

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

(j) Forms for Large Circular Siphons

The Contractor shall submit to NIA a detailed Drawings for a collapsible steel forms to be used in the inner forms of the monolithic barrels. The length of one section of the barrels is at every 9.15 meters bar length intervals as shown on the Drawings. The outer forms of the concrete barrels shall be made with butt joints throughout the form surfaces to be in contact with the concrete shall be smooth and true. All forms shall be sufficiently tight with suitable gaskets provided at all form joint and gates to prevent leakage of mortar. Forms shall be braced and sufficiently stiff to withstand, without detrimental deformation, all operations incidental to the proper placement of concrete within the forms. All forms shall be cleaned and oiled before pouring concrete.

(k) Removal of Forms

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

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

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

TS 1517 CONSTRUCTION JOINTS

(a) General

After the top of a lift is finally compacted, it shall be immediately and carefully protected

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

(b) Cleaning

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

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

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

3. Cleaning Vertical Construction Joints – The vertical construction joints shall be cleaned by wet sandblasting or by brush manner.

TS-1518 REPAIR OF CONCRETE

No repair of work or plaster finish of formed concrete in structures will be permitted, unless otherwise provided in these Specifications or directed by the Engineer. All defective concrete shall be removed and replaced with the Contractor assuming all expenses and losses. If directed, the Contractor shall notify the Engineer of the start of the repair work at least 24 hours in advance thereof and shall repair concrete only in the presence of the NIA representative, unless inspection of such repair work is waived.

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

which are greater in area than 400 sq.cm. and which extends beyond reinforcement.

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

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

Surface of concrete to be repaired with sealing compound method shall be cured by the water, curing method for one day before application of the sealing compound. All repair shall be sound and free shrinkage cracks and dummy areas after they have been cured and have dried 30 days.

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

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

TS-1519 FINISHES AND FINISHING

(a) General

Allowable deviations from established lines, grades and dimensions are set forth in Paragraph 1521. These allowable deviations are defined as "tolerance" and are to be distinguished from surface irregularities in finish as described herein. The class of finish and the requirements for finishing concrete surfaces shall be as specified in this Paragraph.

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

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

(b) Formed Surfaces

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

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

The classes of finish and their application are as follows:

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

Abrupt irregularities on surfaces to which pre-molded joint filler is to be applied shall not exceed 0.30 cm.

Finish F2 - Finish F2 applies to all formed surfaces not permanently concealed by fill materials or concrete, or not required to receive finish F3. Surface irregularities, measured as described in sub-paragraph (a) shall not exceed 0.60 cm. for abrupt irregularities and 1.20 cm. for gradual irregularities.

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

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

Except as hereinafter provided, abrupt irregularities on surfaces to receive F4 finish, when measured as described in sub-paragraph (a), shall not exceed 0.60 cm. for irregularities parallel to the direction of the flow and 0.30 cm. for irregularities not parallel to the direction of the flow . Gradual irregularities on surfaces to receive an F4 finish shall not exceed 1.60 cm.

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

The Contractor will not be entitled to any extra payment or compensation for reducing or eliminating irregularities on formed concrete surfaces which do not meet specification limits.

(c) Unformed Surfaces

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

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

Finish U2 - Finish U2 (floated finish) applies to unformed surfaces not permanently concealed by fill material or concrete, or not required to receive finishes U3 and U4. Finish U2 is also used as the second stage of finish U3. Floating may be performed by use of hand manpower driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently, and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform is texture. If finish U3 is to be applied, floating shall be continued

until a small amount of mortar without excess water is brought to the surface, so as to permit effective traveling. Surface irregularities measured as described in sub-paragraph (a), shall not exceed 0.60 cm.

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

Finish U4 - Finish U4 applies to canal lining. The finished surface shall be equivalent in evenness, smoothness and freedom from rock pockets and surface voids to that obtainable by effective use of a
long handled steel trowel, light surface fitting and light trowel marks will not be considered objectionable. Surface irregularities measured as described in sub-paragraph (a), shall not exceed 0.60 cm. for bottom slabs and 1.20 cm. for side slopes.

(d) Moisture Control for Unformed Surfaces

In warm, dry or windy weather the moisture control measured specified herein shall be taken to inhibit loss of moisture from the surface of the concrete. Such surface shall be fog-sprayed, covered completely with white polyethylene sheet, or otherwise treated as approved. The curing specified in Paragraph 1322 shall be started as soon as the concrete hardens, however, the surface of the concrete shall be kept wet during the change in curing methods.

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

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

TS-1520 CURING

(a) General

All concrete except interior surface shall be cured for a period of not less than 14 consecutive days.

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

(i) Floors, stair threads and horizontal construction joints shall be cured for 14 days by a covering

of damp sand or curing mats, except that curing of construction joints surfaces may be discontinued in less than 14 days when the surfaces are to be covered with fresh concrete. The sand or curing mats shall not be kept so wet as to allow water to drain from it and stain concrete walls. The sand or curing mats shall be removed after the expiration of the curing period.

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

(b) Membrane Curing Method

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

Sealing compound shall be applied to unformed concrete surfaces immediately upon completion of moisture control measures taken as specified in Paragraph TS - 623. Where such measures are not required, sealing compound shall be applied as soon as the concrete is hard enough to preclude damage from application of the sealing compound. The NIA will require that the side slopes and bottom of the canal lining be sprayed separately unless the surfaces are ready simultaneously to receive the sealing compound.

Sealing compound shall be applied to formed concrete surfaces immediately upon removal of the forms as specified in Paragraph TS - 620. The moisture control measures shall be taken until the forms have been removed. Formed surfaces shall be sprayed with water immediately after the forms have been removed until the surfaces are saturated. The sealing compound shall be applied as soon as the surface film or water has disappeared but while the surface is still damp.

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

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

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

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

(c) Water Curing

Water curing shall start as soon as practicable after placement of the concrete and shall continue until completion of the specified during period or until covered with fresh concrete. Concrete if

cured by water, shall be kept wet by ponding method or by covering with an approved water saturated materials, or by a system of perforated pipes, mechanical sprinklers, porous hose, or by any other methods approved by NIA, which will keep all surfaces to be cured continuously (not periodically) wet.

Water used for curing shall be free of chemicals which may have an adverse effect on the concrete. For example, water containing sulfates or chlorides is not acceptable.

TS 1521 TOLERANCES FOR CONCRETE CONSTRUCTION

(a) General

Permissible surface irregularities for the various classes of concrete surface finish, specified in Paragraph 1517 are defined as "finishes", and are to be distinguished from tolerances that are consistent with modern construction practice, yet governed by the effect that permissible deviations will have upon the structural action or operational function of the structure. Deviations from the established lines, grades, and dimensions will be permitted to the extent set forth herein.

Where tolerances are not stated in the Specifications or Drawings for any individual structure or feature thereof, permissible deviations will be interpreted in conformity with the provisions of this Paragraph. Concrete work that exceeds the tolerance limits specified will be rejected and shall be corrected or removed and replaced, as ordered.

(b) Tolerance for Canal Structures

1. **Concrete Canal Lining:**

Departure from established alignment

- 5 cm on tangents
- 10 cm on curves

Departure from established profile grade

- 2.50 cm

Reduction in thickness of lining

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

Variation from specified width section at any depth ---------- 3 cm

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

Variation in surfaces:

Invert, in 3 meters ---------- 0.60 cm
Side Slopes, in 3 meters ---------- 1.20 cm

2. **Bridges, Inlets, Chutes Structures:**

Departure from established alignment----- 1.20 cm

Departure from established grades ------- 1.20 cm

Variation from the plumb or the specified batter in the lines and surfaces of column, piers, walls and in rises:

Exposed in 3 meters ---------- 1.20 cm
Backfilled in 3 meters ---------- 2.00 cm

Variation in cross-sectional dimensions of columns, walls, piers, slabs, beams and similar parts:

Minus ---------- 0.60 cm
Plus ---------- 1.20 cm

3. **Bridge Slabs:**

Variation in thickness of Slab

Minus ---------- 0.30 cm
Plus ---------- 0.60 cm

Variation from specified width over curbs 0.60 cm

Variation from specified grade of top of
curb in cambered position ---------- 0.60 cm

4. **Foundations**

Variation in dimension in plan:

Minus ---------- 2.50 cm
Plus ---------- 5.00 cm

Variation from established grade:
Minus ---------- 1.20 cm
Plus ---------- 2.00 cm
Misplacement of eccentricity

2 percent of the footing width in the direction of misplacement but not more than ------- 5.00 cm

5. **Bridge Seat**

Variation of any one bearing from established elevation ---------- 0.30 cm
Difference in elevations of bearings for adjacent spans, maximum ---------- 0.60 cm
Difference in elevations of bearings for zone span on any one pier, maximum ---------- 0.30 cm
Horizontal misplacement for any one bearing, maximum ---------- 0.70 cm
Variation in the sizes and locations of slabs and wall openings ---------- 1.20 cm

Sills and side walls for radial gates and similar watertight joints:

Variation from the plumb level not greater than 0.30 cm. in 3 meters

6. **Stoplog Slots:**

Variation from a common plane between the sealing surfaces of each pair of related stoplog slots shall be no greater than ---------- 0.15 cm

Variation of widths of stoplog guides:

Minus ---------- 0.30 cm
Plus ---------- 0.60 cm

(c) Tolerances for Cast-In-Place Concrete Pipe

Departure from established alignment or from established grade ---------- 2.50 cm

Variation in thickness at any point:
Minus 2-1/2% or 0.60 cm whichever is greater
Plus 5% or 1.20 cm whichever is greater

Variation from inside diameter --------- 0.5%

Variation in surface invert –---------- 0.60 cm in 3 meters

(d) Tolerances for Placing Reinforcement Steel

Variation from indicated protective cover:

For 5 cm cover ---------- 0.60 cm
For 7.5 cm cover ---------- 1.20 cm

Variation from indicated spacing ------- 2.50 cm

TS-1522 FAILURE TO CURE

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

TS-1523 FAILURE TO MEET CONCRETE REQUIREMENTS

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

TS-1524 PROTECTION ON CONCRETE WORKS

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

SECTION XVII

CONCRETE STRUCTURES

TS-1701 SCOPE

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

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

TS-1702 CONCRETE CONSTRUCTION

All concrete construction shall conform to the provisions of Section XV, Concrete, and to detailed requirements of the following paragraphs. Concrete finishes shall conform to Paragraph 1519, Section XV, Concrete, and/or shall be as noted on the Drawings.

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

The dimensions of each structure shown on the Drawings will be subject to changes as may be found necessary by the NIA to adapt the structures to the actual field condition and conditions disclosed by the excavation.

TS-1703 METHOD OF MEASUREMENT

Measurement for payment of any and all classes of concrete will be made by the number of cubic meter computed to the neat lines of the structure, unless otherwise specifically shown on the Drawings or specified in these Specifications. In the event cavities resulting from careless excavation or from excavation performed to facilitate the Contractor's operation, as determined by the NIA, are required to be filled with concrete. Such refilling will be made by and at the expense of the Contractor. In measuring concrete for payment, the volume of all openings, embedded pipes, woodwork and metalwork within the concrete will be deducted.

TS-1704 BASIS OF PAYMENT

Payment for any and all classes of concrete in various parts of the work will be made at the applicable unit bid prices per cubic meter which price and payment shall include cost for furnishing of all materials, equipment and labor, and all operations required in the construction specified under Section XV, Concrete.

TS-1705 CONCRETE FOR ALL STRUCTURES

(a) General

The item "Concrete for All Structures" in the Bill of Quantities include all concrete in diversion work (except rubble masonry), canal structures and road structures such as siphons, bridges, drainage culverts, road crossings, pipe crossings, ungated thresher crossings, control

structures, drop structures, headgates and turnouts and all other structures not otherwise specified elsewhere in these Specifications.

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

Concrete for diversion works, canal structures and other structures will be measured and paid for as specified in Paragraph 1703 and 1704. respectively. Structures not fully and acceptably completed will not be measured for payment. Precast structures installed and acceptably completed in place shall be paid for as specified in Paragraph 1704.

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

(b) Curing and Joints

All concrete shall be cured in accordance with Section XV, Paragraph 1522; except that concrete for canal siphon shall be cured until the concrete test cylinders shall have attained a strength of at least 3,000 pounds per square inch.

The Contractor shall construct expansion and construction joints at sections specified on the Drawings all in accordance with the provisions of Section XV, Paragraph 1519 and Section XXI, Concrete Joints and Joint Materials, and elsewhere in these Specifications.

TS-1706 PRECAST CONSTRUCTION

(a) Scope and Description

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

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

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

(b) Transporting and Placing

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

(c) Sampling and Testing

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

(d) Measurement and Payment

Measurement of concrete in precast structures will be measured by the number of cubic meter. It shall be computed to the neat lines as if these structures were construed to the details shown on the Drawings.

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

TS-1707 LEAN CONCRETE

In the construction of siphons, the bottom of the cast-in-place concrete barrels will be exposed to high velocity flow of seepage during pouring which will absorb or wash out the cement in the concrete poured. To minimize the effect of seepage, a blinding concrete with minimum strength of 70 kg/sq.cm. shall first be poured to the lines, grade and dimensions on which the barrels will be constructed as shown on the Drawings.

Lean concrete shall be measured and paid for as specified in Paragraph 1703 and 1704, respectively.

TS-1708 STAFF GAGES

The Contractor shall install two vertical staff gages, one upstream and one downstream, in all parshall flumes and turnouts with valve structures and in all check structures in the laterals as shown on the Drawings or as directed by the Engineer. The porcelain plated or enameled steel staff gages and other materials and accessories necessary for the installation shall be supplied by the Contractor.

Installation of staff gages will not be measured for payment including all the channels, anchors, anchor bolts and other metal materials necessary to install the staff gages at the parshall flumes and check structures. The cost of installation and other materials supplied by the Contractor shall be included in the contract unit price for concrete in the respective structures where gages are required.

SECTION XXIII

REINFORCING STEEL BARS

TS-2301 SCOPE

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

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

The length for each size of reinforcing steel bar to be furnished by the Contractor shall be computed by taking the theoretical length of steel bars shown on the Drawings multiplied by 1.07 to get the approximate length required for the work. All reinforcing steel bars shall be furnished in commercial standard lengths and the Contractor shall cut and bend the reinforcing steel bars to the detail and dimensions shown on the Drawings.

TS-2302 MATERIALS

All reinforcing steel bars to be furnished by the Contractor shall be Grade 40 or PS 275, deformed type and conforming to the requirements of ASTM A615. The nominal dimensions and unit weights of bar designation shall be in accordance with the following table:

Nominal Bar Diameter	Unit Weight (kg/m)	Nominal Dimensions	
		Cross Sectional Area (sq.mm)	Perimeter (mm.)
6 mm	0.22	28.27	18.85
8 mm	0.40	50.27	25.13
10 mm	0.62	78.54	31.42
12 mm	0.89	113.10	37.70
16 mm	1.58	201.10	50.27
20 mm	2.47	314.20	62.83
25 mm	3.85	491.90	78.54
28 mm	4.83	615.75	87.96
32 mm	6.31	804.25	100.53

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

TS-2303 CONSTRUCTION REQUIREMENT

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

1. Cutting and Bending – Cutting and bending of reinforcing steel bars maybe done in shop or at the job site. All bending works shall be in accordance with the latest standard practice and by approved machine methods. Radii for bends and hooks will be specified on the approved detailed reinforcement Drawings in accordance with sound design procedures.

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

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

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

3. **Relation of Bars to Concrete Surfaces** – The minimum cover for all reinforcements shall conform to the dimensions shown on the detailed reinforcement Drawings.

4. **Splicing** – All splices in reinforcement shall be as shown on the Drawings or as directed by the Engineer. The lapped ends to bars shall be either supported sufficiently to permit

the embedment of the entire surface of each bar in concrete or shall be securely wired.

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

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

TS-2304 PREPARATION OF REINFORCEMENT DRAWINGS

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

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

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

TS-2305 SAMPLING FOR TESTING AND ACCEPTANCE OF MATERIALS THAT FAIL TO MEET CONTRACT REQUIREMENTS

(FOR STEEL BARS FURNISHED BY CONTRACTOR)

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

The NIA reserves the right to accept steel bars that fail to meet the contract requirement provided that the deficiency is not more than nine percent (9%) of the requirements per each type of test and provided further that a corresponding reduction in the unit price will be made. The percentage of reduction is equal to the percentage of deficiency based on the minimum requirement of the ASTM A615 Standard. For example, if the value of the test result for one type of test is five percent (5%) below the minimum requirement, the unit price for payment will be reduced by 5%. If the non-compliance with the test requirements is on two or more tests, the price reduction will be the summation of the percentage of deficiencies.

TS-2306 MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for the operations under this Section and the cost of furnishing, transporting the reinforcing steel bars from the source to the structure site, handling, stockpiling, cutting, bending and placing and other subsidiary works needed to complete the work described herein shall be considered included in the unit bid price per cubic meter of concrete for all reinforced concrete structures called for in the Bill of Quantities.

SECTION XXVIII
GRAVEL BLANKET

TS-2801 SCOPE

The work under this Section shall include furnishing, placing on approved subgrade and compacting the graded sand and gravel to the thickness indicated on the Drawing or as established by the Engineer.

TS-2802 MATERIALS

Materials for the gravel blanket shall meet all the requirements for 50mm coarse aggregate.

TS-2803 PLACING

The materials shall be dumped on the prepared subgrade and spread in layers having an uncompacted thickness of not more than 25 centimeters. Each layer shall be compacted to achieve a relative density of 70% as determined by USBR Test E-12 by four complete passes of a vibratory compactor. The Contractor has the option to adopt any method of compacting the layers of materials approved by the Engineer.

TS-2804 METHOD OF MEASUREMENT

Gravel Blanket will be measured by the cubic meter of materials acceptably placed and computed based on the neat lines and dimensions shown in the Drawings.

TS-2805 BASIS OF PAYMENT

The volume measured as provided above shall be paid at the unit contract price per cubic meter, which price and payment shall constitute full compensation for furnishing all materials, supplies, labor, tools, equipment and all incidentals or subsidiary works necessary for the successful completion of the work described under this section. Excavation involved under this section is not considered a subsidiary work, hence it will not be measured for payment under this section. Rather, it will be measured and paid for under Structure Excavation.

SECTION XXVII
GROUTED RIPRAP

TS-2701 SCOPE

The work under this Section shall include furnishing and placing appropriate sizes of stones or spalls for riprap and grouting the riprap with cement mortar, in accordance with the Drawings and these Specifications or as directed by the Engineer. The stone and spalls shall be obtained from quarry areas or stockpile areas designated by the Engineer.

TS-2702 MATERIALS

Stones for riprap shall be at least 15 centimeters in diameter and shall be sound, tough, durable, dense and resistant to the action of air and water with a specific gravity of at least two and six tenths (2.6).

Mortar for grouted riprap shall consist of one part cement to three parts sand by volume and sufficient water to produce a thick and creamy mixture conforming to the provisions of Section XV-Concrete.

TS-2703 METHOD OF CONSTRUCTION

A) NON-SLOPING GROUTED RIPRAP

The foundation bed shall be moistened, well compacted and brought to the required elevation. The stones shall be well laid with close joints by hands. The stones shall be well arranged in such a manner that the stones can resist disturbance. If big spaces occur between stones and formation bed, said spaces shall be well packed with spall or appropriate sizes of stones. The stones so arranged shall be moistened before placing the grout. All spaces between the stones shall be completely filled with grout from bottom to top and the surface swept with stiff broom. The first layer shall consist of at least 15 centimeters mortar and the boulders should be embedded in this mortar. Thus the mortar poured is worked into the intercises so that the whole mass of boulders from bottom to top is covered and connected with mortar and will act as one mass. The grouted riprap shall be cured with water for a minimum period of three (3) days.

B) SLOPING GROUTED RIPRAP

The slope where the grouted riprap is going to be constructed should be well cured and compacted and trimmed to the required grade and elevation. If the grouted riprap is on the slopes of the embankment, the embankment is constructed to the required degree of compaction. The first layer of 15 centimeters thick mortar should be laid to a height of 60 centimeters to 90 centimeters and to a length which can be handled conveniently so that there is no initial set of mortar. The stones shall be well laid with close joints by hands and shall be well arranged in such a manner that the stones can resist disturbances. If big spaces occur between stones and formation bed, said spaces shall be well packed with spalls or appropriate sizes of stones. The stones so arranged shall be moistened before placing the grout. This will act as base to the subsequent lifts. The next lift can be 1 to 1.25 meters high. Thus the whole sloping grouted riprap should be constructed in 1 to 1.25 meters high lifts at a time. All the spaces between the stones shall be completely filled with grout from bottom to top and the surfaces swept with stiff broom. Thus the mortar poured is worked into the intercises so that the whole mass of boulders from bottom to top is covered and connected with mortar and will act as one mass. The grouted riprap shall be cured with water for a period of three (3) days.

The general construction procedure should be always to start from lowest elevations.

TS-2704 METHOD OF MEASUREMENT

Grouted riprap will be measured by the number of cubic meter of materials acceptably placed and computed based on the neat lines as shown on the Drawings.

TS-2705 BASIS OF PAYMENT

The volume measured as provided above shall be paid at the contract unit price per cubic meter, which price and payment shall constitute full compensation for furnishing all labor, tools, equipment, supplies and materials and all incidentals or subsidiary works necessary for the successful completion of the work described under this Section. Excavation involved under this

Section is not considered a subsidiary work hence, it will not be measured for payment under this Section. Rather, it will be measured and paid for under "Structure Excavation".

SECTION XIX

RUBBLE MASONRY

TS-1901 SCOPE

The work under this Section shall consist of furnishing all material, supplies, tools and equipment, construction of all necessary form work; placing rubble stone and concrete binder on an approved foundation and form work; the removal of forms and curing of the rubble masonry, all in accordance with the Drawings and these Specification or as directed by the Engineer.

TS-1902 MATERIALS

Rubble stones shall consist of field stones that are clean, sound, durable, resistant to the action of water, and must have specific gravity of at least two six tenths (2.6), and diameters ranging from 15 cm. to 60 cm., sixty percent (60%) of which comprises the bigger sizes. Stones shall have the prior approval of the Engineer before their use. Materials for concrete binder shall be in accordance with the applicable provisions of Section XV. Concrete binder shall be Class "A" concrete with 1 ½ (37.5 cm) maximum size of aggregates.

Ts-1903 METHOD OF CONSTRUCTION

Preparation and handling of the concrete binder shall be in accordance with Section XV, Concrete. The stones shall be thoroughly wet before they are installed in place. The entire surface of every stone shall be thoroughly covered with concrete binder. In general, one cubic meter of rubble masonry will require one-half cubic meter of concrete binder. Actual variation in this proportion will not entitle the Contractor to any price adjustment. It is expected that the whole rubble masonry especially in the case of dam and apron as well as other structures should be well encased and covered by the concrete so that it forms the heart of the body of dam and apron and will act contiguous with the concrete shell. This can be achieved by tamping the stones into the concrete using heavy wooden blocks handled by one or two people. After the bed has been prepared as required the first layer of mortar should be laid and rubble embedded in them. The thickness of the mortar should be such that each rubble could be embedded at least 50% of its longest dimension in the mortar so that when the next layer of mortar is poured the rubble which has been embedded is not disturbed. The next layer of boulders can be arranged in the mortar now placed following the same procedure. This will ensure that all the boulders are fully covered with mortar and they are well entrenched and stable in the mortar so that they are not disturbed when subsequent layers of mortar stones are poured. The stones shall be well set such that no stone will project beyond the lines indicated on the Drawings. The concrete binder shall be properly placed into the spaces between stones so that no void is left within the rubble masonry. In case reinforcement are placed, no stone shall be closer than 4" (10 cm) to the nearest reinforcing bars. Rubble masonry shall be cured by water for five(5) days.

The general construction procedure should always to start from lowest elevations so that the sub-grade on which the concrete is laid is not disturbed by the seepage forces when the higher layers are excavated and prepared for concrete pouring.

In situations when rubble masonry is directly constructed on the sub-grade, the sub-grade should be prepared exactly as for any other concrete structures. In these cases, also the first layer can consist of concrete of 15 centimeters thickness in the case of minor structures and 20

centimeters in the case of major structures. The concrete manufacture etc. will be as specified under Section XV, Concrete, and the strength will be as of Class "A" Concrete.

TS-1904 METHOD OF MEASUREMENT

"Rubble Masonry" will be measured in cubic meters in its final position based on the neat lines of the structures as shown on the Drawings.

TS-1905 BASIS OF PAYMENT

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

PUMP, MOTOR & ACCESSORIES

TS-01 SCOPE

Work under this section shall include Supply, delivery and installation of submersible Pump, Motor and its accessories.

Submersible Pump: (See Plans)

- Fully AISI 304 stainless steel
- Stainless steel impellers and diffusers for maximum efficiency and reliability
- Maximum sand content 50g/cu.m
- Include accessories: Cable, Sensor, Magnetic detector, Motor controller, 60amp Circuit breaker, etc.

Submersible Motor

- Permanent magnet motor
- Water cooled rotor
- Kingsbury thrust bearing
- Built-in inverter module

Solar Panel feature – (See Plans)

- Higher yield due to better shading response
- High efficiency 20.6% on conversion of solar energy to electrical
- Ground mounting - Aluminum
- Corrosion resistant
- Designed for 230 kph wind load
- Lightweight and Fast assembly, no welding need
- Supplier/manufacturer of the above feature shall include after sales service

TS-02 EQUIPMENT, TOOLS AND MATERIALS

In accomplishing the contracted work, the contractor will make use of their own equipment and tools. Materials which form part of the contracted work such as pipes, fittings, and other accessories will be provided by the contractor.

TS-03 LOCATION OF PUMP SITES

Pump sites are those previously identified and located by NIA staff.

TS-04 BASIS OF PAYMENT

Payment shall only be made after successful Test Run in the presence of all the stakeholders. Likewise, units which passed the minimum required discharge and in conformity with the specifications in the plans/drawings as certified by the Inspectorate Team at the price per unit specified in the contract are eligible to claim payment. 1 unit shall be defined as “the pump, engine and accessories.

Section VII. Drawings

Section VIII. Bill of Quantities

Project Identification Number: CW – ABRA - 10 – 2023/Cluster 07

Project Name: CLUSTER 07 – CONSTRUCTION OF VARIOUS SMALL IRRIGATION PROJECTS

Location: SAN JUAN, AND LACUB, ABRA

ITEMS OF WORK	QUANTITY	UNIT	AMOUNT
GAANG-TAGAYTAY SIP, Tagaytay, San Juan, Abra			
I. DIVERSION WORKS (WELL DRILLING SOLAR)			
1. Procurement Delivery & Installation of Materials & Accessories (Well Drilling)	3.00	units	3,834,356.40
2. Procurement and Delivery of 2 1/2" Ø HDPE SDR 13.5 (Transmission Pipeline)	220.00	l.m.	78,628.00
3. Installation of 2 1/2" Ø HDPE SDR 13.5 (Transmission Pipeline)	220.00	l.m.	2,657.60
4. Proc. Delivery & Installation of Solar Pump Unit 3HP brushless AC/DC motor	3.00	units	2,196,794.25
5. Conduct of Geo-resistivity Survey	3.00	lot	393,750.00
II. CANAL STRUCTURE WORKS			
1. 211 kgs/sq.cm. Reinforced Concrete	23.73	cu.m	509,050.03
2. Common Earth Excavation	10.08	cu.m	2,540.16
3. Gravel Blanket	2.01	cu.m	8,301.86
4. Other Materials & Accessories	1.00	l.s.	
a. G.I Nipple 2" dia. x 0.30m	15.00	pcs.	2,385.00
b. G.I Ball Valve 2" dia.	21.00	pcs.	18,816.00
c. G.I Nipple 3" dia. x 0.80m	3.00	pcs.	1,440.00
d. G.I Plug 3" dia.	6.00	pcs.	1,770.00
e. G.I Nipple 3 " dia. X 0.50m	6.00	pcs.	1,650.00
f. Perforated Steel Filter	6.00	pcs.	1,530.00
g. G.I Nipple 2” dia. X 0.60m	6.00	pcs.	1,890.00
h. 16mm x 6.0m Round Bar	6.00	pcs.	6,000.00
i. Welding Rod	3.00	kgs.	750.00
III. CANALIZATION WORKS			
1. Procurement and Delivery of 2" Ø HDPE SDR 13.5 (Distribution Pipeline)	6,840.00	l.m.	1,832,162.40
IV. TEMPORARY WORKS			
1. Project Billboard	1.00	lot	3,498.09
2. Emergency Facility	1.00	ls	66,175.96
3. Construction Safety and Health	320.00	man-days	22,198.40
APPROVED BUDGET FOR THE CONTRACT FOR GAANG-TAGAYTAY SIP			**8,986,344.15**

DESCRIPTION	QUANTITY	UNIT	AMOUNT
BALAOANG SIP, Lacub, Abra			
I. DIVERSION WORKS:			
1. Common Earth Excavation	4.58	cu.m.	1,202.25
2. 211 kg/sq.cm. Reinforced Concrete	9.26	cu.m.	198,460.51
3. Proc., Del. & Inst'n of Other Materials & accessories	1.00	ls	7,020.00
Flat Bar (6mm x 50mm)	6.00	pcs	
II. PROTECTION WORKS:			
1. Common Earth Excavation	5.81	cu.m.	1,525.13
2. Grouted Riprap	11.05	cu.m.	102,804.34
III. CANAL STRUCTURE WORKS:			
1. Common Earth Excavation	21.27	cu.m.	5,583.38
2. 211 kg/sq.cm. Reinforced Concrete	6.68	cu.m.	143,165.89
3. Rubble Masonry	17.17	cu.m.	178,156.78
4. Grouted Riprap	7.25	cu.m.	67,450.81
5. Gravel Blanket	0.93	cu.m.	4,321.52
6. Proc. and delivery of 1/2"Dia Cable Wire	14.00	ln.m.	5,124.84
7. Installation of 1/2"Dia Cable Wire	14.00	ln.m.	689.08
8. Proc. and delivery of 1 1/4"Dia Cable Wire	35.00	ln.m.	43,180.90
9. Installation of 1 1/4"Dia Cable Wire	35.00	ln.m.	2,953.30
10. Proc., Del., & Inst'n of Other Materials & accessories	1.00	ls	11,150.00
Strainer	3.00	pcs	
1/2" Ø Cable Clip	12.00	pcs	
1 ¼" Ø Cable Clip	12.00	pcs	
16 mm Ø x 6m RSB	2.00	pcs	
1"Ø x 0.15m GI Pipe	8.00	pcs	
#10 Tie Wire Hanger	8.00	Kgs.	
Steel Base Plate (30cm x 30 cm x 5mm)	4.00	pcs	
11. Backfill	4.06	cu.m.	710.46
IV. CANALIZATION WORKS			
1. Common Earth Excavation	123.57	cu.m.	25,949.70
2 Rubble Masonry	109.20	cu.m.	1,133,064.66
3. Proc. And delivery of 3"Dia HDPE SDR 13.5	126.00	ln.m.	75,766.32
4. Installation of 3"Dia HDPE SDR 13.5	126.00	ln.m.	7,029.54
5. Backfill	80.62	cu.m.	14,107.69
6. Demolition of Concrete	5.10	cu.m.	5,355.00
V. TEMPORARY WORKS			
1. Project Billboard	1.00	lot	4,007.30
2.Emergency Facility	1.00	lot	66,233.28
3. Construction Safety & Health	1,780.00	man-days	124,653.40
APPROVED BUDGET FOR THE CONTRACT FOR BALAOANG SIP			**2,229,666.08**
TOTAL APPROVED BUDGET FOR THE CONTRACT			**11,216,010.23**

Section IX. Checklist of Technical and Financial Documents

Checklist of Technical and Financial Documents

I. TECHNICAL COMPONENT ENVELOPE

Class "A" Documents

Legal Documents

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

Technical Documents

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

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

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

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

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

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

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

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

☐ (g) Original duly signed Omnibus Sworn Statement (OSS);

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

Financial Documents

☐ (h) The prospective bidder's audited financial statements, showing, among others, the prospective bidder's total and current assets and liabilities, stamped "received" by the BIR or its duly accredited and authorized institutions, for the preceding calendar year which should not be earlier than two (2) years from the date of bid submission; **and**

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

Class "B" Documents

☐ (j) If applicable, duly signed joint venture agreement (JVA) in accordance with RA No. 4566 and its IRR in case the joint venture is already in existence; **or**
duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful.

II. **FINANCIAL COMPONENT ENVELOPE**

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

Other documentary requirements under RA No. 9184

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

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

☐ (n) Duly signed Cash Flow by Quarter and payment schedule.

Note: Any missing document in the above-mentioned checklist is a ground for outright rejection of the bid.

Bidding Forms

BID FORM

Date : _____
Project Identification No. : _____

To: [name and address of Procuring Entity]

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

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

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

c. The total price of my/our Bid in words and figures, excluding any discounts offered below is: *[in case of discrepancy of the bid between the words and the figure, the bid in words shall prevail]*;

d. The discounts offered and the methodology for their application are: _____;
[if the discount was not specified whether it will be applied on the ABC or bid amount, it will automatically be the bid amount]

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

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

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

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

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

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

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

[12] currently based on GPPB Resolution No. 09-2020

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

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

Name:_____

Legal Capacity: _____

Signature:_____

Duly authorized to sign the Bid for and behalf of: _____

Date: _____

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

BID SECURING DECLARATION
Project Identification No.: *[Insert number]*

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

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid Securing Declaration.

2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any procurement contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of the written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1(f),of the IRR of RA No. 9184; without prejudice to other legal action the government may undertake.

3. I/We understand that this Bid Securing Declaration shall cease to be valid on the following circumstances:

    a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
    b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and (i) I/we failed to timely file a request for reconsideration or (ii) I/we filed a waiver to avail of said right; and
    c. I am/we are declared the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

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

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

SUBSCRIBED AND SWORN to before me this ___ day of *[month] [year]* at *[place of execution],* Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her [insert type of government identification card used], with his/her photograph and signature appearing thereon, with no. _____ and his/her Community Tax Certificate No. _____ issued on ____ at _____.

Witness my hand and seal this ___ day of *[month] [year]*.

NAME OF NOTARY PUBLIC
Serial No. of Commission _____
Notary Public for _____ until _____
Roll of Attorneys No. _____
PTR No. _____ *[date issued], [place issued]*
IBP No. _____ *[date issued], [place issued]*

Doc. No. _____
Page No. _____
Book No. _____
Series of _____
* This form will not apply for WB funded projects

Omnibus Sworn Statement

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

AFFIDAVIT

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

1. *[Select one, delete the other:]*

   [If a sole proprietorship:] I am the sole proprietor or authorized representative of [Name of Bidder] with office address at [address of Bidder];

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

2. *[Select one, delete the other:]*

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

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

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

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

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

6. *[Select one, delete the rest:]*

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

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

affinity up to the third civil degree;

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

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

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

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

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

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

IN WITNESS WHEREOF, I have hereunto set my hand this_____day of_____, 20___at _____, Philippines.

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

SUBSCRIBED AND SWORN to before me this ___ day of *[month] [year]* at *[place of execution],* Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her [insert type of government identification card used], with his/her photograph and signature appearing thereon, with no. _____ and his/her Community Tax Certificate No. _____ issued on ____ at _____.

Witness my hand and seal this ___ day of *[month] [year]*.

NAME OF NOTARY PUBLIC
Serial No. of Commission _____
Notary Public for _____ until _____
Roll of Attorneys No. _____
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* This form will not apply for WB funded projects

CONTRACT AGREEMENT

THIS AGREEMENT, made this *[insert date]* day of *[insert month]*, *[insert year]* between *[name and address of PROCURING ENTITY]* (hereinafter called the "Entity") and *[name and address of Contractor]* (hereinafter called the "Contractor").

WHEREAS, the Entity is desirous that the Contractor execute *[name and identification number of contract]* (hereinafter called "the Works") and the Entity has accepted the Bid for *[contract price in words and figures in specified currency]* by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents as required by the 2016 revised Implementing Rules and Regulations of Republic Act No. 9184 shall be deemed to form and be read and construed as part of this Agreement, *viz*.:

   a. Philippine Bidding Documents (PBDs);
      i. Drawings/Plans;
      ii. Specifications;
      iii. Bill of Quantities;
      iv. General and Special Conditions of Contract;
      v. Supplemental or Bid Bulletins, if any;

   b. Winning bidder's bid, including the Eligibility requirements, Technical and Financial Proposals, and all other documents or statements submitted;

   Bid form, including all the documents/statements contained in the Bidder's bidding envelopes, as annexes, and all other documents submitted (*e.g.*, Bidder's response to request for clarifications on the bid), including corrections to the bid, if any, resulting from the Procuring Entity's bid evaluation;

   c. Performance Security;

   d. Notice of Award of Contract and the Bidder's conforme thereto; and

   e. Other contract documents that may be required by existing laws and/or the Procuring Entity concerned in the PBDs. Winning bidder agrees that additional contract documents or information prescribed by the GPPB that are subsequently required for submission after the contract execution, such as the Notice to Proceed, Variation Orders, and Warranty Security, shall likewise form part of the Contract.

3. In consideration for the sum of *[total contract price in words and figures]* or such other sums as may be ascertained, *[Named of the bidder]* agrees to *[state the object of the contract]* in accordance with his/her/its Bid.

4. The *[Name of the procuring entity]* agrees to pay the above-mentioned sum in accordance with the terms of the Bidding.

IN WITNESS whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

[Insert Name and Signature]	*[Insert Name and Signature]*
[Insert Signatory's Legal Capacity]	*[Insert Signatory's Legal Capacity]*
for:	*for:*
[Insert Procuring Entity]	*[Insert Name of Supplier]*

[Addendum showing the corrections, if any, made during the Bid evaluation should be attached with this agreement]

KEY PERSONNEL
(FORMAT OF BIO-DATA)

Give the detailed information of the following personnel who are scheduled to be assigned as full-time field staff for the project. Fill up a form for each person.

- Authorized Managing Officer / Representative
- Sustained Technical Employee

1. Name : _____
2. Date of Birth : _____
3. Nationality : _____
4. Education and Degrees : _____
5. Specialty : _____
6. Registration : _____
7. Length of Service with the Firm : _____ Year from _____ (months) _____ (year) To _____ (months) _____ (year)
8. Years of Experience : _____
9. If Item 7 is less than ten (10) years, give name and length of service with previous employers for a ten (10)-year period (attached additional sheet/s), if necessary:

Name and Address of Employer	Length of Service
_____	_____ year(s) from _____ to _____
_____	_____ year(s) from _____ to _____
_____	_____ year(s) from _____ to _____

10. Experience:

This should cover the past ten (10) years of experience. (Attached as many pages as necessary to show involvement of personnel in projects using the format below).

1. Name : _____
2. Name and Address of Owner : _____
3. Name and Address of the Owner's Engineer (Consultant) : _____
4. Indicate the Features of Project (particulars of the project components and any other particular interest connected with the project): _____
5. Contract Amount Expressed in

Philippine Currency : _____

6. Position : _____

7. Structures for which the employee was responsible : _____

8. Assignment Period : from _____ (months) _____ (years)
: to _____ (months) _____ (years)

_____
Name and Signature of Employee

It is hereby certified that the above personnel can be assigned to this project, if the contract is awarded to our company.

_____ _____
(Place and Date) (The Authorized Representative)

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

PERFORMANCE SECURING DECLARATION

Invitation to Bid: [Insert Reference Number indicated in the Bidding Documents]
To: [Insert name and address of the Procuring Entity]

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, to guarantee the faithful performance by the supplier/distributor/manufacturer/contractor/consultant of its obligations under the Contract, I/we shall submit a Performance Securing Declaration within a maximum period of ten (10) calendar days from the receipt of the Notice of Award prior to the signing of the Contract.

2. I/We accept that: I/we will be automatically disqualified from bidding for any procurement contract with any procuring entity for a period of one (1) year for the first offense, or two (2) years **for the second offense**, upon receipt of your Blacklisting Order if I/We have violated my/our obligations under the Contract;

3. I/We understand that this Performance Securing Declaration shall cease to be valid upon:

    a. issuance by the Procuring Entity of the Certificate of Final Acceptance, subject to the following conditions:
        i. Procuring Entity has no claims filed against the contract awardee;
        ii. It has no claims for labor and materials filed against the contractor; and
        iii. Other terms of the contract; or

    b. replacement by the winning bidder of the submitted PSD with a performance security in any of the prescribed forms under Section 39.2 of the 2016 revised IRR of RA No. 9184 as required by the end-user.

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

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

SUBSCRIBED AND SWORN to before me this ___ day of *[month] [year]* at *[place of execution],* Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her [insert type of government identification card used], with his/her photograph and signature appearing thereon, with no. _____ and his/her Community Tax Certificate No. _____ issued on ____ at _____.

Witness my hand and seal this ___ day of *[month] [year]*.

NAME OF NOTARY PUBLIC
Serial No. of Commission _____
Notary Public for _____ until _____
Roll of Attorneys No. _____
PTR No. _____ *[date issued], [place issued]*
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NATIONAL IRRIGATION ADMINISTRATION-CAR
Wangal, La Trinidad, Benguet

Contract Reference Number
Name of the Contract
Location of the Contract

Statement of all Ongoing Government & Private Contracts including contracts awarded but not yet started

Business Name :_____
Business Address :_____

Name of Contract/Location Project Cost	a. Owner Name b. Address c. Telephone Nos.	Nature of Work	Contractor's Role		a. Date Awarded b. Date Started c. Date of Completion	% of Accomplishment		Value of Outstanding Works
			Description	%		Planned	Actual	
Government								
Private								
						Total Cost		

Note: This statement shall be supported with:

1 Notice of Award and/or Contract
2 Notice to Proceed issued by the owner
3 Certificate of Accomplishments signed by the owner or Project Engineer

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

Contract Reference Number
Name of the Contract
Location of the Contract

STATEMENT OF SINGLE LARGEST COMPLETED CONTRACT (SLCC) SIMILAR TO THE CONTRACT TO BE BID

Business Name : _____
Business Address : _____

Name of the Contract	Date of the Contract	Contract Duration	Owner's Name and Address	Nature of Works	Contractor's Role		Total Contract Value at Award	Date of Completion	Total Contract Value at Completion
						Percentage			

Note :
The Bidder shall be able to support this Statement with; Notice of Award and or Notice to Proceed, Project Owner's Certificate of Final Acceptance issued by the Owner other than the Constructor's Performance Evaluation Summary (CPES) Final Rating, which must be at least satisfactory. In the case of contracts with the private sector, an equivalent document Shall be submitted.

Submitted by :

Printed Name & Signature
Designation
Date

Qualification of Key Personnel Proposed to be Assigned to the Project

Business Name : _____
Business Address : _____

		Project Manager	Project Engineer	Material Engineer	Foreman	Construction Safety and Health Personnel
1	Name					
2	Address					
3	Date of Birth					
4	Employed Since					
5	Experience					
6	Previous Employment					
7	Education					
8	PRC License					

Minimum Requirements *: 1 Project Manager/ Engineer*
: 1 Material Engineer *: 1 Construction Safety and health Personnel*
: 1 Foreman

Note *: Attached individual resume and PRC License of the (professional) personnel.*

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

BILL OF QUANTITIES

Contract : _____
Project : _____
Location : _____

DESCRIPTION	QUANTITY	UNIT	UNIT COST IN WRITTEN WORDS	UNIT COST (IN FIGURES)	TOTAL
TOTAL AMOUNT OF BID (In words and in figure)					

The undersigned Bidder hereby certify that he has fully informed himself of all local conditions affecting the carrying out of the contract works and that this bid has been prepared in strict accordance with the terms and conditions of the bid documents.

Submitted by :

Name of the Representative of the Bidder

Date : _____

Position

List of Major Equipment units, Owned or Leased and/or under Purchase Agreements, Pledged to the Proposed Contract

Business Name : _____
Business Address : _____
_____

Description	Model/Year	Capacity / Performance / Size	Plate No.	Motor No. / Body No.	Location	Condition	Proof of Ownership / Lessor or Vendor
A. Owned							
i.							
ii.							
iii.							
iv.							
v.							
B. Leased							
i.							
ii.							
iii.							
iv.							
v.							
C. Under Purchase Agreements							
i.							
ii.							

This statement shall be supported with: Proof of ownership, certification of availability of equipment from the equipment lessor/vendor for the duration of the contract

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

National Irrigation Administration
Wangal, La Trinidad, Benguet

Contract Reference Number: _____
Name of the Contract: _____
Location: _____

CONTRACT : _____

_____

LOCATION: _____

CASH FLOW BY QUARTER AND PAYMENT SCHEDULE

	% WT	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
ACCOMPLISHMENT					
CASH FLOW					
CUMULATIVE ACCOMPLISHMENT					
CUMULATIVE CASH FLOW					

SUBMITTED BY:

DATE: _____

_____

_____

_____