PROJECT TITLE : **REHABILITATION OF WATER DISTRIBUTION AND SERVICE LINE APPURTENANCES**
LOCATION : **DIFFERENT AREAS IN CALAMBA CITY**

I. SCOPE OF WORKS AND SPECIFICATIONS

FOR THE SUPPLY OF LABOR , MATERIALS AND SUPERVISION FOR THE ABOVE PROJECT TITLE

A. EARTHWORKS

☐ 1 Removal of Existing Pavement: All concrete pavement surfaces to be removed shall be scored with concrete sawing equipment; provided, that any Portland cement concrete base under asphaltic mix surface will not be required to be scored by sawing. Asphaltic concrete pavement shall be removed to clean straight lines.

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

☐ Concrete sidewalks, curbs and gutter required to be removed shall be cut to the nearest score marks.

☐ 2 Excavation: Excavation for pipelines shall be open-cut trenches. Excavate trenches with even bottoms, uniform width and vertical sides. The bottom of the trench, including any shoring shall have a minimum and maximum width shown in table of Typical Trench Detail drawing (SD-1). The maximum amount of open trench permitted at any one time and in one location shall be 300 meters, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater.

☐ When excavating in rock or shale, dig trench 10 – 15 cm below the desired pipe bottom and backfill with compacted sand to proper grade.

☐ 3 Disposal of excess Excavated Material: Remove and dispose all excess excavated material in manner approved by Engineer.

☐ 4 Excavation in Lawn Areas: The sod shall be carefully removed and stockpiled to preserve it for replacement. Excavated material from the trench may be placed on the lawn provided a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of back filling and testing of the pipeline, the sod shall be replaced in a manner so as to restore the lawn as near as possible to its original condition.

☐ 5 Excavation in Vicinity of Trees: Except where trees are shown on the drawing to be removed, trees shall be protected from injury during construction operations and no tree is to be removed without written permission from Engineer. Trees shall be supported during excavation.

B. PIPE LAYING

☐ 1 Installation: Install pipes, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials and all other appurtenances as shown and as required to provide a complete and workable installation. Where pipe supports details are shown, the supports shall conform thereto and shall be placed as indicated; provided, that the support for all exposed piping shall be complete and adequate regardless of whether or not supporting devices are specifically shown. At all times when the work of installing pipes is not in progress, all openings into the pipe and the ends of the pipe in trenches shall be kept tightly closed to permit entrance of animals and foreign materials.

☐ 2 Laying of Pipes into Trench: Trenches shall be in a reasonably dry condition when the pipe is laid. The pipe sections shall be laid to the line and grade when shown and they shall be closely jointed to form a smooth flow line. Immediately before placing each section of pipe in final position for jointing, the bedding for the pipe shall be checked for firmness and uniformity of surface.

☐ 3 Connections to Existing Water Mains: Preassemble fittings, valves etc., as far as possible and have all necessary tools and equipment on-site before shutting off the existing main. Pour concrete thrust blocks, if required, to the new line and allow curing for at least eight days before the pipe is put under pressure.

☐ 4 Thrust Blocking: Concrete thrust blocks, anchor blocks or welded joints shall be provided at all junctions, changes in directions exceeding 11 ½ º or where otherwise shown. Concrete should have a compressive strength of at least 140 kg/cm2, 28 days after pouring. This can be accomplished by mixing the following proportions:

· One part Portland cement
· 2½ parts clean sand (do not use beach sand)
· Five parts crushed stone (1 – 3 cm)
· Enough water to make a workable mix

C. BACKFILL/RESTORATION

☐ 1 A newly laid pipe shall be backfilled at least 150mm (6in) above the top of the pipe at the end of each day with selected material obtained from the excavation. Materials used for backfill shall be selected, free from grass, roots, brush or other vegetation, or rocks having maximum dimensions larger than 150mm (6 in). If in opinion of the Engineer, said material is unsuitable for backfill purposes, borrow material having the sand equivalent value of not less than twenty (20) (ASTM – D2419) shall be used for this portion of the trench backfill. Selected material shall first be brought up to mid – diameter of the pipe and compacted; then the remainder of the backfill to 150mm (6in) above the pipe maybe placed and compacted. Such material shall be compacted to ninety five percent (95%) of max. density where the trench is located under proposed structures and ninety percent (90%) of max. density elsewhere. Compaction shall be obtained by tamping it not more than 150mm (6in) layers or by using excess water and passing a concrete vibrator between the pipe and the side of the trench. Obtain and complete (IR) inspection request form prior to backfilling; the works may proceed upon approval of the Supervising Engineer. Remainder of the trench shall be backfilled not later than the following day.

☐ Barricades and warning lights satisfactory to the Engineer shall be provided and maintain for all in which case of heavy steel plates, adequately braced bridges or other type of crossing capable of supporting vehicular traffic shall be furnished.

☐ 2 Concrete pavement shall be replaced with the same kind or better material in conformance with the latest specifications, rules and regulation, and subject to the inspection and approval of the agency having jurisdiction.

D. HYDROTESTING/DISINFECTION

☐ Prior to permanent resurfacing after the trench is backfilled, but with joints exposed, all pipes, slowly with water and has been completely filled; it shall be allowed to stand under a slight pressure for a minimum of 48 hours. The test pressure shall be 100 psi and leakage shall not be less than 0.0777 li per mm per kilometer of length per hour.

☐ All new domestic water mains or extensions to existing systems, or valve section of such extension or any replacement in the existing water system shall be disinfected with chlorine. Disinfections shall be completed not more than 3 days prior to placing the pipeline into service unless otherwise approved by the Engineer and care shall be taken to prevent recontamination of the pipeline.

II. MATERIALS SPECIFICATIONS

A. PIPES AND FITTINGS

Unplasticized Polyvinyl Chloride Pipe

☐ 1 Pipe Description: Pipes and fittings shall conform to the requirements of AWWA C900 or PNS 65 and shall be pressure Class 150 (Series 8).

☐ Comply with ISO 1452 and lead free with 1CP_EOS Method and machine installed Integral Fixed Seal. The seal is glass reinforced polypropylene(PP) highly flexibleEPDM Rubber homogeneous bonded to stiff piping.

☐ 2 Pipe and Fitting Construction: The pipe and fittings shall have steel pipe equivalent or cast iron equivalent outside dimensions. Rating as indicated with integral push-on bell with elastomeric gasket seal on one end and plain beveled on the other end. PVC Pipes and fittings shall be made from clean, blue-pigmented, virgin, NSF approved Class 12454-A or 12454-B PVC compound conforming to the requirements of ASTM D1784. All pipes shall be furnished in lengths of 6 meters.

☐ 3 ***Pipe Dimensions: Pipe shall conform to the following dimensions:***

Nominal Pipe Size,	2	3	4	6	8	10	12
Nominal	50	75	100	150	200	250	300
Outside Diameter,							
min	63.0	90.0	110.0	160.0	225.0	280.0	315.0
max	63.3	90.3	110.4	160.5	225.7	280.9	316.0
Wall Thickness, mm							
min	3.6	5.2	6.3	9.5	13.4	16.6	18.7
max	4.2	5.9	7.1	10.3	14.4	17.8	20.0

☐ 4 Markings: Pipes to be marked with trace ability codes

☐ 5 Random Testing: For every size, two (2) sample pipes representing each lot of one hundred (100) pieces or less shall be tested for compliance with this specification. Any visible defect or failure to meet the quality standards herein will be grounds for rejecting the entire order.

☐ 6 Certification: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

Galvanized Iron Pipes

☐ 1 Pipe Description: Pipes shall conform to the requirements of the ASTM A53/A53M or ASTM A120 and shall be Schedule 40.

Pipe fittings shall conform to the requirements of ASME/ANSI B16.3 (Malleable Iron Threaded Fittings Class 150 and 300) and shall be Class 150.

☐ 2 Pipe Construction: The pipe shall be practically straight and both ends of the pipe shall be at right angle to the axis of the pipe. The inside and outside surfaces of the pipe shall be free from injurious defects. Unless otherwise specified, the length of the pipe shall be 6 meters. The tolerance shall be plus 6 meters without negative tolerance. Pipes shall be clearly marked with Trademark, Nominal Size, Length and Class of Pipe.

☐ 3 The pipe threads shall be made according to American Standard Pipe Taper Thread (NPT) with taper angle equal to 1°47'.

☐ 4 Pipe shall be coated with zinc, both inside and outside surfaces, in accordance to ASTM A153/A153M-05 (Standard Specification for Zinc Coating (Hot – Dip) on Iron and Steel Hardware)

☐ 5 Pipe Dimensions: Pipe shall conform to the following dimensions and weights:

Nominal Pipe Size,	½	¾	1	1¼	1 ½	2	3	4
Nominal Diameter,	15	20	25	32	40	50	75	100
Outside Diameter,	21.3	26.7	33.4	42.2	48.3	60.3	88.9	114.3
Wall Thickness, mm	2.8	2.9	3.4	3.6	3.7	3.9	5.49	6.02
Tolerance (outside diameter,	±0.397	±0.397	±0.397	±0.397	±0.397	±1%	±1%	±1%
Tolerance (wall thickness, mm)	-12.5%	-12.5%	-12.5%	-12.5%	-12.5%	-12.5%	-12.5%	-12.5%
Weight per meter,	1.27-1.34	1.68-1.78	2.50-2.62	3.38-3.55	3.75-4.23	5.00-5.43	10.3-11.3	14.5-16.1

☐ 6 Pipe Thread: The pipe threads shall be made according to "American Standard Pipe Taper Thread (NPT) with taper angle equal to 1˚47'.

Nominal Pipe Size,	½	¾	1	1¼	1 ½	2
Nominal Diameter,	15	20	25	32	40	50
Thread per inch	14	14	11 ½	11 ½	11 ½	11 ½
Pitch, in	0.071	0.071	0.087	0.087	0.087	0.087

☐ 7 Coatings: Pipes shall be coated with zinc both inside and outside surfaces.

☐ 8 Random Testing: For every size, two (2) sample pipes representing each lot of one hundred (100) pieces or less shall be tested for compliance with this specification. Any visible defect or failure to meet the quality standards herein will be grounds for rejecting the entire order.

☐ 9 Certification: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

Galvanized Iron Fittings

☐ 1 Fitting Description: All pipe fittings shall conform to the requirements of " MALLEABLE IRON THREADED FITTINGS CLASS 150 AND 300 (ASME/ANSI B16.3)" and shall be Class 150.

☐ 2 Fitting Dimensions: Fittings shall conform to the following dimensions:

Nominal Pipe Size, in	1/2	3/4	1	1 1/4	1 1/2	2	3	4
Length								
Length	28.45	33.27	38.1	44.45	46.74	57.15	78.23	96.27
Weight, kg	0.11	0.18	0.29	0.43	0.56	0.79	2.34	4.0
45° Elbow								
Length	22.35	24.89	28.45	32.77	36.32	42.67	55.12	66.29
Weight, kg	0.07	0.10	0.15	0.38	0.52	0.77	2.11	3.46
St. Elbow								
Length, ME	40.89	48.01	54.1	61.98	67.82	83.06	114.55	114.27
Length, FE	28.45	33.02	38.10	44.45	49.28	57.15	78.23	96.27
Weight, kg	0.11	0.18	0.29	0.49	0.66	1.06	2.99	4.94
Tee								
Length	28.45	33.27	38.10	44.45	49.28	57.15	78.23	96.27
Weight, kg	0.16	0.25	0.41	0.59	0.78	1.19	3.22	5.12
Cross Tee								
Length	28.45	33.27	38.10	44.45	49.28	57.15	78.23	96.27
Weight, kg	0.20	0.29	0.44	0.72	0.86	1.33	3.70	6.76
Coupling								
Length	34.04	38.61	42.42	49.02	54.61	64.26	80.77	93.73
Weight, kg	0.09	0.13	0.22	0.34	0.45	0.66	1.5	2.56
Union Patente								
Length	43.69	51.31	55.63	57.4	62.74	69.85	89.92	97.79
Weight, kg	0.21	0.26	0.41	0.54	0.74	1.09	2.47	4.31
Thickness, mm	2.54	3.05	3.30	3.56	3.81	4.32	5.84	6.60
Tolerance								
Dimension, CF, mm	±1.50	±1.50	±1.80	±1.80	±2.00	±2.00	±2.50	±3.00
Thickness	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10

*Note:

1. All dimensions are in millimeters except where otherwise shown.
2. Center-to-face dimensions apply to elbows, tees and crosses
3. Face-to-face dimensions apply to couplings, unions, etc.
4. ME – Male End, FE – Female End, CF – Center-to-Face

☐ 3 Fitting Thread: All pipe fittings shall be female thread made according to "American Standard Pipe Taper Thread" (NPT).

☐ 4 Coatings: Fittings shall be coated with zinc in accordance to "STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE (ASTM A153/A153M-05)".

☐ 5 Certification: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

Cast Iron Fittings

☐ 1 Fitting Description: Cast iron fitting shall conform to the requirements of AWWA C110 (American standard for cast iron and ductile iron fittings, 2-in through 48-in., for water and other liquids) or ISO r13 (cast iron pipes, special casting and cast iron parts for pressure mainlines).

☐ Fitting shall have a wall thickness of not less than that of the pipe with which they are used and the ends shall have the ends suitable for making watertight joints.

☐ 2 Fitting Construction: Fittings are manufactured of ductile iron grade 70-50-05 (minimum tensile strength: 70,000psi; minimum yield strength: 50,000; minimum elongation: 5%) as specified in AWWA C110 or C153. The flanges can be tapped for studs when specified. Unless otherwise specified flanges will have bolt holes straddling centerline, bolt hole drilling can be rotated when so specified.

Fittings shall be furnished with mechanical or flanged joints.

☐ *a. Mechanical Joints:* All mechanical joint fittings will be Bell and Bell unless otherwise specified. Mechanical joint fittings shall be rated for 350 psi working pressure for sizes 4"- 24".

☐ *b. Flanges:* All flanges are plain without projections and are furnished smooth or with shallow serrations. The flanges can be tapped for studs when specified. Unless otherwise specified flanges will have bolt holes straddling centerline. Bolt hole drilling can be rotated when so specified. Flanged fittings shall be rated for 250 psi working pressure for sizes 4" – 64".

☐ *c. Bolts, Studs and Nuts:* Bolts are hex head machine bolts with regular or heavy hex nuts as specified. Studs with one hex nut each are required for tapped flanges. Bolts, studs and nuts are low-carbon steel per ASTM A307 Grade B; threads are ANSI B1.1 Coarse Thread Series, Class 2A external and Class 2B internal. Recommended studs are the same length as corresponding bolt length with "tap end" threaded approximately the same length as flange thickness.

☐ 3 Coating: All fittings shall be epoxy coated internally and externally in accordance to AWWA C116 (protective fusion-bonded epoxy coatings for the interior and exterior surfaces of ductile-iron and gray-iron fittings for water supply service).

☐ 4 Testing: For every 100 pcs of any size of fittings, at least 3 pcs. shall be chosen at random and subject to a pressure of 1.1 MPa (160 psi). If any sample tested cracks or leaks, the lot represented will be rejected. The manufacturer shall furnish one certified copy of the reports to the Calamba Water District.

☐ 5 Certification: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

Polyethylene(PE) Tubing

☐ 1 Materials : Shall be made from PE 100 virgin compounds as defined in PNS ISO 4427:2002/AMD 01:2002; PWWA NM 201:2002(Philippine National Standard for Polyethylene Pipes for Potable WaterSupply) or approved equivalent. All compounds shall qualify for a rating of PN 16 (232 psi) for water and as per requirements of above mentioned standards.

☐ HDPE compound used to make pipes shall contain no ingredients that has been demostrated to migrate into water in quantities considered to be toxic and microbial growth hazard. Pipe should be free from unpleasant taste and odor.

☐ 2 Dimensions - The Standard Dimension Ratio (SDR) shall be 11 with nominal dimensions as follows:

Nominal Diameter,	½	¾	1	1¼	1½	2	2½	3
Outside Diamenter,	20	25	32	40	50	63	75	90
Mean Wall Thk, mm	2.3	2.3	3	3.7	4.6	5.8	6.8	8.2

☐ 3 Marking - All tubing shall be clearly marked at intervals of not more than 0.6 LM with nominal size, type of material(PE 3306 or PE 3406). Standard Dimension Ratio(SDR 11) manufacturer's trade name and production code and seal of approval from an accredited testing laboratory.

☐ 4 Random Testing: For every size, two (2) sample pipes representing each lot of one hundred (100) pieces or less shall be tested for compliance with this specification. Any visible defect or failure to meet the quality standards herein will be grounds for rejecting the entire order.

☐ 5 Certification: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

B. VALVES

Gate Valves

1 **Valve Description**

☐ All valves shall conform to the AWWA Specifications C509 (STANDARD FOR RESILIENT SEATED GATE VALVES). Component parts are constructed of heavy, rugged proportions for extra strength to withstand pipe strain and possible shifting in underground service. Gate valves shall be flange or mechanical joint where the pipelines design pressure is 1.0MPa (150 psi) or less be designed for minimum water working pressure of 1.0 MPa (150 psi).

2 **Valve Construction**

☐ The body shall be cast iron.

☐ The gate valve shall be flanged and mechanical joint. Flanges and drilling shall conform to ISO 7005 – 2

☐ All the resilient gate valves have a full bore with same nominal diameter as the pipeline. The full bore ensures minimum pressure loss, as the valve does not cause any reduction in the flow path, other great advantages are that the full bore allows drilling and facilitates pipe pigging to ensure high quality potable water.

☐ The ductile iron core is full vulcanized with EPDM rubber internally and externally. No iron parts are exposed to the medium and the excellent rubber vulcanization prevents creeping corrosion underneath the rubber.

☐ The fixed integral wedge nut reduces the number of moveable valve parts and risk of malfunction.

☐ The valve shall have 50mm (2 in) square operating nut with cast arrow showing direction in which the nut is to be turned open the valve.

☐ The body and cover bolts and nuts shall meet specifications of ASTM A-307 (rust proofed).

☐ The valve shall be encapsulated and shall conform to the following dimensions:

Nominal Size,	2	3	4	6	8	10	12
Nominal Diameter,	50	75	100	150	200	250	300
Length (Face to Face)	178-180	203-205	221-229	267-268	292-295	330-335	356 – 365
Height (above Centerline)	241-326	297-318	334 – 430	443 – 549	544 – 646	627 – 750	785 – 835
Weight	13-18	20-23	26-33	51-53	75 – 83	125 – 133	174 - 193

3 **Coatings**

☐ All valve casting to be shot blasted prior to epoxy coating. Epoxy coating shall conform to AWWA Specifications C550 (PROTECTIVE EPOXY INTERIOR COATINGS FOR VALVES AND HYDRANTS). Body and bonnet are coated internally and externally. Layer thickness shall be 250-400 microns on flat and pressurized parts and 150-300 microns on convex outer edge.

4 **Testing**

☐ For every size and type of wedging mechanism, two sample gate valves representing each lot of one hundred (100) pieces or less shall be tested for reliability of operation. This test is in addition to those required under section 28.2 and 28.3 of AWWA C500. The shell and seat should be tested equal to 1.5 MPa and 1.1 MPa respectively. The manufacturer shall furnish one certified copy of the test reports to the Calamba Water District.

5 **Certification**

☐ The manufacturer shall furnish a sworn statement that the inspection and metallurgical test and pressure test have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification including compliance with NSF/ANSI 61 shall be submitted to Calamba Water District.

Brass Gate Valves

1 **Valve Description**

☐ Valves shall be full port, screwed-in bonnet and non-rising stem.

2 **Valve Construction**

☐ The valve body, bonnet and solid wedge disc shall be brass conforming to ASTM B584 Alloy C84400-1996 or the latest revision or its equivalent. The minimum pressure rating shall be 125psi saturated steam pressure and 200psi non-shock water, oil or gas.

3 **Valve Dimensions**

☐ Valve shall conform to the following dimensions:

Nominal Pipe Size,	½	¾	1	1¼	1 ½	2
Nominal	15	20	25	32	40	50
Length, mm	35 – 43	39 – 45	43 – 54	48 – 61	54 – 63	58 – 72
Height, mm	71 – 72	77 – 84	88 – 98	103 – 116	114 – 125	134 – 153
Handwheel	54 – 55	54 – 55	60 – 61	72 – 77	72 – 77	80 – 83

4 **Valve Ends**

☐ The valve shall be threaded end conforming to ASME B1.20.1 (NPT)

5 **Testing**

☐ For every size, two (2) sample valves representing each lot of one hundred (100) pieces or less shall be tested for compliance with this specification. Any visible defect or failure to meet the quality standards herein will be grounds for rejecting the entire order.

6 **Certification**

☐ The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

Air Release and Air/Vacuum Valves

☐ 1 Air release and air/vacuum valves shall conform to the requirements of AWWA C512 (AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES FOR WATERWORKS SERVICE).

☐ 2 25mm (1”) air release and air/vacuum valves shall be single body type with National Pipe Threaded (NPT) inlet and outlet configurations.

☐ 3. Epoxy lining and coatings for valves shall conform to AWWA C550 (PROTECTIVE EPOXY INTERIOR COATINGS FOR VALVES AND HYDRANTS).

☐ 4 Certification: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

Concrete

☐ 1 Portland cement: Cement shall conform to the Standard Specifications for READY MIXED CONCRETE, ASTM C-94. An air-entraining admixture, conforming to ASTM C-260, shall be added to Type I, Type II or Type III Portland Cement.

☐ 2 Aggregates: All aggregates used for concreting shall conform to ASTM-33 and shall be checked daily for any variances in moisture current. Said variances shall be corrected and/or taken into consideration for each batch.

☐ a. Coarse Aggregates: Shall be uniformly and evenly graded for each application in accordance A.C.I. Standard 318. Unless otherwise approved, aggregate shall be sound, crushed, angular grantic stone. Smooth or rounded stone (river rock) shall not be acceptable.

☐ b. Fine Aggregates: Shall consist of natural sand, manufactured sand or a combination thereof.

III. REFERENCE DRAWINGS

☐ See attached drawings

IV. ACCEPTANCE

☐ 1. No Leaks

☐ 2. Proper Waste/Debris Disposal

☐ 3. Proper Concrete Restoration

V. WARRANTY

☐ One year against defects of materials and workmanship from the date of issuance oF Certificate of Completion.

VI. OTHERS

☐ 1. Contractor should submit all the necessary documents such as Materials Mill Certificate or equivalent prior to inspection/delivery, Detailed Daily Schedule of Activities during Kick off Meeting, etc...

☐ 2. Construction Safety and Good Housekeeping must be observed at all Times.

☐ 3. Concrete Classification for Restoration Works
- a. Bacnotan Road - Class AA
- b. Mayapa National Road - Class AA
- b. Marangal Street/Calamba Height - Class A
- d. Masikap Street(Taklaban) - Class A

☐ 4. Interconnection of new lines to the existing lines and Relocation of Water Meter should be included in the offer. Clustering Asssembly in Mayapa National Road replacement of service connection only.

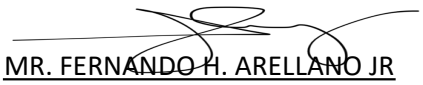
☐ 5. Furnish of all relevant drawings and documents.

☐ 6. Installation of 50mmØ Brass Check Valve in I-Mall Watering system(Mayapa) should be included.

NOTES :

Reference - LWUA TECHNICAL STANDARDS and CWD EXISITING STANDARDS.

Prepared by:



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