



VICTORIAS CITY WATER DISTRICT

Quirino Street, Victorias City, Negros Occidental
Tel. Nos. (034)399-2865/ 717-6152 Telefax (034)399-3554

Website: victoriacitywd.gov.ph

Email address: victoriacitywd@yahoo.com

Procurement of

CONSTRUCTION

OF TRANSMISSION

LINES SECTION A

2021

November 2021

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Glossary of Terms, Abbreviations, and Acronyms

ABC – Approved Budget for the Contract.

ARCC – Allowable Range of Contract Cost.

BAC – Bids and Awards Committee.

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



VICTORIAS CITY WATER DISTRICT

Quirino Street, Victorias City, Negros Occidental
Tel. Nos. (034)399-2865/ 717-6152 Telefax (034)399-3554

Website: victoriacitywd.gov.ph

Email address: victoriacitywd@yahoo.com

Invitation to Bid for *Procurement of Construction of Transmission Lines Section A 2021*

1. The **VICTORIAS CITY WATER DISTRICT (VCWD)**, through its **2022 Approved Corporate Budget** intends to apply the sum of **Five Million One Hundred Forty Five Thousand Nine Hundred Seventy Six Pesos and Sixty Centavos (PhP 5,145,976.60)**, being the Approved Budget for the Contract (ABC) to payments under the contract for **Procurement of Construction of Transmission Lines Section A 2021 [VCWD-2021-036]**. Bids received in excess of the ABC shall be automatically rejected at bid opening.
2. The **VCWD** now invites bids for the above Procurement Project. Completion of the Works is required **One Hundred Twenty (120) calendar days**. Bidders should have completed a contract similar to the Project. The description of an eligible bidder is contained in the Bidding Documents, particularly, in Section II (Instructions to Bidders).
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 **VCWD Bids and Awards Committee Secretariat** and inspect the Bidding Documents at the address given below from 8:00 A.M. to 5:00 P.M., Monday to Friday.
5. A complete set of Bidding Documents may be acquired by interested bidders on **November 23, 2021 until 11:45 A.M. of December 13, 2021** 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 **Ten Thousand Pesos (PhP 10,000.00)**. The Procuring Entity shall allow the bidder to present its proof of payment for the fees in person, or through electronic means.
6. The **VCWD BAC** will hold a Pre-Bid Conference on **December 1, 2021 at 1:30 P.M.** in the BAC Conference Room at the address below and shall be open to prospective bidders.
7. Bids must be duly received by the BAC Secretariat through **manual submission** at the office address as indicated below, on or before **12:00 P.M. of December 13, 2021**. Late bids shall not be accepted.

The complete schedule of activities is listed, as follows:

Activities	Schedule
1. Advertisement	November 23, 2021 – December 13, 2021
2. Issuance of the Bidding Documents	November 23, 2021 until 11:45 A.M. of December 13, 2021
3. Pre-Bid Conference	December 1, 2021 at 1:30 P.M.
4. Deadline for the Pre-qualification and Submission of Bids	December 13, 2021 at 12:00 P.M.
5. Opening of Bids	December 13, 2021 at 1:30 P.M.
6. Evaluation of Bids	December 14, 2021 at 1:30 P.M.

8. All bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in **ITB** Clause 16.
9. Bid opening shall be on **December 13, 2021 at 1:30 P.M.** at the given address below. Bids will be opened in the presence of the bidders' representatives who choose to attend the activity.
10. The **VCWD** reserves the right to reject any and all bids, declare a failure of bidding, or not award the contract at any time prior to contract award in accordance with Sections 35.6 and 41 of the 2016 revised Implementing Rules and Regulations (IRR) of RA No. 9184, without thereby incurring any liability to the affected bidder or bidders.
11. For further information, please refer to:

Bids and Awards Committee Secretariat
VICTORIAS CITY WATER DISTRICT
 Quirino St., Victorias City, Negros Occidental
 Email address: victoriacitywd@yahoo.com.ph
 Telephone no. (034) 399-3554 / 399-2865/ 717-6152
 Website address: victoriacitywd.gov.ph

12. You may visit the following websites:

For downloading of Bidding Documents:

- <https://notices.philgeps.gov.ph/>
- <http://victoriacitywd.gov.ph/category/bids-and-awards/>

November 2021


CYRINE N. FAMA
Bids and Awards Committee Chairperson

Section II. Instructions to Bidders

1. Scope of Bid

The Procuring Entity, **VICTORIAS CITY WATER DISTRICT** invites Bids for the **Procurement of Construction of Transmission Lines Section A 2021** with Project Identification Number [**VCWD-2021-036**].

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

2. Funding Information

2.1. The GOP through the source of funding as indicated below for **year 2022** in the amount of **Six Million Pesos (PhP 6,000,000.00)**.

2.2. The source of funding is:

VCWD 2022 Approved Corporate 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 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 tradable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.

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

15. Bid Security

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

15.2. The Bid and bid security shall be valid until **March 31, 2022**. 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 (1) original and two (2) copies** of the first and second components of its Bid.

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

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

17. Deadline for Submission of Bids

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

18. Opening and Preliminary Examination of Bids

- 18.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the **IB**. The Bidders' representatives who are present shall sign a register evidencing their attendance. In case videoconferencing, webcasting or other similar technologies will be used, attendance of participants shall likewise be recorded by the BAC Secretariat.
In case the Bids cannot be opened as scheduled due to justifiable reasons, the rescheduling requirements under Section 29 of the 2016 revised IRR of RA No. 9184 shall prevail.
- 18.2. The preliminary examination of Bids shall be governed by Section 30 of the 2016 revised IRR of RA No. 9184.

19. Detailed Evaluation and Comparison of Bids

- 19.1. The Procuring Entity's BAC shall immediately conduct a detailed evaluation of all Bids rated "*passed*" using non-discretionary pass/fail criteria. The BAC shall consider the conditions in the evaluation of Bids under Section 32.2 of 2016 revised IRR of RA No. 9184.
- 19.2. If the Project allows partial bids, all Bids and combinations of Bids as indicated in the **BDS** shall be received by the same deadline and opened and evaluated simultaneously so as to determine the Bid or combination of Bids offering the lowest calculated cost to the Procuring Entity. Bid Security as required by **ITB** Clause 16 shall be submitted for each contract (lot) separately.
- 19.3. In all cases, the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184 must be sufficient for the total of the ABCs for all the lots participated in by the prospective Bidder.

20. Post Qualification

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

21. Signing of the Contract

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

Section III. Bid Data Sheet

Bid Data Sheet

ITB Clause				
5.2	No further instruction.			
7.1	No further instruction.			
10.1	The contractor must include all the brochures of all equipment, materials and goods to be delivered. The contractor must specify the brand and model of all equipment, materials and goods to be delivered.			
10.3	Valid PCAB License, minimum of Small B with Specialty in Water Supply.			
10.4	The key personnel must meet the required minimum years of experience set below:			
	Key Personnel	General Experience (in years)	Relevant Experience (in years)	
	1. Project Manager	15	10	
	2. Project Engineer	5	3	
	3. Materials Engineer	5	3	
	4. Construction Safety Officer	5	3	
	5. Welder	10	5	
	6. Foreman	10	5	
	<i>Note: The Contractor must submit a detailed list of roles, function, and responsibilities of each Key Personnel.</i>			
10.5	The minimum major equipment requirements are the following:			
		Equipment	Capacity	Number of Units
	1.	Backhoe	0.80 cu.m	1
	2.	Dump truck	12 cu.m	1
	3.	Walk Behind Roller (twin drums)	460 kg.	2
	4.	Welding Machine	250 amps.	2
	5.	Plate Compactor	1-2 tons	2
	6.	Water Pump/Dewatering Pump	5 hp	1
	7.	Concrete Cutter	24 inches (blade guard)	2
12	No further instruction.			

15.1	<p>The bid security shall be in the form of a Bid Securing Declaration or any of the following forms and amounts:</p> <p>a. The amount of not less than PhP 102,919.53 [2% of ABC], if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit;</p> <p>b. The amount of not less than PhP 257,298.83 [5% of ABC] if bid security is in Surety Bond.</p>
19.2	Partial bids are NOT allowed.
20	No further instruction.
21	Additional contract documents relevant to the Project that may be required by existing laws and/or the Procuring Entity, such as construction schedule and S-curve, manpower schedule, construction methods, equipment utilization schedule, construction safety and health program approved by the DOLE, and other acceptable tools of project scheduling.

Section IV. General Conditions of Contract

1. Scope of Contract

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

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

2. Sectional Completion of Works

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

3. Possession of Site

4.1. The Procuring Entity shall give possession of all or parts of the Site to the Contractor based on the schedule of delivery indicated in the **SCC**, which corresponds to the execution of the Works. If the Contractor suffers delay or incurs cost from failure on the part of the Procuring Entity to give possession in accordance with the terms of this clause, the Procuring Entity's Representative shall give the Contractor a Contract Time Extension and certify such sum as fair to cover the cost incurred, which sum shall be paid by Procuring Entity.

4.2. If possession of a portion is not given by the above date, the Procuring Entity will be deemed to have delayed the start of the relevant activities. The resulting adjustments in contract time to address such delay may be addressed through contract extension provided under Annex "E" of the 2016 revised IRR of RA No. 9184.

4. The Contractor's Obligations

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

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

5. Performance Security

- 5.1. Within **ten (10) calendar days** from receipt of the Notice of Award from the Procuring Entity but in no case later than the signing of the contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR.
- 5.2. The Contractor, by entering into the Contract with the Procuring Entity, acknowledges the right of the Procuring Entity to institute action pursuant to RA No. 3688 against any subcontractor be they an individual, firm, partnership, corporation, or association supplying the Contractor with labor, materials and/or equipment for the performance of this Contract.

6. Site Investigation Reports

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

7. Warranty

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

8. Liability of the Contractor

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

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

9. Termination for Other Causes

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

10. Dayworks

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

11. Program of Work

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

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

12. Instructions, Inspections and Audits

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

13. Advance Payment

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

14. Progress Payments

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

15. Operating and Maintenance Manuals

15.1. If required, the Contractor will provide “as built” Drawings and/or operating and maintenance manuals as specified in the **SCC**.

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

Section V. Special Conditions of Contract

Special Conditions of Contract

GCC Clause	
2	No further instruction.
4	In case of replacement of key personnel, the Contractor must submit a written notice to the Procuring Entity within seven (7) days of change of Key Personnel.
6	No further instruction.
7.2	Five (5) 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 fourteen (14) 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 <u>PhP 100,000.00</u> .
12	<p>The Procuring Entity shall conduct random inspection. An amount not exceeding <u>PhP 100,000.00</u> shall be withheld for any form of negligence of duties, roles and responsibilities of the Contractor's Key Personnel, this includes non-performance of Key Personnel, absence of site supervision on work/project site, failure of submission of Monthly Report duly signed by the Project Manager and Project Engineer within seven (7) of each completed Month, et al.</p> <p>Non-compliance may result to suspension of work.</p>
13	The amount of the advance payment shall not exceed 15% of the total contract price and schedule of payment.
14	<p>Materials and equipment delivered on the site but not completely put in place shall be included for payment.</p> <p>The Entity shall only release the payment to the Contractor upon concurrence of the veracity of the Monthly Project Milestones as follows:</p> <ul style="list-style-type: none"> (a) 15% Advance Payment for Mobilization; (b) 50% Work Accomplishment; (c) 100% Work Accomplishment. <p><i>Note: Progress payments are subject to retention of ten percent (10%) referred to as the "retention money."</i></p>
15.1	The "as built" drawings are required 30 days upon project completion.
15.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required is <u>PhP 100,000.00</u> .

Section VI. Specifications

1. GENERAL REQUIREMENTS

1.1. GENERAL DESCRIPTION OF WORK

The Works covered in this Contract comprise the provision by the Contractor at his own risk and cost of all materials, shoring, tools, plants, labor, transports, water, power, and attendance, overhead and everything else necessary for the construction, installation and completion of the Works for the **Procurement of Construction of Transmission Lines Section A 2021** to the entire approval of the PROCURING ENTITY.

All materials or workmanship shall comply with the specifications. Other standards superior to those enumerated in this specification shall be acceptable, subject to the approval of the Site Engineer, the authorized representative of the Owner. The opinion of the Site Engineer must be obtained prior to utilizing such materials or workmanship on or off the site.

1.2. PROJECT SITE

The location of the Site is as shown on the Drawings. The Contractor shall be deemed to have inspected the Site before tendering and to take into account all the conditions there, such as means of access, facilities for transport, storage and movement of plants and materials, and any other contingencies liable to affect his tender price, as no claim for extra payment in this connection will be entertained.

The Contractor shall be liable for and shall indemnify the Procuring Entity against any damage, expense, liability, loss, claim or proceedings whatsoever whether arising at common law or by statute in respect of personnel injury to or death of any person whomsoever or to any property arising out of or in the course of or by reason of the visit to the Site.

1.3. PLANS AND SPECIFICATIONS

Any conflict in the plans and specifications and applicable codes and standards, shall be referred to the Site Engineer for evaluation and appropriate action.

1.4. PERMITS

The **procurement and payment of all excavation permits and other permits necessary** in the project implementation shall be the responsibility of the Contractor in the name of the Owner as specified in ***SCC Clause 11. Permits and Licenses***. Cost of permits to be used by the Local Government Units (LGUs) and National Agencies such as the Department of Public Works and Highways (DPWH) shall be deemed as included in the unit prices of every item in the contract. No separate payment will be paid to the Contractor for any permit arising from the work items in the contract.

In addition, the Contractor shall secure a permit to operate from the City Engineer's Office to start any excavation, or work encroachment on any portion of the road lane in the city.

1.5. RIGHT-OF-WAYS

- a. Lands of right-of-way for the Works to be constructed under the Contract will be provided by the Owner or as shown on the Drawings. Nothing contained in the Contract Documents shall be interpreted as giving the Contractor exclusive occupancy of lands or right-of-way provided. Any additional lands or right-of-way required for construction operations shall be provided by the Contractor at his own expense.
- b. Except as may be otherwise be provided, the Contractor shall secure, from the agencies having jurisdiction, the necessary permits to create obstructions, to make excavations if required under the Contract, and to otherwise encroach upon rights-of-way, and present evidence to the Site Engineer that such permission has been granted, before work is commenced. Regulations and requirements of all agencies concerned shall be strictly adhered to in the performance of this Contract, including the furnishing of insurance and bonds required by such agencies. The enforcement of such requirements under this Contract shall not be made the basis for claims for additional compensation.
- c. The Contractor shall not do any work that will affect any oil, gas, sewer, or water pipeline, any telephone, telegraph, or electric transmission line, fence or any other structure, nor enter upon the rights-of-way involved until notified by the Site Engineer that the Owner has secured authority thereof from the proper party. After authority has been obtained, the Contractor shall give said party due notice of his intention to begin work, and shall give said party convenient access and every facility for removing, shoring, supporting or otherwise protecting such pipeline, transmission line, ditch, fence or structure, and for replacing same. The Contractor shall not be entitled to extension of time or extra compensation on account of any postponement, interference, or delay caused by any such pipeline, transmission line, fence, or structure being on line of the work.

1.6. PROTECTION OF PUBLIC AND PRIVATE PROPERTY

In the event the existing laid pipes of the owner, subscriber loop or communication facilities of the telecommunication companies, or any properties owned by the private establishments have been damaged during construction, the Owner will not be held liable or obliged to pay for it. The Contractor must assure that there are no properties, whether owned or not by the Owner, will be damaged; otherwise the Contractor shall be responsible for all the damages resulting from their operations, thus; these must be properly restored to the satisfaction of the private property owner or the agency having jurisdiction over public property.

1.7. BARRICADES AND WARNING LIGHTS

The Contractor shall provide and maintain at least twenty (20) units of barricades at any time, spaced every ten (10) meters of the total length of the pipelaying activities and ten (10) units of battery powered blinking warning lights. These will serve as warning signs to ensure the safety of the motorists and pedestrians during day and night pipelaying activities.

Obstructions such as material piles and equipment shall be provided with similar warning signs and lights.

1.8. TRAFFIC COORDINATION AND MAINTENANCE OF TRAFFIC

Whenever work interferes with the flow of traffic along a roadway, the Contractor shall provide for traffic control and signing and public safety in accordance with the City's local traffic management rules and regulation. The Contractor shall provide traffic aides and watchmen/flagmen, when necessary, to ensure smooth flow of traffic. Where road closures or detours are permitted by the Traffic Management Center (TMC) or any concerned local authorities, the Contractor shall determine the appropriate agencies, boards, or departments the Contractor must notify prior to taking the action and the proper advance notice to be provided to each body.

Coordination with local police department and agencies concerned with vehicular traffic problems shall be the responsibility of the Contractor. Prior to the start of the pipelaying activities, the Contractor shall show proof to the Engineer that the aforesaid coordination was made and shall present to the Engineer for approval that safety arrangement and traffic deviation or rerouting program.

1.9. CLEARING OF ROUTES IN ROADS/STREETS

Routes of the proposed pipelines in roads/streets are shown in the plans. Clearing of said routes shall be the responsibility of the Contractor including the settlement of claims and complaints by the affected public.

1.10. INSPECTION AND TESTING

- a. All materials furnished and all work performed under the Contract shall be subject to the inspection by the **Site Engineer or his representative, an Auditor and a representative from the Engineering Division in charge of the Design and Specification**. Such inspection includes mill, plant, shop, or field inspection as required. The inspectorate team shall be permitted to access to all parts of the work, including plants where materials or equipment are manufactured or fabricated; and they shall be furnished with such materials, information and assistance by the Contractor and suppliers as required to make a complete and detailed inspection.
- b. Work done in the absence of prescribed inspection may be required to be removed and replaced under the proper inspection; and the entire cost of removal and replacement, shall be borne by the Contractor regardless of whether the work removed is found to be defective or not.

- c. The inspectors will make, or have made, such required tests as they deems necessary to insure that the work is being accomplished in accordance with the requirements of the Contract.

In the event such tests conducted reveal non-compliance with the requirements of the Contract, the Contractor shall bear the cost of such corrective measures deemed necessary by the Site Engineer, as well as the cost of subsequent retesting.

- d. For locally manufactured materials and equipment, the Contractor shall require its Supplier to submit in writing to the Site Engineer the schedule/s of production at least five (5) working days prior to start of the Contract.

1.11. PIPE DUMPS AND EQUIPMENT YARDS

The Contractor shall be solely responsible to find a suitable pipe dumps and stores to store the pipes, valves, fittings and other construction materials supplied by or to the Contractor and all the equipment to be used for construction.

The Contractor shall be responsible for obtaining the consent of the owner, tenants or occupier of lands to the use of such land for storing of the pipes, valves and specials; and the yard for the equipment. The Contractor shall pay all cost, expenses, rental, compensation or other disbursement, which may be incurred by him in negotiations with the owner, tenant or occupier and during the subsequent use by him of such land for these purposes. No reimbursement will be made to the Contractor in this respect. The full cost thereof shall be deemed included in the Contract Rates.

1.12. DELAYS AND STOPPAGES

All delays and stoppages in the progress of the Work arising from disputes as to the quantity of materials, the insufficient supply of materials, plants, etc and all damage or injury caused to the work of the Contract, or to the adjoining or adjacent works, buildings, streets, land, etc, in consequence of such delays and stoppages shall be solely and entirely at the risk and cost of the Contractor.

2. INSTALLATION OF PIPELINES

2.1. SCOPE

Includes all requirements pertaining to site clearing, trenching, subgrade preparation, sheeting and bracing, pipe embedment, backfill, and compaction for the installation of mains, hydrants, services, and appurtenances. Includes all other earthwork required to complete the work as specified.

2.2. PREPARATION OF THE WORK AREA

A. DETECTION OF EXISTING UTILITIES AND SERVICES

The Contractor shall investigate, and have full knowledge of the position of existing utilities and underground services such as drains, pipes, electric cables, culverts, etc. He shall take all necessary precaution as part of his work. He shall undertake the following:

1. Detailed utility detection shall be conducted by the Contractor to ascertain the locations of the existing utilities that may be affected by the execution of the works. The type of utility, size and depth shall be clearly identified. It is the responsibility of the Contractor to coordinate and ask the assistance of the concerned agencies/utilities which may be affected in the implementation of the works.
2. Where necessary, trial pits and exploration trenches to ascertain the exact portions of these services shall be excavated, ahead of pipelaying works, in places where they are known or thought to be and elsewhere and these shall be backfilled with approved materials.
3. All damages to the existing services shall be made good to the satisfaction of Procuring Entity and the relevant authorities at no additional cost to the district.

B. SITE CLEARING

The Contractor shall remove and dispose off trees and bushes within the site of the Works as and wherever directed by the Site Engineer. However, all trees and bushes within 2 meters of either side of all pipelines to be laid under the Contract shall be removed and disposed off. Site clearing shall include clearing, grubbing, demolishing, breaking up and removing all trees, shrubs, vegetation, stumps, and structures such as walls, fences and other obstruction within the Site except those which have been designated to be retained. Materials suitable for disposal shall be disposed in city's designated dumpsites. The costs for the transportation of the same to dumpsites shall be borne by the Contractor and should be considered in their bid proposal. It is the responsibility of the Contractor to visit the site and orient himself of the possible dumping areas.

2.3. PIPE HANDLING

The proper handling, moving, and storing of pipe materials should assure the integrity of the materials regardless of size, type or classification.

A. INSPECTION OF DELIVERED PIPE MATERIALS

The pipe materials shall undergo a final inspection at the f the job site. The VCWD representative shall check for the following before accepting the delivery:

1. Damage on any of the pipe materials before or during unloading;
2. Conformity of all piping materials (e.g., pipes, rings, gaskets and fittings) against a shop drawing submitted to the district for quantity and correct sizes and class.

B. LOADING/UNLOADING

The Contractor shall make sure that the pipe materials are not damaged while being loaded or unloaded. The following are prescribed in loading/unloading of pipe materials:

1. If possible, pipe materials should be loaded/unloaded using some form of mechanical lifting equipment. Whatever the method used, it should prevent abuse and damage to the pipe materials.
2. In handling the pipes, no hooks, chains, or similar metal devices should contact the pipe at any failure points.
3. Single slings should not be used. Pipes should be lifted with 2 slings (minimum) at their third points to avoid bending them and cracking their lining or coating.
4. At the jobsite, pipes should be unloaded as near as possible to where they are to be used, so as to avoid excessive handling.
5. Pipes should never be dragged along the ground or road.

C. STACKING/STORAGE

Pipes, fittings and gasket materials should be stacked and stored in accordance with the manufacturer's recommendations. The Contractor shall ensure compliance with the following:

1. All pipes, fittings and gasket material should be kept as clean as possible and be protected from any contamination.
2. Pipe stockpiles should be built on a flat base, above the ground to minimize contamination.
3. The bottom layer should be supported uniformly along the barrel of the pipes to prevent bending.
4. Pipes of the same size and classes should be stacked together.
5. When stacking pipes, the bell ends should project beyond the end of the barrel in alternate layers.
6. Stacks should be kept within the limits of safety and practicality. Generally, a stack should not be more than 1.5 m high.
7. The stacked pipes should be secured against rolling down.

8. HDPE pipes should be protected from sunlight. The stockpiles should be covered with opaque material in a way that permits adequate air circulation above and around the pipe and prevents the excessive accumulation of heat.
9. The interior of the pipes, as well as all end surfaces, should be kept free from dirt and foreign matter from the time they are delivered to their actual installation.
10. Coils may be stored stacked one on top of the other, but they should be kept away from hot surfaces.
11. Short pipes, fittings, adapters and gaskets should be placed in separate piles.
12. When issuing pipes, fittings, adapters and gaskets, the principle of “first in first out” should be followed.

D. STRINGING

Pipe stringing means the unloading of pipes along the line of the trench. If pipes are to be strung, the Contractor shall ensure that the proper practices are applied:

1. Pipes should be laid as near to the trench as safely possible to avoid excess handling.
2. The pipe should be laid on the side opposite the excavated material or equipment, or, if trench is not yet opened, opposite where these will be positioned.
3. Pipes should be secured against rolling into the trench and kept safe from traffic and heavy equipment.
4. The bell end of the pipe should be placed towards the direction of the work, as during the installation, the spigot end will enter the bell end of the previously laid section.
5. Lifting equipment should be used to lower larger pipes; for which a webbing sling should be attached to the pipe.
6. The pipe ends should be covered to prevent contamination and entry of any object.

2.4. EARTHWORKS

A. GENERAL

Except when specifically provided to the contrary, excavation shall include the removal of materials of whatever nature encountered, that would interfere with the proper execution and completion of the work. Except for

obstructions from other utilities (PLDT, NONECO & DPWH), the Contractor shall take extra care as to prevent damages. The Contractor shall take full responsibility as to whatever damage he may encounter. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such materials shall be removed from the site prior to performing any excavation or placing any fill. The Contractor shall secure permits and clearances from Department of Environment and Natural Resources (DENR) concerning the cutting of trees if needed and shall provide the materials required. The Contractor shall furnish, place and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching or other approved measures for the removal or exclusion of water, including taking care of storm water and waste water reaching the site of the work from any source. The walls and faces of all excavations in which workers are exposed to danger from unstable ground shall be guarded against by a shoring system, sloping of the excavation, or some other acceptable method. The Contractor shall furnish, install and maintain such sheeting, bracing, etc., as may be necessary to protect the workers and to prevent any movement of earth which could injure or delay the work or endanger adjacent structures. In excavations which workers may be required to enter, excavated or other material shall be effectively stored and retained at least 60 cm or more from the edge of the excavation.

All excavation and trenching operations shall conform to any and all national, provincial and local safety requirements.

For longitudinal excavations, the maximum length for open continuous excavation per street shall be **150 meters**. This shall be fully backfilled and made passable to traffic and continuously maintained in good condition until fully restored before another strip of the same maximum length shall be excavated. For long projects extending to kilometers along a road, **150 meters** excavated strips may be made at each end or at **300 meters** distances.

B. PIPELINE EXCAVATION

1. General

The trench for underground pipelines should be kept as narrow and shallow as practical for safety and economic considerations. The trenching work also entails clearing or grubbing and staking of the trench line.

2. Trenching

- a. The trench should be straight, with vertical sides centered on the pipe centerline.

- b. Trench excavation should not extend too far ahead of pipe laying for safety reasons. An open trench presents a danger to the construction crew and the public, especially after working hours. The maximum length of open trench permitted at any one time and in one location shall be **150** meters, or the length necessary to accommodate the amount of pipe installed in single day, whichever is greater.
- c. No trenching should be allowed to start and proceed without the required *warning devices, barricades, signals and flaggers*.
- d. Local regulations should be observed. Usually these require that some sections of an open trench should be filled up or protected in specific ways overnight in order not to disrupt certain services and emergency vehicles should be observed.
- e. If the trench is below asphalt or concrete pavements, power saws should be used to ensure smooth edge cuts.
- f. All asphalt or concrete debris should be hauled away before the excavation starts to prevent their use as backfill material.

3. Trench Widths and Depth

- a. The trench width , including any shoring shall have a minimum width equal to the outside diameter (O.D) of the pipe plus **300 mm (12 in.)** and a maximum width equal to the outside diameter of the pipe plus **600 mm (24 in.)**. (See Table of Trench Dimension):
 - The minimum of **0.15 m** on each side of the pipe permits proper installation and adequate room to properly place the backfill under and around the pipe.

TABLE OF TRENCH DIMENSION (IN METERS)												
PIPE DIAMETER	in.	3" & UNDER	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	mm	75 mm & UNDER	100	150	200	250	300	350	400	450	500	600
MINIMUM "W"	m	0.20	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.90
MAXIMUM "W"	m	0.30	0.70	0.75	0.80	0.85	0.90	0.95	1.00	1.05	1.10	1.20

- The **0.30 m** on each side prevents excessive loading directly on the pipe during backfilling.
 - b. For curve alignments, the trench width should be greater than usual to accommodate the permissible deflection of the joints.
 - c. Where the pipe is to be welded, bell holes must be excavated large enough for a welder to properly work without obstruction. Bell holes should be laid out and excavated just before the pipe section is laid, to ensure that the hole falls at the location of the joint.
4. Other Trench Specifications
- a. When the ground is unstable, the trench walls may have to be “stepped” or “sloped”. The trench wall slope should be at about $\frac{3}{4} : 1$ and must not extend below the top of pipe
 - b. The trench bottom must be uniform. It should be free of humps, abrupt changes of direction, hard objects, large stones, and tree roots. (See “Trench Bedding” below.)
 - c. Where surface loads will be encountered, the depth of the trench should be sufficient to allow for the pipe diameter, bedding, and the minimum recommended **pipe cover of 0.9 m**. Vehicles should not be allowed to pass over the line of pipe under shallow cover until the backfill has completely compacted.
 - d. Water must be kept out of the trench during construction so that the pipe will not become contaminated. Pumps should be used in the trench, if necessary, to remove any buildup of water.

5. Trench Bedding

Bedding usually refers to the material in which the pipe is partially or completely embedded. Proper pipe bedding increases the load bearing capacity of the pipe. The bedding required depends on the pipe material, size, and loading over the backfilled trench. For trench bedding, refer to figure below; otherwise refer to the bedding requirement indicated in the pipelaying drawings.

The Contractor shall ensure that the proper bedding shall meet the following conditions:

- a. The trench bottom must be properly leveled and compacted so that the full length of the pipe will have continuous, firm support.
- b. Bedding material should be spread over the trench bottom to the full width of the trench.

- c. Bedding material should be well-graded granular material up to 25 mm in size.

6. Trench Over-Excavation Where Shown

The trenches shall be over-excavated where shown, to the depth shown, then backfilled to the grade of the bottom of the pipe with suitable selected granular material or with sand. Said backfill shall be brought to the optimum moisture content and compacted to ninety-five percent (95%) of maximum density under proposed structures, and ninety percent (90%) elsewhere. Work specified in this subsection shall be performed by the Contractor at his own expense.

7. Trench Over-Excavation to Clear Obstructions

Trenches shall be over-excavated to the depth approved by the Site Engineer for pipeline clearance of obstruction. All work specified in this subsection shall be performed by the Contractor at his own expense when the over-excavation plus the cover of the pipe measured to existing ground surface does not exceed 1.5 meters; when the additional over-excavation plus the cover of the pipe measured to existing ground surface exceeds 1.5 meters, additional payment will be made to the Contractor for that portion of work located below said depth. Said additional payment will be made under separate unit price bid items for over-excavation if such bid items have been established; otherwise, payment will be made in accordance with negotiated price.

8. Trench Over-Excavation when Ordered

Trenches shall be over-excavated beyond the depth shown when ordered by the Site Engineer. Such over-excavation shall be to the depth ordered. The trench shall then be refilled to the grade of the bottom of the pipe with either selected granular material obtained from the excavation, sand, or crushed rock, at the option of the Site Engineer. When crushed rock bedding is ordered, well-graded material of 40 mm (1.6 in.) maximum size shall be used. Bedding material shall be placed in layers, brought to optimum moisture content, and compacted to ninety-five percent (95%) of maximum density where the pipeline trench passes under structures, and ninety percent (90%) elsewhere. Payment will be made under separate unit price bid item for furnishing and installing bedding and backfill if such bid items have been established; otherwise, payment will be made in accordance with negotiated price.

9. Over-Excavation not ordered, Specified, or Shown

Any over-excavation carried below the grade ordered, specified, or shown shall be refilled to the required grade with suitable selected granular material by the Contractor at his own expense. Such material shall be moistened as required and compacted to ninety-five percent (95%) of maximum density.

10. Excavation in Road Crossing

Any excavation in cross-roads, install 24-in concrete culvert through the width of the road. Afterwards, backfill the trench immediately to easily accommodate both pedestrian and vehicular traffic. The pipelaying of pipes will all pass through the concrete culvert.

11. Disposal of Excavated Material

The Contractor shall remove and dispose all excavated material at his own expense and in a manner approved by the Site Engineer.

12. Excavation in Vicinity of Trees

Except where trees are shown on the drawings to be removed, trees shall be protected from injury during construction operations; and no tree is to be removed without written permission from the Site Engineer. No tree roots over 50 mm (2 in.) in diameter shall be cut without permission of the Site Engineer. Trees shall be supported during excavation as may be directed by the Site Engineer.

13. Rock Excavation

Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 0.25 cubic meters (0.33 cubic yards) or more in volume; (2) all rock material and ledges, bedding deposits, and un-stratified masses which cannot be removed without systematic drilling and blasting. Said rock excavation shall be performed by the Contractor at his own expense provided that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the Contractor price will be made under a separate additive – deductive bid item if such bid item has been established; otherwise payment or deduction in the Contract amount shall be made in accordance with a negotiated price.

2.5. LAYING PIPES

After the trench bottom has been prepared, the pipes may be set in place. The following general directions for laying pipes apply to all types.

A. PREPARATION/PRELIMINARY INSPECTION

Before the pipes are lowered into the trench, the following must be ensured:

1. Pipes should be free from damage. Any unsatisfactory sections should be rejected.
2. The inside of each pipe length should be clean. Any dirt, oil, grease, animals, and other foreign matter should be removed.

B. PLACEMENT OF THE PIPES

1. A pipe should be lowered into the trench by mechanical equipment, if possible. It should never be rolled into the trench from the top. A smaller diameter pipe may be lowered into the trench by two people using ropes, one rope looped around near each end of the pipe.
2. Larger pipe sizes are best handled with appropriate equipment. When a pipe is lowered by machinery, it shall be supported by a sling in the middle of the pipe length. The sling must be removed once the pipe is down.
3. Pipes jointed by coupling may be laid in either direction. Belled-end pipes are normally laid with the bells facing in the direction in which the work progresses, except downhill, where the direction is reversed.
4. A conscious effort should be made to keep the inside of the pipe clean. When pipes are not being laid, the open ends of installed pipes should be plugged to prevent the entry of animals, dirt, and trench water.
5. It is very important for the entire length of the pipe sections to be evenly in contact with the ground.
6. Pipe lengths should never be deflected in the joints to any degree than that recommended by the manufacturer.

2.6. BACKFILLING AND COMPACTING

A. BACKFILLING

Prior to the hydrostatic testing of pipes, selected sandy material is placed **0.15 m** over the pipeline, leaving the joints exposed for observation during leakage tests. A portion of the material is used for the remainder of the trench to furnish weight to resist movement due to pressure.

1. Clean granular material such as sand and gravel is generally recommended for the first layer of backfill. This can be either suitable existing soil or soil introduced from another source.
2. Before backfilling, water should be removed from the trench using a pump or other means.

3. Backfill always follows pipe installation as closely as possible. This protects the pipe from falling boulders, eliminates the possibility of the pipe being lifted due to flooding of the open trench, and avoids the pipe shifting out off line due to cave-ins.
4. The first layer of backfill should be shoveled evenly along both sides of the pipe, making a layer about 0.15 m thick. Then the tamping bar is used to tamp this soil firmly around the pipe.
5. An initial backfill should be placed around the upper half of the pipe and compacted, by hand or by approved mechanical equipment, to avoid damage or movement of the pipe. The trench should be filled in layers to a depth of 0.30 m. This initial backfill will protect the pipe during the remainder of the backfilling process.
6. The remainder of the trench should be backfilled by placing the material in layers and compact the layers thoroughly. This backfill does not need to be as carefully selected, placed, or compacted. The fill should, however, be uniformly dense.
7. If trenches are in a road right-of-way or where there will be a sidewalk, the completed backfill must meet the compaction requirements of the agency concerned. Backfill in other trenches need not be compacted to such a degree.

B. COMPACTING

The Contractor shall make sure that the backfill be done gently and thoroughly to the satisfaction of the Site Engineer. The key to it is in the amount of soil that is thrown in to be tamped around the pipe. Generally, compacting of the backfill can be done in one of three ways:

1. *Manual Compacting or Hand Tamping*

Hand tamping may be done in the area adjacent to and immediately above the pipe. Two types of tamping bars are required for a complete job. First, a bar with a narrow head or blade is used to tamp under the couplings. Then a bar with a flat head is used to compact soil at the sides of the pipe. These bars are quickly fabricated in the shop and can be used to easily do a satisfactory job

2. *Mechanical Compaction*

Mechanical compaction is normally done when settling must be kept to a minimum and when the backfill must support the surface loads. The equipment used for this purpose is often mechanically driven, and the backfill must be placed and compacted in 0.15-0.30 m lifts.

C. **BACKFILL MATERIALS FOR PIPE TRENCHES**

1. Native Backfill – native materials (except clay, silt, muck) that are free from grass, roots, or other vegetation, boulders or rock having maximum dimensions less than 75mm may be used as native backfill. For alleys and roads not subject to traffic load, excavated materials may be used as backfilling materials above pipe zone provided it is properly tamped to attain 90% compaction.
2. Imported Backfill – Any earth material (except clay, silt, muck) and satisfying the specification for native backfill may be used to replace unsuitable material. If excavated material from trench excavation is not suitable for backfill as mentioned in item 1, imported or borrow materials from approved source shall be used.
3. Sand Bedding – Sand bedding unless, otherwise specified, shall be borrowed material, the cost of which is included in the unit cost of the pipelaying and with minimum characteristics specified herein. In case selected bedding material from trench is suitable, corresponding cost shall be deducted from the cost of pipelaying.

Material that is free of organic matter does not contain stone or rock fragments larger than 10mm in greatest dimensions and non-cohesive shall be used as selected sandy material. Not more than 50% of the material shall pass the No. 200 sieve (0.075mm).

3. SURFACE RESTORATION AND PAVING

3.1. **GENERAL**

The Contractor shall furnish all materials, labor, plant, and equipment for the removal of all pavement, sidewalks, curbs and gutters, fences, poles, driveways, walks, other property, and surface structures that are necessary for the proper prosecution of the work, but only upon approval of the parties having jurisdiction thereof and of the Site Engineer. Unless otherwise shown, the Contractor shall restore at his own expense all property removed or destroyed by its operation at least equal to conditions prior to work under this Contract or to the satisfaction of the property owner.

3.2. **REMOVAL OF EXISTING PAVEMENT**

- a. In cutting or breaking up street surfacing required for the performance of the work, the Contractor shall not use equipment which will damage the adjacent pavement. All concrete pavement surfaces to be removed shall be scored with concrete sawing equipment; provided, that any Portland cement concrete based under asphaltic mix surface will not be required to be scored by sawing. Asphaltic concrete pavement shall be removed to clean straight lines.

The Contractor shall remove the pavement and road surfaces as part of the trench excavation, and the amount removed shall not exceed the maximum width of trench for pipelines as indicated on the drawings, unless otherwise ordered in writing by the Site Engineer.

The width of the pavement area required to be removed for the installation of the valves, valve chambers, spirals, or other structures shall not exceed the maximum linear dimensions of such structures by more than 0.30 meters on each side.

The width of the pavement area required to be removed for the transfer and installation of service connections shall not exceed the maximum width as shown on the Drawings.

- b. Concrete sidewalks, curbs and gutters required to be removed in connection with performing the work under the contract shall be cut to the nearest score marks and shall be replaced with the same kind or better materials in accordance with the latest specifications, rules and regulations, and subject to inspection and approval of the agency having jurisdiction.
- c. The cutting width of the concrete pavement area for the trench preparation shall be **1.0, 0.5 & 0.45 meter** and for the gravel pavement shall be **0.5 & 0.45 meter** or as shown in the plans. Consideration of the thickness for the concrete pavement demolition shall be **0.10 meter, 0.30 meter and 0.35 meter for concrete & gravel road and 0.1 for the asphalt or as shown in the plans.**

3.3. RESTORATION OF DAMAGED SURFACE PROPERTY

Except where shown on the drawings or specified otherwise, any pavement, shrubbery, fences, poles and other property and surface structures which have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, city ordinances or the specific directions of the Site Engineer, or through failure to employ usual and reasonable safeguards, shall be replaced or repaired at the expense of the Contractor.

3.4. REPLACEMENT OF SURFACE STRUCTURE AND PRIVATE PROPERTY

Except where shown in the drawings, the Contractor shall restore all private property and surface structures removed or disturbed as a part of the work to a condition equal to that before the work began. He shall also furnish all labor and materials incidental thereto at his own expense.

3.5. TEMPORARY RESURFACING AND REPAVING

- A. Immediately upon completion of backfilling of the trench or excavation in paved areas, the Contractor shall place a temporary road, at least **40mm (1.5 in.)** in thickness, over all disturbed areas of the streets, paved driveways, alleys, and other traveled places where the original surface has been disturbed by its operation. The temporary pavement shall be of a character satisfactory in all respects and safe for public travel. The temporary surfacing may consist of compacting **Item 201** or Earthfill material or as directed by the Site Engineer. The surface of all temporary repaving shall conform to the street grades. The temporary repaved surfaces and trenches shall be covered with a **20mm -1.219 x 2.438 meters (ASTM A36)** “Steel Plates” to ensure safety of the motorist and pedestrians during pipelaying activities. The temporary repavement shall be maintained by the Contractor at his own expense until permanent surfacing is completed. The Contractor shall immediately remove and replace in a satisfactory condition any and all such pavement as shall become unsatisfactory and not in accordance with the terms and intent of the specification and incompliance with the terms and condition of the excavation permit issued by the City Engineer’s Office or the DPWH. Upon completion of the substantial parts of the project but not before the pipelines has been tested for pressure and leakage, the temporary resurfacing shall be replaced with permanent resurfacing.

3.6. PAVING

A. GENERAL

Paving materials and methods of construction shall be in accordance with referenced sections of the latest edition of the **DPWH Standard Specifications for Public Works and Highways, Republic of the Philippines**. Thickness and extent of base course, paving course and other construction details are as shown on the Drawings. All provisions contained in the referenced Standard Specifications involving “measurement” and “payment” are not applicable to work performed in this Contract.

B. BORROW

When sufficient suitable material is not available from the roadway excavations, additional “borrow” materials shall be obtained from other sources at no extra cost to the Owner.

C. SUBGRADE PREPARATION

This item shall consist of the preparation and conditioning of the subgrade to the full width of the roadbed in accordance with Item 105 of the referenced and in conformity with the lines, grades, and cross sections shown on the plans.

D. AGGREGATE SUB-BASE COURSE

This item shall consist of a foundation of the surface course, composed of gravel or crushed stone and filler materials in accordance with **Item 200** of the referenced Standard Specifications (*DPWH Standard Specifications for Public Works and Highways, Republic of the Philippines*). Grading shall be as indicated in Table 200.1 – Grading Requirements of the referenced standards.

E. BITUMINOUS CONCRETE SURFACE COURSE

This item shall consist of a pavement composed of bituminous concrete on a prepared base in accordance with Item 301 of the referenced Standard Specifications.

F. PORTLAND CEMENT CONCRETE PAVEMENT

This item shall consist of a pavement composed of Portland cement concrete on a prepared base in accordance with **Item 311** of the referenced Standard Specifications.

G. STRENGTH REQUIREMENT

The pavement, either concrete or asphalt, shall be restored to its original design, strength and thickness. For concrete, use three **(3) to seven (7) days** curing period for major thoroughfares and other national roads, both attaining flexural strength of **550 psi** and comprehensive strength of **4,000 psi** as shown in test results.

4. PIPING WORKS

4.1. GENERAL

- A. The Contractor shall furnish and install all pipes, fittings, closure pieces, supports, bolts, nuts, gaskets, joining materials, and appurtenances as shown and specified in the plans, and as required for a complete and workable piping system. Shop drawings of all piping shall be furnished in accordance with Section VII. Clause 2. “Shop Drawing”.
- B. All bolts, anchor bolts, nuts, and studs in the assembly of piping shall be Hot- Dipped galvanized per TS-20 and then coated with two coats of coal tar epoxy after installation.
- C. All exposed piping shall be adequately supported with devices of appropriate design. Where details are shown, the supports shall conform thereto and shall be placed as indicated; provided that support for all piping shall be complete and adequate regardless of whether or not supporting devices are specifically shown.
- D. All pipes shall be laid in a uniform profile as shown on the drawings.

- E. All protective barrier materials (cement, paints, coatings, and linings), joining and sealing materials (gaskets, adhesives, and lubricants), mechanical devices (water meters, valves, and filters), pipes and related products (pipe, hose, and fittings) shall be in compliance with **NSF/ANSI 61 Drinking Water System Components-Health Effects**.

For lead content, materials shall be evaluated in accordance with NSF/ANSI 372 – Drinking Water System Components-Lead Content. Testing shall be conducted in any government accredited testing laboratories. Test results shall be submitted to the Procuring Entity for conformation prior to the pre-manufacturing inspection.

4.2. PE (POLYETHYLENE) PLASTIC PIPE

a. Materials

1. General - The pipes shall be manufactured from polyethylene containing only those antioxidants, UV stabilizers and pigments necessary for the manufacture of pipes conforming to this specification and for its end use, including weldability when us possible. The pipes for drinking water shall be either black or blue or black with blue stripes. For black pipes, the carbon black content in the compound shall be (2.25t 0.25)% by mass, when measured in accordance with ISO 6964. The use of the color blue or black with blue stripes shall be specified in accordance with national requirements. The material for the stripes shall be of the same type of resin as used in the base compound for the pipe.
2. Dispersion of Pigments in Compounds - When determined in accordance with ISO 11420, the dispersion of the carbon black shall be equal to or less than grade 3. When determined in accordance with ISO 13949, the dispersion of blue pigments shall be equal to or less than grade 3.
3. Thermal Stability-When determined in accordance with ISO/TR 10837, the induction time for materials PE 63, PE 80, and PE 100 shall be either at least 20 minutes when tested at 200°c or an equivalent period when tested at 210°C, provided the equivalence is supported by a clear correlation between results obtained at 200°C or210°C, respectively. In cases of dispute, the test temperature shall be 200°C.
4. Reworked material - Clean reworked material generated from a manufacturer's own production of pipe in accordance with this specification may be used if it is derived from the same resin as used for the relevant production.

b. Effect on water quality

1. When used under conditions for which they are designed, materials in contact with or likely to come into contact with drinking water shall not constitute a toxic hazard, shall not support microbial growth and shall not give rise to unpleasant taste or odor, cloudiness or discoloration of the water.
2. The concentrations of substances, chemicals and biological agents leached from materials in contact with drinking water, and measurements of the relevant organoleptic physical parameters, shall not exceed the maximum values recommended by the World Health

Organization in its publication Guidelines for Drinking Water Quality, Volume I Recommendations, or as required by the ECC Council Directive of July 1980 on the quality of water intended for human consumption, whichever is the more stringent in each case. Conformance to this provision shall be certified by a testing institute accredited by the Bureau of Product Standards.

c. Designation and classification

1. The compound shall be designated by the material type (e.g. PE 80) conforming to the applicable level of minimum required strength (MRS) specified as follows:

Designation of Material.	MRS. at 50 yrs and 20°C, Mpa	Maximum allowable hydrostatic design stress σ_s , Mpa
PE100	10	8
PE80	8	6.3
PE63	6.3	5

when the lower confidence limit σ_{LCL} for the compound is determined in accordance with ISO/TR 9080 and this σ_{LCL} is classified in accordance with ISO 12162 to obtain the MRS.

d. Melt flow rate and density

1. When measured in accordance with ISO 1133, the melt flow rate shall conform to the following conditions:
 - a. The melt flow rate of the compound shall not deviate by more than $\pm 30\%$ from the value specified by the manufacturer.
 - b. The change in MFR caused by processing, i.e. the difference between the measured value for material from the pipe and the measured value for the compound, shall not be more than 25%.

e. Geometrical Characteristics

1. The dimensions of pipes shall be measured in accordance with ISO 3126.
2. Nominal outside diameters shall conform to ISO 161-1. The selected outside diameters and the wall thickness in accordance with the selected nominal pressures are given as follows:

For polyethylene pipes PE 100 (PE 3408) with design stress σ_s of 8 Mpa

Nominal Outside Diameter d_n , mm	S8/SDR 17/ PN 10	Nominal Wall Thickness, e_n , mm	
		S6.3/SDR 13.6/ PN 12.5	S5/SDR 11/ PN 16
20	-	-	2.3
25	-	-	2.3
32	2.3	2.4	3.0
50	3.0	3.7	4.6
63	3.7	4.7	5.8
75	4.5	5.6	6.8
90	5.4	6.7	8.2
110	6.6	8.1	10.0
160	9.5	11.8	14.6
200	11.9	14.7	18.2
225	13.4	16.6	20.5
280	16.6	20.6	25.4
315	18.7	23.2	28.6
355	21.1	26.1	32.2
400	23.7	29.4	36.6
450	26.7	33.1	40.9

For polyethylene pipes PE 80 (PE 2406) with design stress σ_s of 6.3 Mpa

Nominal Outside Diameter d_n , mm	Nominal Wall Thickness, e_n , mm				
	S10/SDR 21/ PN 6	S10/SDR 17/ PN 8	S6.3/SDR 13.6/PN 10	S5/SDR 11/ PN 12.5	S4/SDR 9/ PN 16
20	-	-	-	-	2.3
25	-	-	-	2.3	2.8
32	-	2.3	2.4	3.0	3.6
50	2.4	3.0	3.7	4.6	5.6
63	3.0	3.8	4.7	5.8	7.1
75	3.6	4.5	5.6	6.8	8.4
90	4.3	5.4	6.7	8.2	10.1
110	5.3	6.6	8.1	10.0	12.3
160	7.7	9.5	11.8	14.6	17.9
200	9.6	11.9	14.7	18.2	22.4
225	10.8	13.4	16.6	20.5	25.2
280	13.4	16.6	20.6	25.4	31.3
315	15.0	18.7	23.2	28.6	35.2
355	16.9	21.1	26.1	32.2	39.7
400	19.1	23.7	29.4	36.3	44.7
450	21.5	26.7	33.1	40.9	50.3

For polyethylene pipes PE 63 with design stress σ_s of 5 Mpa

Nominal Outside Diameter d_n , mm	Nominal Wall Thickness, e_n , mm							
	S16 SDR 33 PN 3.2	S12.5 SDR 26 PN 4	S8.3 SDR 17.6 PN 6	S8 SDR 17 PN 6.3	S6.3 SDR 13.6 PN 8	S5 SDR 11 PN 10	S4 SDR 9 PN 12.5	S3.2 SDR 7.4 PN 16
20	-	-	-	-	2.3	2.3	2.3	2.3
25	-	-	2.3	2.3	2.3	2.3	2.8	3.5
32	-	-	2.3	2.3	2.4	2.9	3.6	4.4
50	-	2.3	2.9	3.0	3.7	4.6	5.6	6.9
63	2.3	2.5	3.6	3.8	4.7	5.8	7.1	8.6
75	2.3	2.9	4.3	4.5	5.6	6.8	8.4	10.3
90	2.8	3.5	5.1	5.4	6.7	8.2	10.1	12.3
110	3.4	4.2	6.3	6.6	8.1	10.1	12.3	15.1
160	4.9	6.2	9.1	9.5	11.8	14.6	17.9	21.9
200	6.2	7.7	11.4	11.9	14.7	18.2	22.4	27.4
225	6.9	8.6	12.8	13.4	16.6	20.5	25.2	30.8
280	8.6	10.7	15.9	16.6	20.6	25.4	31.3	38.3
315	9.7	12.1	17.9	18.7	23.2	28.6	35.2	43.1
355	10.9	13.6	20.1	21.1	26.1	32.2	39.4	48.5
400	12.3	15.3	22.7	23.7	29.4	36.3	44.7	54.7
450	13.8	17.2	25.5	26.7	33.1	40.9	50.3	61.5

3. The tolerances on the outside diameters shall be in accordance with ISO 11922-1, Grade A for normal tolerance (NI) pipes, and Grade B for close tolerance (CT) pipes.
4. Nominal wall thickness e_n shall be in accordance with ISO 4065. The tolerance on the minimum wall thicknesses ($e_{y, \min}$) permitted at any point shall conform to ISO 11922-1, i.e. Grade T for $e_{y, \min} \leq 16$ mm and Grade U for $e_{y, \min} \geq 16$ mm.
5. The ovality of pipes at the manufacturer after extrusion but prior to coiling shall conform to ISO 11922-1, specifically Grade N for PE 63, PE 80, and PE 100.
6. The minimum diameter of a drum of coiled pipe shall be $18 \times d_n$, and in any case such that kinking of the pipe is prevented.
7. The length of straight pipes and coils shall not be less than that agreed between the supplier and user.

f. Mechanical Properties

1. Hydrostatic Strength - When tested in accordance with ISO 1167, the pipes shall conform to the following requirements:

Pipe Material	100h at 20°C	Test Stress, Mpa	1000h at 80°C
		165h ¹ at 80°C	
PE 100	12.4	5.5	5.0
PE 80	9.0	4.6	4.0
PE 63	8.0	3.5	3.2

¹only brittle failures are taken into account

2. Retest in cases of failure at 80°C -A brittle fracture in less than 165h shall constitute a failure. If, in the 165h test, a test piece fails in a ductile mode in less than 165h, a retest shall be performed at a lower stress. The new stress, and the new minimum failure time, shall be selected from the line through the stress/time points given below:

<u>PE 63</u>		<u>PE 80</u>		<u>PE 100</u>	
Stress	Minimum	Stress	Minimum	Stress	Minimum
Mpa	Failure Time, h	Mpa	Failure Time, h	Mpa	Failure Time, h

3.5	165	4.6	165	5.5	165
3.4	285	4.5	219	5.4	233
3.3	538	4.4	283	5.3	332
3.2	1000	4.3	394	5.2	476
		4.2	533	5.1	688
		4.1	727	5.0	1000
		4.0	1000		

g. Physical Characteristics

1. Thermal stability of pipes manufactured from PE 63, PE 80 and PE 100 – When determined in accordance with ISO/TR 10837, the induction time for test specimens taken from pipes manufactured from PE 63, PE 80 and PE 100 shall be either at least 20 minutes when tested at 200°C, or an equivalent period when tested at 210°C, provided the equivalence is supported by a clear correlation between results obtained at 200°C or 210°C, respectively. The test specimens shall be taken from the inside surface of the pipe.
2. Longitudinal Reversion - The value of the longitudinal reversion shall not be greater than 3%, when determined in accordance with ISO 2505-1, method A or B, using 110°C±2°C for PE 63, PE 80 and PE 100, and the test time given in ISO 2505-2. For pipes with an outside diameter greater than 200 mm, longitudinally cut segments may be used.
3. Weathering of non-black pipes - To determine the effects of weathering, pipes shall be exposed to outdoor conditions in accordance with the procedures adopted by the Bureau of Product Standards and described in ISO 4607. After exposure to a total solar energy of at least 3.5 GJ/M², the pipe shall conform to the following requirements:
 - Hydrostatic strength, when determined with f.1 at 80°C for at least 165h, shall be the minimum required.
 - The elongation at break, when determined in accordance with ISO 6259-1 and ISO 6259-3, shall not be less than 350%;
 - The induction time, when measured in accordance with ISO/TR 10837 using a test specimen taken from the outside surface of the pipe, shall be at least -10 minutes at 200°C.
- h. Fusion compatibility - If pipes manufactured from PE 63, PE 80 or PE 100 are to be joined by butt fusion or using electrofusion fittings mixing different pipe materials, the joints shall conform to the requirements specified in f.1 (80°C/165h). Compounds designated PE 63, PE 80 or PE 100 having a melt flow rate MFR (190°C/5kg) within the range 0.2g/10 min to 1.3g/10min shall be considered compatible for fusion to each other.
- i. Marking - All marking on the pipes shall be thermally printed at maximum intervals of 1 meter.

The marking shall indicate at least the following information:

- the manufacturer's name and/or trademark
 - the Bureau of Product standards "Q" check mark
 - the number of this PNS standard
 - the dimensions (nominal outside diameter x normal wall thickness)
 - the outside diameter tolerance (A or B)
 - the designation of the pipe material (e.g. PE 100, PE 80, PE 63)
 - the nominal pressure (PN)
 - the pipe series (S or SOR)
 - the production period (date or code)
 - the number of the national standard
 - the words "potable water" have to be included if the pipe is intended for drinking water
 - other markings that may be specified by the owner
- j. Sampling and Testing Schedule - The manufacturer shall adhere to the following sampling and testing schedule as specified by PNS ISO 4427: 2002 Annex B as follows:

Requirements	Minimum Frequency per Extruder
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General Requirements

1. Diameter and wall thickness	Per roll/hourly
2. Length	Every 8 hours
3. Appearance	Every 8 hours

Type Test

1. Material	Every 6 months or every change of material brand/pipe
2. Carbon Black	-do-

- | | |
|------------------------------------------|------|
| 3. Weathering & Thermal Stability | -do- |
| 4. Effects of Materials on Water Quality | -do- |
| 5. Density | -do- |
| 6. Melt Flow Rate | -do- |

MRS Test

10,000 hr test for master batches	Every change of material Supplier/ Brand
-----------------------------------	------------------------------------------

Hydrostatic Strength

- | | |
|-----------------|--------------------------------------------------|
| 1. 100 hr test | Every 6 months or every change of material brand |
| 2. 165 hr test | -do- |
| 3. 1000 hr test | -do- |

Quality Control Test

Longitudinal Reversion	Every 8 hours
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5. VALVES

5.1. GATE VALVES

a. Valves

This section applies to gate valves 50mm (2in.) through 300mm (12in.) in sizes. All valves shall confirm with the “Standard for Resilient seated Gate Valves” (AWWA C509). Gate valves where the pipeline design pressure is 1.0MPa (150psi) or less shall be designed for a minimum water working pressure of 1.0 MPa (150psi) and shall be cast iron bodied, the resilient seats applied to the body or gate. Discs shall be cast iron with bronze disc rings, and the seat shall be bronze and replaceable. The valve shall be non-rising stem with a minimum of two “O” ring seal as (at least one above the stem collar), or rising stem when shown on the

drawings. The valves shall have a 50 mm (2 in.) square operating nut with a cast arrow showing direction in which the nut is to be turned to open the valve. Valves shall be constructed to permit the placement of the "O" rings above the stem collar under full working water pressure with the valves in the full open position. The valves shall be coated in accordance with Division 5 – Painting and Coatings.

b. Testing Requirements

1. Operation Test – Each valve shall be operated in the position for which it was designed to ensure free and perfect functioning of all parts in the intended manner. Any defects of workmanship shall be corrected and the test repeated until satisfactory performance is demonstrated.
2. Shell Test – A hydrostatic test pressure equal to twice the rated working pressure of the valve shall be applied to the body with the gate in the open position. The test shall show no leakage through the metal, flanged joints, or stem seals.
3. Seal Test – A test shall be made at rated working pressure to prove the sealing ability of each valve from both directions of flow. The test shall allow no leakage through the metal, pressure-containing joints, or past the seat.
4. Hydrostatic Test – One prototype valve of each size and class of a manufacturer's design shall be hydrostatically tested with twice the specified rated pressure applied to one side of the gate and zero pressure on the other side. The test is to be made in each direction across the gate. Under this hydrostatic test, the manufacturer may make special provisions to prevent leakage past the seats. No part of the valve or gate shall be permanently deformed by the test.
5. Torque test – A prototype of each size should be over torque in the closed and open positions to demonstrate no distortion of the valve stem or damage to the resilient seat as evidenced by failure to seal at rated pressure. The applied torque shall be 250 ft-lb for 3 and 4 NRS valves, and 350 ft-lb for 6, 8, 10, and 12 NRS valves (1.0 ft-lb=0.736 Newton-meter=0.66 kg-m).
6. Leakage Test – Two prototype valves of each size chosen by the LWUA quality control inspector to represent the extremes of seat compression shall be fully opened and closed to a seal or 500 complete cycles with sufficient flow that the valve is at 200 psi pressure differential at the point of opening and closing. The valves shall be drop tight under rated pressure differential applied alternately to each side of the gate after completion of the tests.
7. Pressure Test – One prototype of each valve size shall be tested to 500 psi with the closure member in the position. There shall be no rupture or cracking of the valve body, valve bonnet, or seal plate. Leakage at pressure-containing joints shall not be a cause for failure of the test.

5.2. AIR VACUUM VALVES

Air vacuum valves of sizes up to and including 75 mm (3 in.) in diameter shall have threaded connections except where otherwise shown on the drawings. The bodies shall be of high strength

cast iron, and the float shall be of stainless steel. All internal parts such as float guides, bushings, and baffle retaining screws, etc., shall be either stainless steel or bronze. Seat washer and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for a water working pressure of not less than 1.0 MPa (150psi). All valves be designed to automatically operate so that they will: (a) positively open under atmospheric pressure (as water drains from the body of the valve, it will allow air to flow in to the pipe while it is being emptied); (b) positively close as water, under low head, fills the body of the valve; and (c) not blow shut under high velocity discharge.

5.3. AIR RELEASE VALVES

Air release valves up to and including 75mm (3in.) in diameter shall have threaded connections, except where otherwise shown on the drawings, and shall be designed for a water working pressure of 1.0MPa (150psi). The body shall be of high strength cast iron and the float shall be of stainless steel. All internal parts, except the seat, shall be of stainless steel or bronze. The seat shall be of material insuring water tightness with a minimum maintenance. The valve shall be designed to automatically permit the escape of accumulated air under pressure while the pipe is in operation. The valves shall be either direct lever operating.

5.4. PRESSURE REDUCING VALVES

The pressure reducing valve shall be of the diaphragm type equipment with a pilot spring to provide a range of downstream pressure settings. The pressure reducing valve shall be designed for a minimum water working pressure of 1.0 MPa (150 psi) and shall be factory tested under a hydrostatic pressure of at least 2.0 MPa (300 psi). The valve body and cover shall be cast iron meeting the requirements of ASTM A48. The valve shall have flanged ends, and the valve disc shall be non-metallic and renewable. The main valve shall be of bronze as specified in ASTM specification B62, and the valve seat shall be replaceable. The pilot control system shall be of brass with type 18-8 stainless steel trim. the diaphragm shall be of heavily reinforced synthetic rubber and shall be fully supported by the valve body. the valve shall be coated as required in Clause 14 - Painting and Coating.

Specifications

Size: DN100, Flange Type PN16

Pressure Rating: 16 bars

Valve Pattern: Globe

Working Temp: up to 60 C

Component Materials

Body, Cover and Actuator: Ductile Iron

Internals: Stainless Steel & Elastomer

Control Trim System: Brass control components/ accessories

Copper & Brass tubing & fittings

Optional: Stainless Steel 316

Coating: Electrostatic polyester powder coating or Epoxy fusion bonded coating

Elastomer: Nylon fabric reinforced NR

5.5. MISCELLANEOUS VALVES

Valves 50mm (2in.) and smaller, unless otherwise shown, shall be all bronze or brass with threaded connections designed for a water working pressure not less than 1.0 MPa (150psi). Material specifications for brass valves shall have a commercial designation of 85-5-5-5 in accordance with ASTM B584, UNS No. 83000. Valves for service connections shall be ball valve type with locking.

5.6. FIRE HYDRANT

Material Specifications:

1. **Chain** - Steel (ASTM A-307 Grade B)
 2. **Cap** - Cast Iron (ASTM A126 Class B)
 3. **Rubber Stopper** - Rubber (Neoprene D2000)
 4. **Body** - Cast Iron (ASTM A126 Class B)
 5. **Cover** - Cast Iron (ASTM A126 Class B)
 6. **Stem Unit** - Stainless Steel (A-276 Type 420 or 316)
- ✓ **Minimum Working Pressure** - 150 Psi
- ✓ **Hose connector** - 2 1/2" Ø

5.7. VALVE BOX COVER



PERSPECTIVE

Materials:

Body	Cast Iron / Ductile
Coating	Epoxy Coating

5.8. MECHANICAL FLOWMETER

The water meters shall be in accordance with ISO 4064 class B all positions, and OIML certificate or an equivalent from manufacture country. The water meters shall be used to register quantities of water pumped. The water meters shall be capable to operate with water having suspended solids.

The water meters shall be turbine type (axial flow horizontal helix, or vertical turbine). The meters shall be dry dial type and magnetic drive.

Water meters shall be provided with standard pulsar, or optionally with high resolution pulsar capable of transferring flow rate and flow direction ready for connection to a data logger.

The meters shall be provided with hermetically capsuled register reading in cubic meters. The register should be dome glass lens with stainless steel encapsulation. The register shall have a test index circle divided into 10 equal parts. Totalizer shall be digital type capable of registering at least 999999 m³. The totalizer shall be set at 0 (zero).

The meters shall be tampered proof, and shall have protective device which can be sealed in such a way that after sealing, both before and after water meter has been correctly installed there is no possibility of dismantling or altering the water meter or its adjustment device without damaging the protective devices. Sealing material must be stainless steel wire and aluminium seal. The lid of meters shall be made of brass or high-quality plastic for protection purposes. The working pressure shall not be less than (16) bar for all items.

The entire flow range the permissible head loss shall not exceed 1 bar. The test pressure nevertheless shall be 1.6 times the nominal pressure and twice the nominal pressure as specified in the standards.

The meters shall be supplied with flanged connections. Flanges shall be of PN16 for all items. Flanges drilling shall be in accordance to B.S. 45204. The meters shall be provided with steel companion flanges, gaskets, bolts and nuts. The bodies of bulk water meters casing for flanged ends meters shall be made of cast iron, or Ductile (for PN 25), or steel for (PN 25&40).

The meters shall be protected against external and internal by an epoxy powder coating and the material of the meter shall be resistant to corrosion. Materials in contact with water shall be non-toxic and shall not affect the quality of water.

The meters shall be capable to operate in a water temperature up to 50°C. Materials of the meters shall be capable to resist chlorine dose up to 5 ppm, also shall resist impurities in water. The measuring mechanism shall be removable type. Therefore, the measuring mechanism can be completely removed from the meter casing. The measuring mechanism shall also be secured against removal from body by a seal.

The permissible continuous load for meters of given size shall conform with ISO 4064 and shall not be below nominal flows (Qu) given below:

DN 50	15 m ³ /h
DN 80	40 m ³ /h
DN 100	60 m ³ /h
DN 150	150 m ³ /h
DN 200	250 m ³ /h
DN 300	600 m ³ /h

All catalogues, operation and maintenance manuals shall be provided. Evidence of compliance with technical specifications and standard as well as the certificate of testing for accuracy, pressure, and capacities is required. Approval certificates of relevant authorities, such as EEC, BS, AWWA, and the like shall be provided. The size, model, serial number, Q n (nominal flow rate in m³/h), direction of flow, year of manufacturing, stamped with initial WAJ, meteorological class, working pressure, indicated on all meters, and all other marking shall be in accordance to standards.

The Contractor shall furnish and install flowmeters as shown in the drawings. The flowmeters shall be of the magnetic drive, propeller type and shall be furnished with an integral cast body of close grain high tensile cast iron, faced and drilled ANSI flanged ends and shall be designed for 10.56 kg/cm² (150 psi) working pressure. Each unit shall have the same nominal inside diameter throughout their length and shall be furnished with non-corrosive, non-toxic liners. Each meter shall register within two percent (2%) of true flows within the rated range. The register drive shall be completely isolated from water pressure by an O-ring sealed bronze housing and shall be magnetically coupled to the register drive by the use of permanent type ceramic magnets. The register should be dome glass lens with stainless steel encapsulation. The propeller blades shall be fabricated of thermoplastic materials resistant to normal water corrosion. Each meter shall be furnished with a six-digit straight reading type totalizer calibrated in cubic meters.

6. WARNING TAPE

6.1. MATERIAL

The Contractor shall furnish and install for each pipe above or equal to 50 mm an Alu- Foil warning/detection tape (minimum width is 5 cm) - (2") with the words **"CAUTION - VCWD WATER MAINS BELOW"** marked in a continuous manner.

6.2. INSTALLATION

The tape shall be laid flat on top of an intermediate layer of backfill, after compaction of same and prior to backfilling and compacting, the final top layer. The depth of laying the tape will therefore be about 0.30 m (1 foot) from the finish surface or at about:

- 0.45 m from top of pipes with sizes equal to or under 250 mm diameter except for Asbestos Cement Pipes
- 0.60 m above the top of pipes with sizes equal to or larger than 300 mm

7. TESTING, DISINFECTION AND COMMISSIONING

7.1. GENERAL

The Contractor shall furnish all equipment, labor and materials including the water for testing and proper disinfection of the pipelines. The water used for testing shall be furnished by the Contractor and shall provide the facilities necessary to convey the water from the Owner-designated source to the points of use. All testing and chlorinating operations shall be done in the presence of the Owner's representative.

7.2. PIPELINE TESTING

a. General

Before being put into service, new pipelines must be hydrostatically pressure tested. Defects may be discovered that could threaten the pipeline's ability to sustain its maximum operating pressure. If there are any critical defects in the system, the pipeline will leak and fail a pressure test. If leaks are located, the defective pipes should be repaired and re-tested at the expense of the Contractor. Only if the pipeline meets the pressure test should it be put into service.

The Site Engineer must ensure that all testing and disinfection operations are done in his presence or his authorized representative, and generally he should take the following into account:

1. Pressure and leakage tests are usually done at the same time.

2. Testing of pipelines should be done in sections, before any permanent resurfacing of the dug-up roadways.
3. The pipeline trench may be partially backfilled, but the joints can remain exposed for observation, except in heavily traveled roadways.
4. Regardless of the type and size of the laid pipe, test sections shall be limited to **500 meters**, to allow repairs and backfill to be completed as the work progresses. No further pipelaying shall be allowed if this is not complied accordingly. Mistakes in installation should be discovered and corrected early, to avoid excessive expenses of revisiting completed portions of the works.
5. In heavily traveled roads/streets, hydrotesting should be done within 15 days after pipelaying. No further pipelaying shall be allowed in these roads/streets if previous installation were not hydrostatically pressure tested.

b. Testing for Pressure and Leakage

The following procedures must be undertaken prior and during the whole testing process:

1. Inspection before Testing

- a. Pipe sections must be secured from movement by partially backfilling 0.45 m over the pipe, but leaving the joint sections exposed for the required visual inspections.
- b. All pipe ends must be capped and restrained to prevent movement.
- c. All thrust blocks should have been completed and cured for at least 7 days.
- d. Provisions should be made to relieve trapped air from high points and pipe ends.

2. Visual Inspection for Leakages

- a. The pipeline should be filled slowly with water at the lowest point in the line possible, with the hydrants/ and blow-offs open at high points to allow trapped air to escape.
- b. Prior to any testing, the pipe section must be cleaned by flushing with a minimum flushing velocity of 0.80 m/s (2.5 feet per second).
- c. After the pipe system is filled, a slight pressure of at least 20 psi should be applied, and the line should be allowed to settle and

stabilize for 48 hours.

- d. During the **48-hour** period all exposed pipe joints, couplings, valves and fittings should be visually inspected for possible leaks.
- e. Also during this period, all thrust blocks
 - especially those at pipe ends
 - should be checked for excessive movements that could be due to the thrust forces that developed.
- f. In case defects are detected, the defective portions of the line should be repaired or replaced with sound material before proceeding.

3. *Pressure Requirements*

- a. The test shall consist of holding test pressure on each section of the line for a period of two (2) hours.
- b. The test pressure at the lowest point shall be **1.0 MPa (150 psi)** according to the class of pipe installed, **Class 100** or **Class 150**. Pressure gauges shall also be provided at all ends of the section tested.
- b. The water necessary to maintain the pressure shall be measured through a meter or by other satisfactory means conformed by the Site Engineer or his authorized project inspectors.
- c. The leakage shall be measured through a meter or by other means. The leakage shall be considered the amount of water entering the pipeline during the **two (2) hour test period**. For all other types of pipes except cast iron or ductile pipe, the allowable leakage should not exceed **1.85 liters/mm of pipe diameter/km/24 hours**. The allowable leakage for cast iron pipe or ductile iron pipe shall not exceed the values listed in Table 3 of AWWA Standard for Installation of Cast Iron Water (AWWA C600).

Should any test of a section of pipeline disclose joint leakage greater than that permitted, the Contractor shall, at his own expense locate and repair or replace the defective pipe, fitting, joint, coupling or other appurtenance. The test shall be replaced until the leakage is within the permitted allowance.

c. Pressure and Leakage Testing/Inspection

- 1. Never use air to develop test pressure.
- 2. Pressurize the pipe section using a smooth operating test pump to raise the pressure gradually to the required test pressure. Maintain the

pressure using a hand pump or power pump.

3. Use owner-provided water meter (calibrated) to measure add-up water in maintaining the required test pressure. Test pressure must not be allowed to drop by **5 psi during the 2-hr test period**.
4. Fire hydrants, laterals, and service connections are tested with the main line.
5. All newly installed closure pipes shall be tested and pass leakage tests by subjecting the joints (of closure pipes) to a pressure of **50 psi** for a period of **five minutes** and visually checking for leakages. All visible leaks shall be repaired by the Contractor at no expense to the Owner.

7.3. DISINFECTION OF PIPELINES

a. Pipeline Flushing

1. It is important to make sure that before disinfection is begun, the water main is cleaned to remove any foreign materials that may interfere with the disinfection activity.
2. Flushing should be done through a hydrant or blow-off.
3. Minimum flushing velocity is 0.8 m/s (2.5 fps) to attain proper flushing action.

b. Introduction of Chlorine Solution

1. Determine pipeline capacity to determine amount of chlorine needed.
2. A chlorine solution of not more than fifty milligrams per liter (50 mg/l) is pumped at the beginning of a valve section of pipeline until full. Determine chlorine solution with the aid of "Chlorine Residual Test Kit".
3. The preferred application point is usually at one end of the pipe section through a stop inserted on top of the laid pipe.
4. The high points of pipe section being disinfected should be properly vented.
5. At the opposite end of the pipe section, a draw-off valve should be provided to bleed or drain water during the injection process.
6. The disinfection process shall be in accordance to AWWA Standard C-651- 92

c. Retention Period of Chlorine Solution

1. The average retention or contact period for 50-mg/l-chlorine solution is 24hours.
2. All pipeline valves and appurtenances should be operated to ensure that they are also disinfected.
3. During the 24-hour contact period, chlorinated water should not be allowed to flow into the potable water distribution system.

4. After a contact period of 24 hours, samples should be taken along the entire length of the pipeline and tested for chlorine residual. Residual chlorine shall not be less than 25 mg/l; otherwise the treatment procedure shall be repeated until satisfactory results are obtained.
 5. Never discharge highly chlorinated water to the surrounding area to avoid possible damage to properties and persons.
 6. Should the initial treatment fail to result in the conditions stipulated above, the chlorination procedures shall be repeated until satisfactory results are obtained.
- d. Draining and Final Flushing
1. The chlorine solution shall be drained through the draw-off valve into a storm-sewer line.
 2. Clean water shall be used to flush the disinfected pipeline.
 3. After flushing, the residual chlorine should be between 0.20 to 0.75 mg/l.
 4. Report on flushing shall be completed and signed by Contractor and witnessed by VCWD personnel.

8. PORTLAND CEMENT CONCRETE PAVEMENT (ITEM 311) -RESTORATION

8.1 SCOPE OF WORK

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

It shall consist of pavement of **Portland Cement Concrete**, with or without reinforcement, constructed on the prepared base in accordance with this Specification and conformity with the lines, grades, thickness and typical cross-section shown on the Plans.

8.2 MATERIALS REQUIREMENTS

A. PORTLAND CEMENT

Cement shall conform to the requirements of the following cited Specifications for the type specified or permitted.

Type	Specifications
Portland Cement	AASHTO M 85 (ASTM C
150) Blended Hydraulic Cements	AASHTO M 240

(ASTM C 595) Masonry Cement AASHTO M 150-74
(ASTM C 91)

When Types IV and V (AASHTO M 85), P and PA (AASHTO M 150) cements are used, proper recognition shall be given to the effects of slower strength gain on concrete proportioning and construction practices. Types S and SA cements will be permitted only when blended with Portland Cement in proportions approved by the Site Engineer.

Unless otherwise permitted by the Site Engineer, the product of only one mill of any one brand and type of Portland Cement shall be used on the project.

The Contractor shall provide suitable means of storing and protecting the cement against dampness. Cement which, for any reason, has become partially set or which contains lumps of caked cement will be rejected. Cement salvaged from discarded or used bags shall not be used.

Only Type I Portland Cement shall be used unless otherwise provided for in the Special Provisions. Different brands or the same brands from different mills shall not be mixed nor shall they be used alternately unless the mix is approved by the Site Engineer. However, the use of Portland Pozzolan Cement Type IP meeting the requirements of AASHTO M 240/ASTM C 695, Specifications for Blended Hydraulic Cement shall be allowed, provided that trial mixes shall be done and that the mixes meet the concrete strength requirements, the AASHTO/ASTM provisions pertinent to the use of Portland Pozzolan Type IP shall be adopted.

Cement which for any reason, has become partially set or which contains lumps of caked cement will be rejected. Cement salvaged from discarded or used bags shall not be used.

Samples of Cement shall be obtained in accordance with AASHTO T 127.

B. AGGREGATES

1. Fine Aggregates

It shall consist of natural sand, stone screenings or other inert materials with similar characteristics, or combinations thereof, having hard, strong and durable particles. Fine aggregate from different sources of supply shall not be mixed or stored in the same pile nor used alternately in the same class of concrete without the approval of the Site Engineer.

It shall not contain more than (3) mass percent of material passing the 0.075 mm (No. 200 sieve) by washing nor more than one (1) mass percent each of clay lumps or shale. The use of beach sand will not be

allowed without the approval of the Site Engineer. If the fine aggregate is subjected to five (5) cycles of the sodium sulfate soundness test, the weighted loss shall not exceed 10 mass percent.

The fine aggregate shall be free from injurious amounts of organic impurities. If subjected to the colorimatic test for organic impurities and a color darker than the standard is produced, it shall be rejected. However, when tested for the effect of organic impurities strength of mortar by AASHTO T 71, the fine aggregate may be used if the relative strength at 7 and 28 days is not less than 95 mass percent.

The fine aggregate shall be well-graded from coarse to fine and shall conform to table below.

Grading Requirements for Fine Aggregates

Sieve Designation	Mass Percent Passing
9.5 mm (3/8 in.)	100
4.75 mm (No. 4)	95 - 100
2.36 mm (No. 8)	-
1.18 mm (No. 16)	45 - 80
.600 mm (No. 36)	-
.300 mm (No. 50)	5-30
.150 mm (No. 100)	0 - 10

2. Coarse Aggregates

It shall consist of crushed stone, gravel, blast furnace slag, or other approved inert materials of similar characteristics, or combinations thereof, having hard, strong, durable pieces and free from any adherent coatings.

It shall contain not more than one (1) mass percent of material passing the 0.075 mm (No. 200) sieve, not more than 0.25 mass of clay lumps, nor more than 3.5 mass percent of soft fragments.

If the coarse aggregate is subjected to five (5) cycles of the sodium sulfate soundness test, the weighted loss shall not exceed 12 mass percent.

It shall have a mass percent of wear not exceeding 40 when tested by AASHTO T 96.

If the slag is used, its density shall not be less than 1120 kg/m³ (70 lb./cu. Ft). The gradation of the coarse aggregate shall conform to the table below. Only one grading specification shall be used from any one source.

Grading Requirements for Fine Aggregates

Sieve Designation		Mass Percent Passing		
Standard Mm	Alternate U.S. Standard	Grading A	Grading B	Grading C
75.00	3 in.	100	-	-
63.00	2-1/2 in.	90-100	100	100
50.00	2 in.	-	90-100	95-100
37.50	1-1/2 in.	25-60	35-70	-
25.00	1 in.	-	0-15	35-70
19.00	3/4 in.	0-10	-	-
12.50	1/2 in.	0-5	0-5	10-30
4.75	No. 4	-	-	0-5

C. WATER

Water used in mixing, curing or other designated application shall be reasonably clean and free of oil, salt, acid, alkali, grass or other substances injurious to the finished product. Water will be tested in accordance with, and shall meet the suggested requirements of AASHTO T 26. Water which is drinkable may be used without test. Where the source of water is shallow, the intake shall be so enclosed as to exclude silt, mud, grass or other foreign materials.

D. REINFORCING STEEL

It shall conform to the requirements of **Item 404** (*DPWH Standard Specification, 2004 edition*), Reinforcing Steel. Dowels and tie bars shall conform to the requirements of AASHTO M 31 or M 42, except that rail steel shall not be used for tie bars that are to be bent and re-straightened during construction. Tie bars shall be deformed bars. Dowels shall be plain round bars. Before delivery to the site of work, one-half of the length of each dowel shall be painted with one coat of approved lead or tar paint.

The sleeves for dowel bars shall be metal of approved design to cover 50 mm (2 inches), plus or minus 5 mm (1/4 inch) of the dowel, with a closed end, and with a suitable stop to hold the end of the sleeve at least 25mm (1 inch) from the end of the dowel. Sleeves shall be of such design that they do not collapse during construction.

E. JOINT FILLERS

Poured joint fillers shall be mixed asphalt and mineral or rubber filler conforming to the applicable requirements of **Item 705** (*DPWH Standard Specifications, 2004 edition*), Joint Materials.

Preformed joint filler shall conform to the applicable requirements of **Item 705** (*DPWH Standard Specifications, 2004 edition*). It shall be punched to admit the dowels where called for in the Plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint.

F. ADMIXTURE

Air-entraining admixture shall conform to the requirements of AASHTO M 154.

Chemical admixtures, if specified or permitted, shall conform to the requirements of AASHTO M 194.

Fly Ash, if specified or permitted as a mineral admixture and as 20% partial replacement of Portland Cement in concrete mix shall conform to the requirements of ASTM C 618.

Admixture should be added only to the concrete mix to produce some desired modifications to the properties of concrete where necessary, but not as partial replacement of cement.

G. CURING MATERIALS

Curing materials shall conform to the following requirements as specified: a.)	Burlap cloth -
AASHTO M 182 b.)	Liquid membrane
forming compound	- AASHTO
M148 c.)	Sheeting (film)
materials	- AASHTO
M171	

Cotton mats and water-proof paper can be used.

H. CALCIUM CHLORIDE/CALCIUM NITRATE

It shall conform to AASHTO M144, if specified or permitted by the Site Engineer, as accelerator.

8.3 STORAGE OF CEMENT AND AGGREGATE

All cement shall be stored, immediately upon delivery in a storage which will protect the cement from dampness. The floor of the storage shall be raised from the ground. It shall be placed in locations approved by the Site Engineer. Provisions for storage shall be ample, the shipments of cement as received shall be separately stored in such a manner as to allow the earliest deliveries to be used first and to provide easy access for identification and inspection of each shipment. Stored

cement shall meet the test requirements at any time after storage when retest is ordered by the Engineer. At time of use, all cement shall be free-flowing and free of lumps. The handling and storing of concrete aggregates shall be such as to prevent segregation or the inclusion of foreign materials. The Engineer may require that aggregates be stored separately at satisfactory locations.

In order to secure greater uniformity of concrete mix, the Engineer may require that the coarse aggregate be separated into two or more sizes. Different sizes of aggregate shall be stored in separate bins or in separate stockpiles sufficiently removed from each other to prevent the material at the edges of the piles from becoming intermixed.

8.4 PROPORTIONING, CONSISTENCY AND STRENGTH OF CONCRETE

The Contractor shall prepare the design mix based on the absolute volume method as outlined in the American Concrete Institute (ACI) Standard 211.1, "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete".

It is the intent of this Specification to require at least 364 kg of cement per cubic meter of concrete to meet the minimum strength requirements. The Engineer shall determine from laboratory tests of the materials to be used, the cement content and the proportions of aggregate and water that will produce workable concrete having a slump of between 40 and 75 mm (1-1/2 and 3 inches) if not vibrated or between 10 and 40 mm (1/2 and 1-1/2 inches) if vibrated, and a flexural strength of not less than 3.8 MPa (550 psi) when tested by the third-point method or 4.5 MPa (650 psi) when tested by the mid-point method at seven (7) days in accordance with AASHTO T97 and T177, respectively; or a compressive strength of 27.58 MPa (4,000 psi) for cores taken at seven (7) days and tested in accordance with AASHTO T24.

Slump shall be determined using AASHTO T 119.

The designer shall consider the use of lean concrete (econcrete) mixtures using local materials or specifically modified conventional concrete mixes in base course and in the lower course composite, monolithic concrete pavements using a minimum of 75 mm (3 inches) of conventional concrete as the surface course.

The mix design shall be submitted to the Site Engineer for approval and shall be accompanied with certified test data from an approved laboratory demonstrating the adequacy of the mix design. A change in the source of materials during the progress of work may necessitate a new design mix.

8.5 CONSTRUCTION REQUIREMENTS

A. QUALITY CONTROL OF CONCRETE

1. General

The Contractor shall be responsible for the quality control of all materials during the handling, blending, and mixing and placement operations.

2. Quality Control Plan

The Contractor shall furnish the Site Engineer a Quality Control Plan detailing his production control procedures and the type and frequency of sampling and testing to insure that the concrete produces complies with the Specifications. The Engineer shall be provided free access to recent plant production records, and if requested, informational copies of mix design, materials certification and sampling and testing reports.

3. Qualification of Workmen

Experience and qualified personnel shall perform all batching or mixing operation for the concrete mix, and shall be present at the plant and job site to control the concrete productions whenever the plant is in operation. They shall be identified and duties as follows:

i. Concrete Batcher

The person performing the batching or mixing operation shall be capable of accurately conducting aggregate surface moisture determination and establishing correct scale weights for concrete materials. He shall be capable of assuring that the proportioned batch weights of materials are in accordance with the mix design.

ii. Concrete Technician

The person responsible for concrete production control and sampling and testing for quality control shall be proficient in concrete technology and shall have a sound knowledge of the Specifications as they relate to concrete production. He shall be capable of adjusting concrete mix designs for improving workability and Specification compliance and preparing trial mix designs. He shall be qualified to act as the concrete batcher in the batcher's absence.

4. Quality Control Testing

The Contractor shall perform all sampling, testing and inspection necessary to assure quality control of the component materials and the concrete.

The Contractor shall be responsible for determining the gradation of fine and coarse aggregates and for testing the concrete mixture for

slump, air content, water-cement ratio and temperature. He shall conduct his operations so as to produce a mix conforming to the approved mix design.

5. Documentation

The Contractor shall maintain adequate records of all inspections and tests. The records shall indicate the nature and number of observations made, the number and type of deficiencies found, the quantities approved and rejected, and nature of any corrective action taken. The Engineer may take independent assurance samples at random location for acceptance purposes as he deems necessary.

B. EQUIPMENT

1. Batching Plant and Equipment

- a. **General.** The batching shall include bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If cement is used in bulk, a bin, a hopper, and separate scale for cement shall be included. The weighing hopper shall be properly sealed and vented to preclude dusting operation. The batch plant shall be equipped with a suitable non-resettable batch counter which will correctly indicate the number of batches proportioned.
- b. **Bins and Hoppers.** Bins with adequate separate compartments for fine aggregate and for each size of coarse aggregate shall be provided in the batching plant.
- c. **Scales.** Scales for weighing aggregates and cement shall be of either the beam type or the springless-dial type. They shall be accurate within one-half percent (0.5%) throughout the range of use. Poles shall be designed to be locked in any position and to prevent unauthorized change.

Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy.

- d. **Automatic Weighing Devices.** Unless otherwise allowed on the Contract, batching plants shall be equipped with automatic weighing devices of an approved type to proportion aggregates and bulk cement.

2. Mixers

a. General

Concrete may be mixed at the Site of construction or at a central plant, wholly or in part in truck mixers. Each mixer shall have a manufacture's plate attached in a prominent place showing the

capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

b. Mixers at Site of Construction

Mixing shall be done in an approved mixer capable of combining the aggregates, cement and water into a thoroughly mixed and uniform mass within the specified mixing period and discharging and distributing the mixture without segregation on the prepared grade. The mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and released it at the end of mixing period. In case of failure of the timing device, the mixer maybe used for the balance of the day while it is being repaired, provided that each batch is mixed in 90 seconds. The mixer shall be equipped with a suitable non-resettable batch counter which shall correctly indicate the number of the batches mixed.

c. Truck Mixer and Truck Agitators. Truck mixers used for mixing and hauling concrete, and truck agitators used for hauling central-mixed concrete, shall conform to the requirements of AASHTO M 157.

d. Non-Agitator Truck. Bodies of non-agitating hauling equipment for concrete shall be smooth, mortar-tight metal containers and shall be capable of discharging the concrete at a satisfactory controlled rate without segregation.

3. Paving and Finishing Equipment

The concrete shall be placed with an approved paver to spread, consolidate, screed and float finish freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement in conformance with the Plans and Specifications.

The finishing machine shall be equipped with at least two (2) oscillating type transverse screed.

Vibrators shall operate at a frequency of 8,300 to 9,600 impulses per minute under load at a maximum spacing of 60 cm.

4. Concrete Saw / Cutter

The Contractor shall provide sawing/cutter equipment in adequate number of units and power to complete the sawing/cutting with a water-cooled diamond edge saw blade or an abrasive wheel to the required dimensions and at the required rate. He shall provide at least

one (1) stand-by saw/cutter in good working condition and with an ample supply of saw/concrete blades.

5. Forms

Forms shall be of steel, of an approved section, and of depth equal to the thickness of the pavement at the edge. The base of the forms shall be of sufficient width to provide necessary stability in all directions. The flange braces must extend outward on the base to not less than $\frac{2}{3}$ the height of the form.

All forms shall be rigidly supported on bed of thoroughly compacted material during the entire operation of placing and finishing the concrete. Forms shall be provided with adequate devices for secure setting so that when in place, they will withstand, without visible spring or settlement, the impact and vibration of the consolidation and finishing or paving equipment.

C. PREPARATION OF GRADE

After the sub-grade of base has been placed and compacted to the required density, the areas which will support the any paving machine and the grade on which the pavements is to be constructed shall be trimmed to the proper elevation by means of a properly designed machine extending the prepared work areas compacted at least 60 cm beyond each edge of the proposed concrete pavement. If loss of density results from the trimming operations, it shall be restored by additional compaction before concrete is placed. If any traffic is allowed to use the prepared sub-grade or base, the surface shall be checked and corrected immediately ahead of the placing concrete.

The subgrade or base shall be uniformly moist when the concrete is placed.

D. SETTING FORMS

1. Base Support.

The foundation under the forms shall be hard and true to grade so that the form when set will be firmly in contact for its whole length and at the specified grade. (Any roadbed, which at the form line is found below established grade, shall be filled with approved granular materials to grade in lifts of three (3) cm or less, and thoroughly rerolled or tamped.) Imperfections or variations above grade shall be corrected by tamping or by cutting as necessary.

2. Form Setting

Forms shall be set sufficiently in advance of the point where concrete is being placed. After the forms have been set to correct grade, the

grade shall be thoroughly tamped, mechanically or by hand, at both the inside and outside edges of the base of the forms. The forms shall not deviate from true line by more than one (1) cm at any point.

3. Grade and Alignment

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. Testing as to crown and elevation, prior to placing of concrete can be made by means of holding an approved template in a vertical position and moved backward and forward on the forms.

When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

E. CONDITIONING OF SUB-GRADE OR BASE COURSE

When side forms have been securely set to grade, the sub-grade or base course shall be brought to proper cross-section. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of surrounding grade. The finished grade shall be maintained in a smooth and compacted condition until the pavement is placed.

Unless waterproof sub-grade or base course cover material is specified, the sub- grade or base course shall be uniformly moist when the concrete is placed. If it is subsequently becomes too dry, the sub-grade or base course shall be sprinkled, but the method of sprinkling shall not be such as to form mud or pools of water.

F. HANDLING, MEASURING AND BATCHING MATERIALS

The batch plant site, layout, equipment and provisions for transporting material shall be such as to assure a continuous supply of material to the work.

Stockpiles shall be built up in layers of not more than one (1) meter in thickness. Each layer shall be completely in place before beginning the next which shall not be allowed to “cone” down over the next lower layer. Aggregates from different sources and of different grading shall not be stockpiled together.

All washed aggregates and aggregates produced or handled by hydraulic methods, shall be stockpiled or binned for draining at least twelve (12) hours before being batched.

When mixing is done at the side of the work, aggregates shall be transported from the batching plant to the mixer in batch boxes, vehicle bodies, or other containers of adequate capacity and construction to properly carry the volume required. Partitions separating batches shall be adequate and effective to prevent spilling from one compartment to another while in

transit or being dumped. When bulk cement is used, the Contractor shall use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, with chute, boot or other approved device, to prevent loss of cement, and to provide positive assurance of the actual presence in each batch of the entire cement content specified.

Bulk cement shall be transported to the mixer in tight compartments carrying the full amount of cement required for the batch. However, if allowed in the Special Provisions, it may be transported between the fine and coarse aggregate. When cement is placed in contact with the aggregates, batches may be rejected unless mixed within 1-1/2 hours of such contact. Cement in original shipping packages may be transported on top of the aggregates, each batch containing the number of sacks required by the job mix.

The mixer shall be charged without loss of cement. Batching shall be so conducted as to result in the weight to each material required within a tolerance of one (1) percent for the cement and two (2) percent for aggregates.

Water may be measured either by volume or by weight. The accuracy of measuring the water shall be within a range of error of not over than one (1) percent. Unless the water is to be weighed, the water-measuring equipment shall include an auxiliary tank from which the measuring tank shall be equipped with an outside tap and valve to provide checking the setting, unless other means are provided for readily and accurately determining the amount of water in the tank. The volume of the auxiliary tank shall be at least equal to that of the measuring tank.

G. MIXING OF CONCRETE

The concrete may be mixed at the site of the work in a central-mix plant, or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time will be measured from the time all materials, except water, are in the drum. Ready-mixed concrete shall be mixed and delivered in accordance with requirements of AASHTO M 157, except that the minimum required revolutions at the mixing speed for transit-mixed concrete may be reduced to not less than that recommended by the mixer manufacturer. The number of revolutions recommended by the mixer manufacturer shall be indicated on the manufacturer's serial plate attached to the mixer. The Contractor shall furnish test data acceptable to the Engineer verifying that the make and model of the mixer will produce uniform concrete conforming to the provision of AASHTO M 157 at the reduced number of revolutions shown on the serial plate.

When mixed at the site or in a central mixing plant, the mixing time shall not be less than fifty (50) seconds nor more than ninety (90) seconds, unless mixer performance tests prove adequate mixing of the concrete is a shorter time period.

Four (4) seconds shall be added to the specified mixing time if timing starts at the instant the skip reaches its maximum raised positions. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

The mixer shall be operated at the drum speed as shown on the manufacturer's name plate attached on the mixer. Any concrete mixed less than the specified time shall be discarded and disposed off by the Contractor at his expense. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic meter, as shown on the manufacturer's standard rating plate on the mixer, except that an overload up to ten (10) percent above the mixer's nominal capacity may be permitted provided concrete test data for strength, segregation, and uniform consistency are satisfactory, and provided no spillage of concrete takes place.

The batches shall be so charged into the drum that a portion of the mixing water shall be entered in advance of the cement and aggregates. The flow of water shall be uniform and all water shall be in the drum by the end of the first fifteen (15) seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators or non-agitating truck specified in Subsection 9.5b, Equipment. The time elapsed from the time water is added to the mix until the concrete is deposited in place at the Site shall not exceed forty five (45) minutes when the concrete is hauled in non-agitating trucks, nor ninety (90) minutes when hauled in truck mixers or truck agitators, except that in hot weather or under other conditions contributing to quick hardening of the concrete, the maximum allowable time may be reduced by the Engineer.

In exceptional cases and when volumetric measurements are authorized for small project requiring less than 75 cu.m. of concrete per day of pouring, the weight proportions shall be converted to equivalent volumetric proportions. In such cases, suitable allowance shall be made for variations in the moisture condition of the aggregates, including the bulking effect in the fine aggregate. Batching and mixing shall be in accordance with ASTM C 685, Section 6 through 9.

Concrete mixing by chute is allowed provided that a weighing scale for determining the batch weight will be used.

Retempering concrete by adding water or by other means shall not be permitted, except that when concrete is delivered in truck mixers, additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, if permitted by the Engineer, provided all these operations are performed within forty-five

(45) minutes after the initial mixing operation and the water-cement ratio is not exceeded. Concrete that is not within the specified slump limits at the time of placement shall not be used. Admixtures for increasing the workability or for accelerating the setting of the concrete will be permitted only when specifically approved by the Engineer.

H. LIMITATION OF MIXING

No concrete shall be mixed, placed or finished when natural light is insufficient, unless an adequate and approved artificial lighting system is operated. During hot weather, the Engineer shall require that steps be taken to prevent the temperature of mixed concrete from exceeding a maximum temperature of 900F (320C)

Concrete not in place within ninety (90) minutes from the time the ingredients were charged into the mixing drum or that has developed initial set shall not be used. Retempering of concrete or mortar which has partially hardened, that is remixing with or without additional cement, aggregate, or water, shall not be permitted.

In order that the concrete may be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor will be required to have available at all times materials for the protection of the edges and surface of the unhardened concrete.

I. PLACING CONCRETE

Concrete shall be deposited in such a manner to require minimal rehandling. Unless truck mixers or non-agitating hauling equipment are equipped with means to discharge concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade in such a manner as to prevent segregation. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

When concrete is to be placed adjoining a previously constructed lane and mechanical equipment will be operated upon the existing lane, that previously constructed lane shall have attained the strength for fourteen (14) day concrete. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after three (3) days.

Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies, by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than fifteen (15) seconds in any one location.

Concrete shall be deposited as near as possible to the expansion and contraction joints without disturbing them, but shall not be dumped from the discharge bucket or hopper into a joint assembly unless the hopper is well centered on the joint assembly. Should any concrete material fall on or be worked into the surface of a complete slab, it shall be removed immediately.

J. TEST SPECIMENS

As work progresses, at least one (1) set consisting of three (3) concrete beam test specimens, 150 mm x 150 mm x 525 mm or 900 mm shall be taken from each 330 m² of pavement, 230 mm depth, or fraction thereof placed each day. Test specimens shall be made under the supervision of the Site Engineer, and the Contractor shall provide all concrete and other facilities necessary in making the test specimens and shall protect them from damage by construction operations. Cylinder samples shall not be used as substitute for determining the adequacy of the strength of concrete.

The beams shall be made, cured, and tested in accordance with AASHTO T 23 and T 97.

K. STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT

Following the placing of the concrete, it shall be struck off to conform to the cross-section shown on the Plans and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement will be at the elevation shown on the Plans. When reinforced concrete pavement is placed in two (2) layers, the bottom layer shall be struck off and consolidated to such length and depth that the sheet of fabric or bar mat may be laid full length on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck off and screeded. Any portion of the bottom layer of concrete which has been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with freshly mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the reinforcement may be firmly positioned in advance of concrete placement or it may be placed at the depth shown on the Plans in plastic concrete, after spreading by mechanical or vibratory means.

Reinforcing steel shall be free from dirt, oil, paint, grease, mill scale and loose or thick rust which could impair bond of the steel with the concrete.

L. JOINTS

Joints shall be constructed of the type and dimensions, and at the locations required by the Plans or Special Provisions. All joints shall be protected from the intrusion of injurious foreign material until sealed.

1. Longitudinal Joint

Deformed steel tie bars of specified length, size, spacing and materials shall be placed perpendicular to the longitudinal joints, they shall be placed by approved mechanical equipment or rigidly secured by chair or other approved supports to prevent displacement. Tie bars shall not be painted or coated with asphalt or other materials or enclosed in tubes or sleeves. When shown on the Plans and when adjacent lanes of pavement are constructed separately, steel side forms shall be used which will form a keyway along the construction joint. Tie bars, except those made of rail steel, may be bent at right angles against the form of the first lane constructed and straightened into final position before the concrete of the adjacent lane is placed, or in lieu of bent tie bars, approved two-piece connectors may be used.

Longitudinal formed joints shall consist of a groove or cleft, extending downward from and normal to, the surface of the pavement. These joints shall be effected or formed by an approved mechanically or manually operated device to the dimensions and line indicated on the Plans and while the concrete is in a plastic state. The groove or cleft shall be filled with either a premolded strip or poured material as required.

The longitudinal joints shall be continuous; there shall be no gaps in either transverse or longitudinal joints at the intersection of the joints.

Longitudinal sawed joints shall be cut by means of approved concrete saws to the depth, width and line shown on the Plans. Suitable guide lines or devices shall be used to assure cutting the longitudinal joint on the true line. The longitudinal joint shall be sawed before the end of the curing period or shortly thereafter and before any equipment or vehicles are allowed on the pavement. The sawed area shall be thoroughly cleaned and, if required, the joint shall immediately be filled with sealer.

Longitudinal pavement insert type joints shall be formed by placing a continuous strip of plastic materials which will not react adversely with the chemical constituent of the concrete.

2. Transverse Expansion Joint

The expansion joint filler shall be continuous from form to form, shaped to subgrade and to the keyway along the form. Preformed joint filler shall be furnished in lengths equal to the pavement width or equal

to the width of one lane. Damaged or repaired joint filler shall not be used.

The expansion joint filler shall be held in a vertical position. An approved installing bar, or other device, shall be used if required to secure preformed expansion joint filler at the proper grade and alignment during placing and finishing of the concrete. Finished joint shall not deviate more than 6 mm from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

3. Transverse Contraction Joint/Weakened Joint

When shown on the Plans, it shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement and shall include load transfer assemblies. The depth of the weakened plane joint should at all times not be less than 50 mm, while the width should not be more than 6 mm.

- a. Transverse Strip Contraction Joint. It shall be formed by installing a parting strip to be left in place as shown on the Plans.
- b. Formed Groove. It shall be made by depressing an approved tool or device into the plastic concrete. The tool or device shall remain in place at least until the concrete has attained its initial set and shall then be removed without disturbing the adjacent concrete, unless the device is designed to remain in the joint.
- c. Sawed Contraction Joint. It shall be created by sawing grooves in the surface of the pavement of the width not more than 6 mm, depth should at all times not be less than 50 mm, and at the spacing and lines shown on the Plans, with an approved concrete saw. After each joint is sawed, it shall be thoroughly cleaned including the adjacent concrete surface.

Sawing of the joint shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive ravelling, usually 4 to 24 hours. All joints shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on during the day or night, regardless of weather conditions. The sawing of any joint shall be omitted if crack occurs at or near the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints should be sawed in sequence. If extreme condition exist which make it impractical to prevent erratic cracking by early sawing, the contraction joint groove shall be formed prior to initial set of concrete as provided above.

4. Transverse Construction Joint

It shall be constructed when there is an interruption of more than 30 minutes in the concreting operations. No transverse joint shall be constructed within 1.50 m of an expansion joint, contraction joint, or plane of weakness. If sufficient concrete has been mixed at the time of interruption to form a slab of at least 1.5 m long, the excess concrete from the last preceding joint shall be removed and disposed off as directed.

5. Load Transfer Device

Dowel, when used, shall be held in position parallel to the surface and center line of the slab by a metal device that is left in the pavement.

The portion of each dowel painted with one coat of lead or tar, in conformance with the requirements of **Item 404, Reinforcing Steel (DPWH Standard Specifications, 2004 edition)**, shall be thoroughly coated with approved bituminous materials, e.g., MC-70, or an approved lubricant, to prevent the concrete from binding to that portion of the dowel. The sleeves for dowels shall be metal designed to cover 50 mm plus or minus 5 mm (1/4 inch), of the dowel, with a watertight closed end and with a suitable stop to hold the end of the sleeves at least 25 mm (1 inch) from the end of the dowel.

In lieu of using dowel assemblies at contraction joints, dowel may be placed in the full thickness of pavement by a mechanical device approved by the Engineer.

M. FINAL STRIKE-OFF (CONSOLIDATION AND FINISHING)

1. Sequence

The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straight-edging and final surface finish. Work bridges or other devices necessary to provide access to the pavement surface for the purpose of finishing straight-edging, and make corrections as hereinafter specified, shall be provided by the Contractor.

In general, the addition of water to the surface of the concrete to assist in finishing operations will not be permitted. If the application of water to the surface is permitted, it shall be applied as fog spray by means of an approved spray equipment.

2. Finishing Joints

The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material assembly, also under and around all load transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent

to joints shall be mechanically vibrated as required in Subsection for Placing Concrete.

After the concrete has been placed and vibrated adjacent to the joints as required in Subsection I, Placing Concrete, the finishing machine shall be brought forward, operating in a manner to avoid damage or misalignment of joints. If uninterrupted operation of the finishing machine, to over and beyond the joints causes segregation of concrete, damage to, or misalignment of the joints, the finishing machine shall be stopped when the front screed is approximately 20 cm (8 inches) from the joint. Segregated concrete shall be removed from in front of and off the joint. The front screed shall be lifted and set directly on top of the joint and the forward motion of the finishing machine resumed. When the second screed is close enough to permit the excess mortar in front of it to flow over the joint, it shall be lifted and carried over the joint. Thereafter, the finishing machine may be run over the joint without lifting the screeds, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.

3. Machine Finishing

a. Non-vibratory Method.

The concrete shall be distributed or spread as soon as placed. As soon as the concrete has been placed, it shall be struck off and screeded by an approved finishing machine. The machine shall go over each area of pavement as many times and at such intervals as necessary to give the proper compaction and leave a surface of uniform texture. Excessive operation over a given area shall be avoided. The tops of the forms shall be kept clean by an effective device attached to the machine and the travel of the machine on the forms shall be maintained true without wobbling or other variation tending to affect the precision finish.

During the first pass of the finishing machine, a uniform ridge of concrete shall be maintained ahead of the front screed in its entire length.

b. Vibratory Method.

When vibration is specified, vibrators for full width vibration of concrete paving slabs, shall meet the requirements in Subsection 9.5b, Equipment. If uniform and satisfactory density of the concrete is not obtained by the vibratory method at joints, along forms, at structures, and throughout the pavement, the Contractor will be required to furnish equipment and method which will produce pavement conforming to the Specifications. All provisions in item (a) above not in conflict with the provisions for the vibratory method shall govern.

4. Hand Finishing

Hand finishing methods may only be used under the following conditions:

- a. In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade.
- b. In narrow widths or areas of irregular dimensions where operations of the mechanical equipment is impractical, hand methods may be used.

Concrete, as soon as placed, shall be struck off and screeded. An approved portable screed shall be used. A second screed shall be provided for striking off the bottom layer of concrete if reinforcement is used.

The screed for the surface shall be at least 60 cm (2 feet) longer than the maximum width of the slab to be struck off. It shall be of approved design, sufficiently rigid to retain its shape, and constructed either of metal or other suitable material shod with metal.

Consolidation shall be attained by the use of suitable vibrator or other approved equipment.

In operation, the screed shall be moved forward on the forms with a combined longitudinal and transverse shearing motion, moving always in the direction in which the work is progressing and so manipulated that neither end is raised from the side forms during the striking off process. If necessary, this shall be repeated until the surface is of uniform texture, true to grade and cross-section, and free from porous areas.

5. Floating

After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float, either by hand or mechanical method.

- a. Hand Method. The hand-operated longitudinal float shall be not less than 365 cm (12 feet) in length and 15 cm (6 inches) in width, properly stiffened to prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing motion while held in a floating position parallel to the road center line, and moving gradually from one side of the

pavement to the other. Movement ahead along the center line of the pavement shall be in successive advances of not more than one-half the length of the float.

Any excess water or soupy material shall be wasted over the side forms on each pass.

- b. Mechanical Method. The mechanical longitudinal float shall be of a design approved by the Site Engineer, and shall be in good working condition. The tracks from which the float operates shall be accurately adjusted to the required crown. The float shall be accurately adjusted and coordinated with the adjustment of the transverse finishing machine so that a small amount of mortar is carried ahead of the float at all times. The forward screed shall be adjusted so that the float will lap the distance specified by the Engineer on each transverse trip. The float shall pass over each areas of pavement at least two times, but excessive operation over a given area will not be permitted. Any excess water or soupy material shall be wasted over the side forms on each pass.
- c. Alternative Mechanical Method. As an alternative, the Contractor may use a machine composed of a cutting and smoothing float or floats suspended from and guided by a rigid frame. The frame shall be carried by four or more visible wheels riding on, and constantly in contact with the side forms. If necessary, following one of the preceding method of floating, long handled floats having blades not less than 150 cm (5 feet) in length and 15 cm (6 inches) in width may be used to smooth and fill in open-textured areas in the pavement. Long-handled floats shall not be used to float the entire surface of the pavement in lieu of, or supplementing, one of the preceding methods of floating. When strike off and consolidations are done by the hand method and the crown of the pavement will not permit the use of the longitudinal float, the surface shall be floated transversely by means of the long-handled float. Care shall be taken not to work the crown out of the pavement during the operation. After floating, any excess water and laitance shall be removed from the surface of the pavement by a 3-m straight-edge or more in length. Successive drags shall be lapped one-half the length of the blade.

6. Straight-edge Testing and Surface Correction

After the floating has been completed and the excess water removed, but while the concrete is still plastic, the surface of the concrete shall be tested for trueness with a 300 cm long straight-edge. For this purpose, the Contractor shall furnish and use an accurate 300-cm straight-edge swung from handles 100 cm (3 feet) longer than one-half the width of the slab. The straight-edge shall be held in contact with the surface in successive positions parallel to the road center line and the whole area gone over from one side of the slab to the other as

necessary. Advances along the road shall be in successive stages of not more than one-half the length of the straight-edge. Any depressions found shall be immediately filled with freshly mixed concrete, struck off, consolidated and refinished. High areas shall be cut down and refinished. Special attention shall be given to assure that the surface across joints meets the requirements for smoothness. Straight-edge testing and surface corrections shall continue until the entire surface is found to be free from observable departures from the straight-edge and the slab conforms to the required grade and cross-section.

7. Final Finish

If the surface texture is broom finished, it shall be applied when the water sheen has practically disappeared. The broom shall be drawn from the center to the edge of the pavement with adjacent strokes slightly overlapping. The brooming operation should be so executed that the corrugations produced in the surface shall be uniform in appearance and not more than 1.5 mm in depth. Brooming shall be completed before the concrete is in such condition that the surface will be unduly roughened by the operation. The surface thus finished shall be free from rough and porous areas, irregularities, and depressions resulting from improper handling of the broom. Brooms shall be of the quality size and construction and be operated so as to produce a surface finish meeting the approval of the Engineer. Subject to satisfactory results being obtained and approval of the Engineer, the Contractor will be permitted to substitute mechanical brooming in lieu of the manual brooming herein described.

If the surface texture is belt finished, when straight-edging is complete and water sheen has practically disappeared and just before the concrete becomes non-plastic, the surface shall be belted with 2-ply canvas belt not less than 20 cm wide and at least 100 cm longer than the pavement width. Hand belts shall have suitable handles to permit controlled, uniform manipulation. The belt shall be operated with short strokes transverse to the center line and with rapid advances parallel to the center line.

If the surface texture is drag finished, a drag shall be used which consists of a seamless strip of damp burlap or cotton fabric, which shall produce a uniform gritty texture after dragging it longitudinally along the full width of pavement. For pavement 5 m or more in width, the drag shall be mounted on a bridge which travels on the forms. The dimensions of the drag shall be such that a strip of burlap or fabric at least 100 cm wide is in contact with the full width of pavement surface while the drag is used. The drag shall consist of not less than 2 layers of burlap with the bottom layer approximately 15 cm wider than the layer. The drag shall be maintained in such condition that the resultant surface is of uniform appearance and reasonably free from grooves over 1.5 mm in depth. Drag shall be maintained clean and free from

encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags be substituted.

Regardless of the method used for final finish, the hardened surface of pavement shall have a coefficient of friction of 0.25 or more. Completed pavement that is found to have a coefficient of friction less than 0.25 shall be grounded or scored by the Contractor at his expense to provide the required coefficient of friction.

8. Edging at Forms and Joints

After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each side of each slab, and on each side of transverse expansion joints, formed joints, transverse construction joints, and emergency construction joints, shall be worked with an approved tool and rounded to the radius required by the Plans. A well – defined and continuous radius shall be produced and a smooth, dense mortar finish obtained. The surface of the slab shall not be unduly disturbed by tilting the tool during the use.

At all joints, any tool marks appearing on the slab adjacent to the joints shall be eliminated by brooming the surface. In doing this, the rounding of the corner of the slab shall not be disturbed. All concrete on top of the joint filler shall be completely removed.

All joints shall be tested with a straight-edge before the concrete has set and correction made if one edge of the joint is higher than the other.

N. SURFACE TEST

As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a 3-m straight-edge or other specified device. Areas showing high spots of more than 3 mm but not exceeding 12 mm in 3 m shall be marked and immediately ground down with an approved grinding tool to an elevation where the area or spot will not show surface deviations in excess of 3 mm when tested with 3 m straight-edge. Where the departure from correct cross-section exceeds 12 mm, the pavement shall be removed and replaced by and at the expense of the Contractor.

Any area or section so removed shall be not less than 1.5 m in length and not less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 1.5 m in length, shall also be removed and replaced.

O. CURING

Immediately after the finishing operations have been completed and the concrete has sufficiently set, the entire surface of the newly placed concrete shall be cured in accordance with either one of the methods described herein. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or the lack of water to adequately take care of both curing and other requirements, shall be a cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than ½ hour between stages of curing or during the curing period.

In all congested places, concrete works should be designed so that the designed strength is attained.

1. Cotton of Burlap Mats

The surface of the pavement shall be entirely covered with mats. The mats used shall be of such length (or width) that as laid they will extend at least twice the thickness of the pavement beyond the edges of the slab. The mat shall be placed so that the entire surface and the edges of the slab are completely covered. Prior to being placed, the mats shall be saturated thoroughly with water. The mat shall be so placed and weighted down so as to cause them to remain in intimate contact with the covered surface. The mat shall be maintained fully wetted and in position for 72 hours after the concrete has been placed unless otherwise specified.

2. Waterproof Paper

The top surface and sides of the pavement shall be entirely covered with waterproof paper, the units shall be lapped at least 45 cm. The paper shall be so placed and weighted down so as to cause it to remain in intimate contact with the surface covered. The paper shall have such dimension but each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement, or at pavement width and 60 cm strips of paper for the edges. If laid longitudinally, paper not manufactured in sizes which will provide this width shall be securely sewed or cemented together, the joints being securely sealed in such a manner that they do not open up or separate during the curing period. Unless otherwise specified, the covering shall be maintained in place for 72 hours after the concrete has been placed. The surface of the pavement shall be thoroughly wetted prior to the placing of the paper.

3. Straw Curing

When this type of curing is used, the pavement shall be cured initially with burlap or cotton mats, until after final set of the concrete or, in any case, for 12 hours after placing the concrete. As soon as the mats are removed, the surface and sides of the pavement shall be thoroughly wetted and covered with at least 20 cm of straw or hay, thickness of

which is to be measured after wetting. If the straw or hay covering becomes displaced during the curing period, it shall be replaced to the original depth and saturated. It shall be kept thoroughly saturated with water for 72 hours and thoroughly wetted down during the morning of the fourth day, and the cover shall remain in place until the concrete has attained the required strength.

4. Impervious Membrane Method

The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place, or if the pavement is cured initially with jute or cotton mats, it may be applied upon removal of the mass. The curing compound shall not be applied during rain.

Curing compound shall be applied under pressure at the rate 4 L to not more than 14 m² by mechanical sprayers. The spraying equipment shall be equipped with a wind guard. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes and concrete surface exposed by the removal of forms will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed, but approved means shall be used to insure proper curing at least 72 hours and to prevent the intrusion of foreign material into the joint before sealing has been completed. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film be damaged from any cause within the 72 hour curing period, the damaged portions shall be repaired immediately with additional compound.

5. White Polyethylene Sheet

The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units used shall be lapped at least 45 cm. The sheeting shall be so placed and weighted down so as to cause it to remain intimate contact with the surface covered. The sheeting as prepared for use shall have such dimension that each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement. Unless otherwise specified, the covering shall be maintained in place for 72 hours after the concrete has been placed.

P. REMOVAL OF FORMS

After forms for concrete shall remain in place undisturbed for not less than twenty four (24) hours after concrete pouring. In the removal of forms, crowbars should be used in pulling out nails and pins. Care should be taken so as not to break the edges of the pavement. In case portions of the concrete

are spalled, they shall be immediately repaired with fresh mortar mixed in the proportion of one part of Portland Cement and two parts fine aggregates. Major honeycomb areas will be considered as defective work and shall be removed and replaced at the expense of the Contractor. Any area or section so removed shall not be less than the distance between weakened plane joint nor less than the full width of the lane involved.

Q. SEALING JOINTS

Joints shall be sealed with asphalt sealant soon after completion of the curing period and before the pavement is opened to traffic, including the Contractor's equipment. Just prior to sealing, each joint shall be thoroughly cleaned of all foreign materials including membrane curing compound and the joint faces shall be clean and surface dry when the seal is applied.

The sealing material shall be applied to each joint opening to conform to the details shown on the Plans or as directed by the Engineer. Material for seal applied hot shall be stirred during heating so that localized overheating does not occur. The pouring shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. The use of sand or similar material as a cover for the seal will not be permitted.

Preformed elastomeric gaskets for sealing joints shall be of the cross-sectional dimensions shown on the Plans. Seals shall be installed by suitable tools, without elongation and secured in place with an approved lubricant adhesive which shall cover both sides of the concrete joints. The seals shall be installed in a compressive condition and shall at time of placement be below the level of the pavement surface by approximately 6 mm.

The seals shall be in one piece for the full width of each transverse joint.

R. PROTECTION OF PAVEMENT

The Contractor shall protect the pavement and its appurtenances against both public traffic and traffic caused by his own employees and agents. This shall include watchmen to direct traffic and the erection of and maintenance of warning signs, lights, pavement bridges or cross-overs, etc. The Plans or Special Provisions will indicate the location and type of device or facility required to protect the work and provide adequately for traffic.

All boreholes after thickness and/or strength determinations of newly constructed asphalt and concrete pavements shall be immediately filled/restored with the prescribed concrete/asphalt mix after completion of the drilling works.

Any damage to the pavement, occurring prior to final acceptance, shall be repaired or the pavement be replaced.

S. ACCEPTANCE OF CONCRETE

The strength level of the concrete will be considered satisfactory if the averages of all sets of three (3) consecutive strength test results equal or exceed the specified strength, f_c' and no individual strength test result is deficient by more than 15% of the specified strength, f_c' .

Concrete deemed to be not acceptable using the above criteria may be rejected unless the Contractor can provide evidence, by means of core tests, that the quality of concrete represented by failed test results is acceptable in place. At least three (3) representative cores shall be taken from each member or area of concrete in place that is considered deficient. The location of cores shall be determined by the Site Engineer so that there will be at least impairment of strength of the structure. The obtaining and testing of drilled cores shall be in accordance with AASHTO T 24.

Concrete in the area represented by the cores will be considered adequate if the average strength of the cores is equal to at least 85% of, and if no single core is less than 75% of, the specified strength, f_c' .

If the strength of control specimens does not meet the requirements of this Subsection, and it is not feasible or not advisable to obtain cores from the structure due to structural considerations, payment of the concrete will be made at an adjusted price due to strength deficiency of concrete specimens as specified hereunder:

Deficiency in Strength of Concrete Specimens, Percent (%)	Percent (%) of Contract Price Allowed
Less than 5	100
5 to less than 10	80
10 to less than 15	70
15 to less than 20	60
20 to less than 25	50
25 or more	0

T. OPENING TO TRAFFIC

The Engineer will decide when the pavement may be opened to traffic. The road will not be opened to traffic until test specimens molded and cured in accordance with AASHTO T 23 have attained the minimum strength requirements in Subsection 10.2. If such tests are not conducted prior to the specified age the pavement shall not be operated to traffic until **7 days** after the concrete was placed. Before opening to traffic, the pavement shall be cleaned and joint sealing completed.

- a. At the Contractor's option, ready-mixed concrete may be used in meeting the requirements as to materials, batching, mixing, transporting and placing as specified herein and in the requirements of the "Specifications for Ready-Mixed Concrete" (ASTM C-94), including the supplementary requirements specified in Subsections (b) through (g) herein.
- b. Ready-mixed 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 or before the drum has been revolved to 250 revolutions, whichever is first. In hot weather, other conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 29.44°C (85°F) or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed forty-five (45) minutes.
- c. Truck mixers shall be equipped with electrically actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the re-settable, recording type and shall be mounted in the driver's cab. The counter shall be actuated at the time of starting mixers at mixing speeds.
- d. Each batch of concrete be mixed in a truck mixer for not less than seventy (70) revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.
- e. Truck mixers and their operation must be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix and grading. If slump tests taken at approximately the $\frac{1}{4}$ and $\frac{3}{4}$ points of the load during discharge give slumps differing by more than 25 mm (1 in.) when specified slump is 76 mm (3 in.) or less, or if they differ by more than 50 mm (2 in.) when the specified slump is more than 76 mm (3 in.), the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump test. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.
- f. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a ticket furnished to the Engineer showing volume of concrete, the weight of cement in kilograms (pounds), and total weight of all ingredients in kilograms (pounds). The ticket shall also show the time of day at which the materials were batched.
- g. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for

transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batched aggregates shall be subject to continuous inspection at the batching plant by the Engineer.

8.7 PLACING REINFORCEMENT (other than pavement reinforcing steel)

- a. All reinforcement shall be placed in accordance with the plans furnished by the Engineer, in case of any doubt or ambiguity in placing of steel, the Contractor shall consult with the Engineer whose decision shall be final in such cases.
- b. All loose rust or scale, all adhering materials, and all oil or other materials which tend to destroy bond between the concrete and the reinforcement shall be removed before placing the steel and before concreting begins.
- c. Metal reinforcement shall be accurately placed and adequately secured by using annealed iron wire ties or suitable clips at intersections and shall be supported by concrete or metal support, spacers, or metal hangers. The minimum clear distance between parallel bars shall be 1-1/2 times the diameter for round bars and twice the side dimension for square bars. In no case shall the clear distance be less than 25 mm (1 in.) nor less than 1-1/3 times the maximum size of the course aggregates. Where bars are used in 2 or more layers at a clear distance of not less than 25 mm (1 in.).
- d. Reinforcement steel shall not be straightened or re-bent in a manner that will injure the material. Bars with kinks or bends not shown on the drawings shall not be used. Heating of the reinforcement will be permitted only when approved by the Site Engineer.

8.8 OFFSETS AND SPLICES IN REINFORCEMENT

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

8.9 LIQUIDATED DAMAGES

For failure to meet the specified strengths of concrete which has been designed, prepared and deposited by the Contractor, the Contractor shall pay the Owner as

liquidated damages, not as penalty or forfeiture, the following schedule applied on the amount of concrete represented by the samples:

- a. For concrete less than one hundred percent (100%) but greater than or equal to ninety percent (90%) of specified strengths, payment of ten percent (10%) of the unit bid cost per cubic meter of concrete;
 - b. For concrete less than ninety percent (90%) but greater than or equal to eighty-five percent (85%) of specified strength, payment of fifteen (15%) percent of the unit bid cost per cubic meter of concrete;
 - c. For concrete less than eighty-five percent (85%) of the specified strength, removal of the concrete so deposited and the replacement of same at the expense of the Contractor;
1. In any case of failure to meet specified strength, the Contractor concrete and the compressive strength of same, as determined by a competent testing authority, shall be taken as conclusive evidence of its strength and integrity, provided the curing will not impair the safety of the structure and can be satisfactory replaced.

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

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

9. MISCELLANEOUS METALWORKS

9.1 SCOPE OF WORK

The Contractor shall furnish, fabricate, and install all the miscellaneous metalwork as specified and shown. Miscellaneous metalwork is defined as all items required to be fabricated from structural steel shapes, plates, bars, and their products.

9.2 WELDING

All welding shall be by the shielded arc method and shall conform to the "AWS Code for Arc and Gas Welding in Building Construction". Qualification of welders shall be in accordance with the "Specifications for Standard Qualification Procedure" of the AWS.

9.3 BOLTS

- a. The Contractor shall furnish and set all bolts and anchor bolts. Except where otherwise shown or specified, all bolts, anchor bolts, washers, and nuts shall be steel, galvanized after fabrication in accordance with “Specification for Zinc (Hot- Galvanized) Coating on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip” (ASTM A123). Except as otherwise provided herein, steel for bolts, anchor bolts, and cap screws shall be in accordance with “Specifications for Low Carbon Steel Externally and Internally Threaded Standard Fasteners”, Grade B (ASTM Designation A-307), or “Specifications for Carbon Steel Bars Subject to Mechanical Property Requirements” (ASTM Designation A-306) or threaded parts of ASTM A-36 and shall meet the following additional requirements: (1) the nut material shall be free-cutting steel, and (2) the nuts shall be capable of developing the full strength of the bolts. Thread shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads, and nuts shall be Heavy Hexagon Series.
- b. Threads on galvanized bolts and nut shall be formed with suitable taps and dies such that they retain the normal clearance after hot dip galvanizing.
- c. Unless otherwise shown, all bolts, anchor bolts, and nuts which are buried, submerged, or inside a covered hydraulic structure shall be Hot-Dip galvanized and then coated with two coats of coal tar epoxy, after installation.

10. REFLECTIVE THERMOPLASTIC STRIPPING MATERIALS (SOLID FORM)-ITEM 612

10.1 DESCRIPTION

This standard specifies the requirement for reflectorized thermoplastic pavement stripping material conforming to AASHTO M 249 that is applied to the road surface in a molten state by mechanical means with surface application of glass beads at a rate of not less than 350 g/L of glass beads having a size range of drop-in type and will produce an adherent reflectorized stripe of specified thickness and width capable of resisting deformation by traffic.

10.2 MATERIALS REQUIREMENTS

- a. Reflectorized Thermoplastic Pavement Material shall be homogeneously composed of pigment, filler, resins and glass reflectorizing spheres.

The thermoplastic material shall be available to both white and yellow.

- b. Glass Beads (Pre-Mix) shall be uncoated and shall comply with the following requirements:

Refractive Index, min. - 1.50
Spheres, Percent, min. - 90

Gradation:

Sieve Passing mm	Mass Percent
0.850	100
0.600	75-95
0.425	-
0.300	15-35
0.180	-
0.150	0-5

10.3 GENERAL REQUIREMENTS

A. COMPOSITION

The pigment, beads and filler shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with the requirements as specified in Table 612.1.

Table 612.1 – Composition Requirements

Component	White	Yellow
Binder, min.	18.0	18.0
Glass Beads:		
min.	30	30
max.	40	40
Titanium Dioxide, min.	10.0	
Chrome Yellow, Medium, min.		10.0
Calcium Carbonate And Inert Fillers, Max.	42.0	42.0

B. QUALITATIVE

The material shall conform to the qualitative requirements as specified in Table 612.2.

Table 612.2 – Qualitative Requirements

Property	Requirements	
	White	Yellow
Specific Gravity, max.	2.15	
Drying Time, minutes,	10.0	
max. Bond Strength to Portland Cement Concrete after heating for four (4) hours	1.24	
± 5 min. @ 218°C, MPa, max.		
Cracking Resistance @ low temp. after heating for four (4) hours ± 5 min. @ 218 ± 2 °C.	No cracks	
Impact Resistance after heating for four (4) hours	115 102.5 \pm 9.5°C	
± 5 min. @ 218 ± 2 °C and forming test specimens, mm/kg, min.	75	45
Softening Point after heating for four (4) hours ± 5 min. @ 218 ± 2 °C.		
Daylight reflectant @ 45 Degrees – 0 degrees, % min.		

C. APPLICATION PROPERTIES

The material shall readily extrude at a temperature of $211 \pm 7^\circ\text{C}$, from approved equipment to produce a line 3.2 to 4.8 mm thick which shall be continuous and uniform in shape having clear and sharp dimensions.

The material shall not exude fumes which are toxic, obnoxious or injurious to persons or property when heated during applications.

The application of additional glass beads by drop-in methods shall be at a rate of not less than 350 g/L of glass beads having a size range for drop-in type. The typical size range of spheres of drop-in type paints is as follows.

Passing 850 μm (#20) sieve and retained on 250 μm (#60) sieve, %	80 – 100
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- 1) Preparation of Road Surface – the materials should be applied only on the surface which is clean and dry. It shall not be laid into loose detritus, mud or similar extraneous matter, or over an old paint

markings, or over an old thermoplastic marking which is faulty. In the case of smooth, polished surface stones such as smooth concrete, old asphalt surfacing with smooth polished surface stones and/or where the method of application of the manufacturer of the thermoplastic materials shall be recommended, and with the approval of the Engineer.

- 2) Preparation of Thermoplastic Materials – The materials shall be melted in accordance with the manufacturer’s instruction in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic and such the local overheating shall be avoided. The temperature of the mass shall be within the range specified by the manufacturer and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material shall be used as expeditiously as possible and for thermoplastics which have natural resin binders or otherwise sensitive to prolong heating the materials shall not be maintained in a molten condition for more than 4 hours.
- 3) Laying – Center lines, lane lines and edges lines shall be applied by approved mechanical means and shall be laid in regular alignment. Other markings may be applied by hand – screed, hand propelled machine or by self-propelled machine approved or directed by the Engineer. After transfer to the laying apparatus the materials shall be maintained within the temperature range specified by the manufacturer and stirred to maintain the right consistency for laying.

In the case of screen application, the material shall be laid to a thickness of not less than 3 mm or more than 6 mm unless authorized by the Engineer when laid over an existing markings. In the case of sprayed application the material shall be laid to thickness of not less than 1.5 mm unless authorized by the Engineer. In all cases the surface produced shall be uniform and appreciably free from bubbles and steaks. Where the Contractor Documents require or the Engineer direct that ballotini shall be applied to the surface of the markings, these shall be applied uniformly to the surface of hot thermoplastic immediately after laying such that the quality of ballotini firmly embedded and retained in the surface after completion complies with the requirements of *DPWH Standard Specifications for Public Works and Highways, Republic of the Philippines*.

Road markings of a repetitive nature, other center lines, lane lines, etc., shall unless otherwise directed by the Engineer be set out with stencils which comply with the size and spacing requirements shown on the Plans.

- 4) Re-use of Thermoplastic Materials – At the end of day’s as much as possible the material remaining in the heater and/or laying apparatus shall be removed. This may be broken and used again provided that the maximum heating temperature has not been exceeded and that the total time during which it is a molten condition does not exceed the

requirements of *DPWH Standard Specifications for Public Works and Highways, Republic of the Philippines*.

D. DEFECTIVE MATERIALS OR WORKMANSHIP

Materials which are defective or have been applied in an unsatisfactory manner or to incorrect dimensions or in a wrong location shall be removed, the road pavement shall be made good and materials replaced, reconstructed and/or properly located, all at the Contractor's expenses and to the satisfaction of the Site Engineer.

E. PROTECTION OF THE TRAFFIC

The Contractor shall protect pedestrians, vehicles and other traffic adjacent to the working area against damage or disfigurement by construction equipment, tools and materials or by spatters, splashes and smirches or paint or other construction materials and during the course of the work, provide and maintain adequate signs and signals for the warning and guidance of traffic.

F. SAMPLING

A minimum weight of 10 kg. of Reflectorized Thermoplastic paint shall be taken for every 100 bags or fraction thereof.

G. TESTING

The material shall be tested in accordance with AASHTO T 250 or with the appropriate method in ASTM designation.

H. PACKING AND MARKING

The material shall be packaged in a suitable container to which it will not adhere during shipment and storage. The blocks of cast thermoplastic material shall be approximately 300 x 915 by 51 mm and shall weigh approximately 23 kg. Each container label shall designate the color, manufacturer's name, batch number and date of manufacture. Each batch manufactured shall have its own separate number. The label shall warn the user that the material shall be heated to $211 \pm 7^{\circ}\text{C}$ during application.

11. AGGREGATE SUBBASE COURSE (ITEM 200)

11.1 DESCRIPTION

This item shall consist of furnishing, placing and compacting an aggregate subbase course on a prepared subgrade in accordance with this Specification and the lines, grades and cross-sections shown on the Plans, or as directed by the Site Engineer.

11.2 MATERIALS REQUIREMENTS

Aggregate for subbase shall consist of hard, durable particles or fragments of crushed stone, crushed slag, or crushed or natural gravel and filler of natural or crushed sand or other finely divided mineral matter. The composite material shall be free from vegetable matter and lumps or balls of clay, and shall be of such nature that it can be compacted readily to form a firm, stable subbase.

The subbase material shall conform to Table 200.1, Grading Requirements

Grading Requirements

Sieve Designation		Mass Percent Passing
Standard, mm	Alternate US Standard	
50	2"	100
25	1"	55 – 85
9.5	3/8"	40 – 75
0.075	No. 200	0 - 12

The fraction passing the 0.075 mm (No. 200) sieve shall not be greater than 0.66 (two thirds) of the fraction passing the 0.425 mm (No. 40) sieve.

The fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 35 and plasticity index not greater than 12 as determined by AASHTO T 89 and T 90, respectively.

The coarse portion, retained on a 2.00 mm (No. 10) sieve, shall have a mass percent of wear not exceeding 50 by the Los Angeles Abrasion Tests as determined by AASHTO T 96.

The material shall have a soaked CBR value of not less than 25% as determined by AASHTO T 193. The CBR value shall be obtained at the maximum dry density and determined by AASHTO T 180, Method D.

11.3 CONSTRUCTION REQUIREMENTS

A. PREPARATION OF EXISTING SURFACE

The existing surface shall be graded and finished as provided under Item 105, Subgrade Preparation, “*DPWH Standard Specifications for Public Works and Highways, Republic of the Philippines*” before placing the subbase material.

B. PLACING

The aggregate subbase material shall be placed at a uniform mixture on a prepared subgrade in a quantity which will provide the required compacted

thickness. When more than one layer is required, each layer shall be shaped and compacted before the succeeding layer is placed.

The placing of material shall begin at the point designated by the Site Engineer. Placing shall be from vehicles especially equipped to distribute the material in a continuous uniform layer or windrow. The layer or windrow shall be of such size that when spread and compacted the finished layer be in reasonably close conformity to the nominal thickness shown on the Plans.

When hauling is done over previously placed material, hauling equipment shall be dispersed uniformly over the entire surface of the previously constructed layer, to minimize rutting or uneven compaction.

C. SPREADING AND COMPACTING

When uniformly mixed, the mixture shall be spread to the plan thickness, for compaction.

Where the required thickness is 150 mm or less, the material may be spread and compacted in one layer. Where the required thickness is more than 150 mm, the aggregate subbase shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any layer shall not exceed 150 mm. All subsequent layers shall be spread and compacted in a similar manner.

The moisture content of subbase material shall, if necessary, be adjusted prior to compaction by watering with approved sprinklers mounted on trucks or by drying out, as required in order to obtain the required compaction.

Immediately following final spreading and smoothing, each layer shall be compacted to the full width by means of approved compaction equipment. Rolling shall progress gradually from the sides to the center, parallel to the centerline of the road and shall continue until the whole surface has been rolled. Any irregularities or depressions that develop shall be corrected by loosening the material at these places and adding or removing material until surface is smooth and uniform. Along curbs, headers, and walls, and at all places not accessible to the roller, the subbase material shall be compacted thoroughly with approved tampers or compactors.

If the layer of subbase material, or part thereof, does not conform to the required finish, the Contractor shall, at his own expense, make the necessary corrections.

Compaction of each layer shall continue until a field density of at least 100 percent of the maximum dry density determined in accordance with

AASHTO T 180, Method D has been achieved. In-place density determination shall be made in accordance with AASHTO T 191.

D. TRIAL SECTIONS

Before subbase construction is started, the Contractor shall spread and compact trial sections as directed by the Site Engineer. The purpose of the trial sections is to check the suitability of the materials and the efficiency of the equipment and construction method which is proposed to be used by the Contractor. Therefore, the Contractor must use the same material, equipment and procedures that he proposes to use for the main work. One trial section of about 500 m² shall be made for every type of material and/or construction equipment/procedure proposed for use.

After final compaction of each trial section, the Contractor shall carry out such field density tests and other tests required as directed by the Engineer.

If a trial section shows that the proposed materials, equipment or procedures in the Engineer's opinion are not suitable for subbase, the material shall be removed at the Contractor's expense, and a new trial section shall be constructed.

If the basic conditions regarding the type of material or procedure change during the execution of the work, new trial sections shall be constructed.

E. TOLERANCES

Aggregate sub-base shall be spread with equipment that will provide a uniform layer which when compacted will conform to the designed level and transverse slopes as shown on the Plans. The allowable tolerances shall be as specified hereunder:

Permitted variation from design THICKNESS OF LAYER	± 20 mm
Permitted variation from design LEVEL OF SURFACE	+10 mm -20 mm

Permitted SURFACE IRREGULARITY Measured by 3-m straight-edge	20 mm
Permitted variation from design CROSSFALL OR CAMBER	±0.3%
Permitted variation from design LONGITUDINAL GRADE over 25 m in length	±0.1%

Section VII. Drawings

[See attached.]

Section VIII. Bill of Quantities

Product Name: CONSTRUCTION OF TRANSMISSION LINES SECTION A 2021
Location: VICTORIAS CITY, NEGROS OCCIDENTAL

SECTION VIII - BILL OF QUANTITIES

Part No. ___ of ___				Part Description: _____	
(Columns (1), (2), (3) and (4) are to be filled up by the Procuring Entity)				(Columns (5) and (6) are to be filled up by the Bidder)	
Pay Item No	Description	Unit	Quantity	Unit Price (Pesos)	Amount (Pesos)
PIPELINES AND APPURTENANCES					
<p>PIPELINES - Furnish and install pipes complete including joints, fittings, and warning/detection tapes, perform excavation of any type of soil excluding rock/boulders/hard limestone with pipe cover of 1.2 metres or less, measured to existing ground surface, sump pumping, pipe supports, thrust blocks, backfilling using suitable materials from the trench, disposal of surplus materials where directed, compaction and hydrotesting in accordance with Specifications and Drawings. The cost shall include provision and maintaining enough safety barricades, bollards, warning signs/lights and steel plates to cover open trenches when required and in accordance with the Plans and Technical Specifications.</p> <p style="margin-left: 40px;"><i>Note 1: Quantity - Length in meters, excluding length of valves, assemblies and fittings under Items B, C and D.</i></p> <p style="margin-left: 40px;"><i>Note 2: Concrete thrust blocks not required for welded steel pipes.</i></p> <p style="margin-left: 40px;"><i>Note 3: Warning and detection tapes required for all pipes.</i></p> <p style="margin-left: 40px;"><i>Note 4: The unit cost of pipelines includes the cost of providing barricades, warning lights and steel plates.</i></p> <p style="margin-left: 40px;"><i>Note 5: Quantities Estimated are for the purposes of comparing bids. Payment will be based on actual quantities furnished, installed or constructed</i></p>					
I. TRANSMISSION PIPELINES					
I.A	Pipe Laying – 200mm HDPE SDR11	396	lm	In Words: _____ _____ In Figures: _____	In Words: _____ _____ In Figures: _____
I.B	Pipe Laying – 150mm HDPE SDR11	366	lm	In Words: _____ _____ In Figures: _____	In Words: _____ _____ In Figures: _____
II. DISTRIBUTION PIPELINES					

II.A	Pipe Laying - 100mm HDPE SDR11	90	lm	In Words: _____ _____ In Figures: _____ _____	In Words: _____ _____ In Figures: _____ _____
III. VALVES AND FITTINGS					
<p>VALVES - Furnish and install gate valves complete with valve boxes, barricade posts, and appropriate fittings to interconnect to existing pipelines and to some interconnections areas as shown on the plans and as specified, perform all necessary excavation and construct concrete base as per Specifications and Drawings.</p>					
III.A	200mmØ, Gate Valve w/ fittings	5	sets	In Words: _____ _____ In Figures: _____ _____	In Words: _____ _____ In Figures: _____ _____
III.B	150mmØ, Gate Valve w/ fittings	4	sets	In Words: _____ _____ In Figures: _____ _____	In Words: _____ _____ In Figures: _____ _____
III.C	100mmØ, Gate Valve w/ fittings	4	sets	In Words: _____ _____ In Figures: _____ _____	In Words: _____ _____ In Figures: _____ _____
IV. APPURTENANCES					
<p>Metering Assembly – Furnish and install district metering assemblies including pressure release valve (PRV), gate valves, air release assembly, pressure gauge, flow meter, pipe fittings, thrust block, and concrete valve box with steel plate cover as specified and as shown on the Drawings</p>					
IV.A	100mmØ, PRV Assembly	2	sets	In Words: _____ _____ In Figures: _____ _____	In Words: _____ _____ In Figures: _____ _____

Hydrant – Furnish and install improvised blow-off assemblies including valves, lateral pipes, riser GI pipe, thrust block, tees/cross tee/bends, fittings, concrete pads and barricades as specified and as shown on the Drawings

IV.B	100mmØ, Fire Hydrant Assembly	1	set	In Words: _____ _____ _____ In Figures: _____	In Words: _____ _____ _____ In Figures: _____
IV.C	75mmØ, Fire Hydrant Assembly	3	sets	In Words: _____ _____ _____ In Figures: _____	In Words: _____ _____ _____ In Figures: _____

V. MISCELLANEOUS WORKS

Pavement Demolition - Furnish, labor, tools and equipment necessary to demolish pavement including the hauling of these discard materials to appropriate dump site. Locating appropriate dump site shall be the contractor's responsibility.

- Note 1: Payment will be based on the maximum allowable trench width as tabulated under standard drawing.
- Note 2: No payment shall be made for asphalt pavement if its thickness is less than 50mm.
- Note 3: Cost of cutting/ sawing the pavement shall be included in the unit bid for pavement demolition.

V.A	Pavement Demolition	291	sq.m.	In Words: _____ _____ _____ In Figures: _____	In Words: _____ _____ _____ In Figures: _____
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Surface Restoration - Furnish materials, labor and equipment necessary to construct pavement and restore surface as specified and as shown on the Drawings.

- Note 1: Cost for the supply and preparation of the base course when required shall be included in the bid unit price.
- Note 2: Payment will be based on the volume of concrete or asphalt pavement restored considering the maximum allowable trench width as tabulated under standard drawings.

V.B	Pavement Restoration	58.20	cu.m.	In Words: _____ _____ _____ In Figures: _____ _____	In Words: _____ _____ _____ In Figures: _____ _____
V.C	Permits Acquisition, Plans & As-built Plans	1	lot	In Words: _____ _____ _____ In Figures: _____ _____	In Words: _____ _____ _____ In Figures: _____ _____
TOTAL BIDDED COST		In Words: _____ In Figures: _____			

Submitted by:

Name of & Signature and Official Stamp of Bidder/Bidder's Representative:

Date: _____

Position: _____

Name of Bidder: _____

Notes:

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

BREAKDOWN OF PRICES

The Bidder shall completely fill up the Bidder's Breakdown of the Unit Price and Lump Sum Bids herein below provided by inserting the amount in figures for each item in the space provided. The Breakdown shall be submitted together with and shall form part of the Bid Form. The amounts shall represent a true breakdown of the bid prices of the Unit Price and Lump Sum Bids shown in the Bid Form in Philippine Peso. These amounts will be used in preparing monthly estimates. All breakdown should be balanced and consistent with the bid amount in Section VIII – Bill of Quantities. An UNBALANCED BREAKDOWN WILL NOT BE ACCEPTABLE. The total amount indicated in the form below for each Unit Price and Lump Sum Bid Items must equal the bid price shown in the Bid Form.

UNIT PRICE BID ITEMS

Construction of Transmission Line Section A 2021

	BID ITEM	QTY	UNIT PRICE SUPPLY / MATERIAL (Pesos)	UNIT PRICE INSTALLATION (Pesos)	BID ITEM TOTAL UNIT PRICE (Pesos)
PIPELINES AND APPURTENANCES					
I.	Transmission Pipelines				
a.	Pipe Laying - 200mm HDPE SDR11	396 lm			
b.	Pipe Laying - 150mm HDPE SDR11	366 lm			
II.	Distribution Pipelines				
a.	Pipe Laying - 100mm HDPE SDR11	90 lm			
III.	Valves and Fittings				
a.	200mmØ, Gate Valve w/ fittings	5 sets			
b.	150mmØ, Gate Valve w/ fittings	4 sets			
c.	100mmØ, Gate Valve w/ fittings	4 sets			
IV.	Appurtenances				
a.	100mmØ, PRV Assembly	2 sets			
b.	100mmØ, Fire Hydrant Assembly	1 set			
c.	75mmØ, Fire Hydrant Assembly	3 sets			
V.	Miscellaneous Works				
a.	Pavement Demolition	291 sq.m.			

b.	Pavement Restoration	58.20 cu.m			
c.	Permits Acquisition, Plans & As-built Plans	1 lot			
TOTAL					

NOTES:

A. PIPELINES AND RELATED CIVIL WORKS

The bidder shall complete the following form by inserting the price amounts (in figures) for supply and installation of pipes up to disinfection of pipes.

Note: Others include detection tapes, thrust blocks, etc.

B. ASSEMBLIES

The bidder shall complete the following form by inserting the price amounts (in figures) for the supply of materials and installation (per unit cost).

Note: Include fittings & other expenses such as taxes, clearance and handling up to the construction site.

C. PAVEMENT DEMOLITION AND SURFACE RESTORATION

The bidder shall complete the following form by inserting the price amounts (in figures) for the supply of materials and installation/labor (per unit cost).

C.1 Pavement Demolition - Furnish, labor, tools and equipment necessary to demolish pavement including the hauling of these discard materials to appropriate dump site. Locating appropriate dump site shall be the contractor's responsibility. (*Notes: 1. Payment will be based on the maximum allowable trench width as tabulated under standard drawing CW-01; 2. No payment shall be made for asphalt pavement if its thickness is less than 50mm; 3. Cost of cutting/ sawing the pavement shall be included in the unit bid for pavement demolition.*)

Note: Include fittings & other expenses such as taxes, clearance and handling up to the construction site.

C.2 Surface Restoration -Furnish materials, labor and equipment necessary to construct pavement and restore surface as specified and as shown on the Drawings. (*Note 1 : Cost for the supply and preparation of the base course when required shall be included in the bid unit price. Note 2 : Payment will be based on the volume of concrete or asphalt pavement restored considering the maximum allowable trench width as tabulated under standard drawings CW – 01.*)

Note: Include fittings & other expenses such as taxes, clearance and handling up to the construction site.

C.3 ROCK/BOULDER EXCAVATION (including breaking, excavation, removal/ disposal as specified in the LWUA Standard Technical Specifications.

Note: Include fittings & other expenses such as taxes, clearance and handling up to the construction site.

D. CULVERT CROSSINGS

The bidder shall complete the following form by inserting the price amounts (in figures) for the supply of materials and installation/labor (per unit cost)

Note: Includes other expenses such as fabrications, thrust blocks, concrete encasement, pipe supports, painting works, backfilling, pavement demolition and restoration, taxes, clearance and handling up to the construction site.

Signature and Official Stamp of Bidder: _____

Date: _____

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);
or
- ☐ (b) Registration certificate from Securities and Exchange Commission (SEC), Department of Trade and Industry (DTI) for sole proprietorship, or Cooperative Development Authority (CDA) for cooperatives or its equivalent document;
and
- ☐ (c) Mayor’s or Business permit issued by the city or municipality where the principal place of business of the prospective bidder is located, or the equivalent document for Exclusive Economic Zones or Areas;
and
- ☐ (e) Tax clearance per E.O. No. 398, s. 2005, as finally reviewed and approved by the Bureau of Internal Revenue (BIR).

Technical Documents

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

- ☐ (l) 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**
- ☐ (m) The prospective bidder's computation of Net Financial Contracting Capacity (NFCC).

Class "B" Documents

- ☐ (n) 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

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

Other documentary requirements under RA No. 9184

- ☐ (p) Original of duly signed Bid Prices in the Bill of Quantities; **and**
- ☐ (q) 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**
- ☐ (r) Cash Flow by Quarter.

