




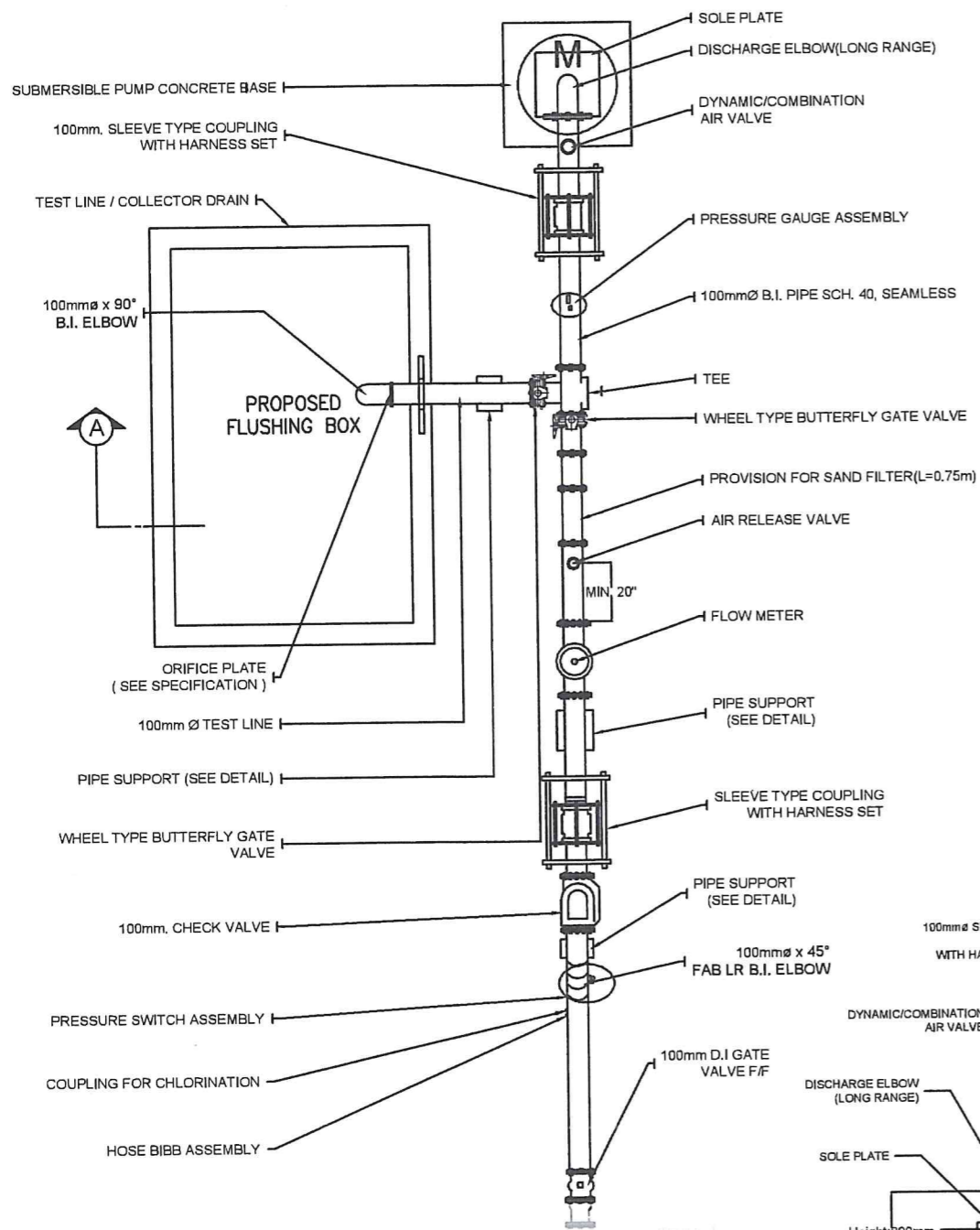


NOT TO SCALE

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SITE

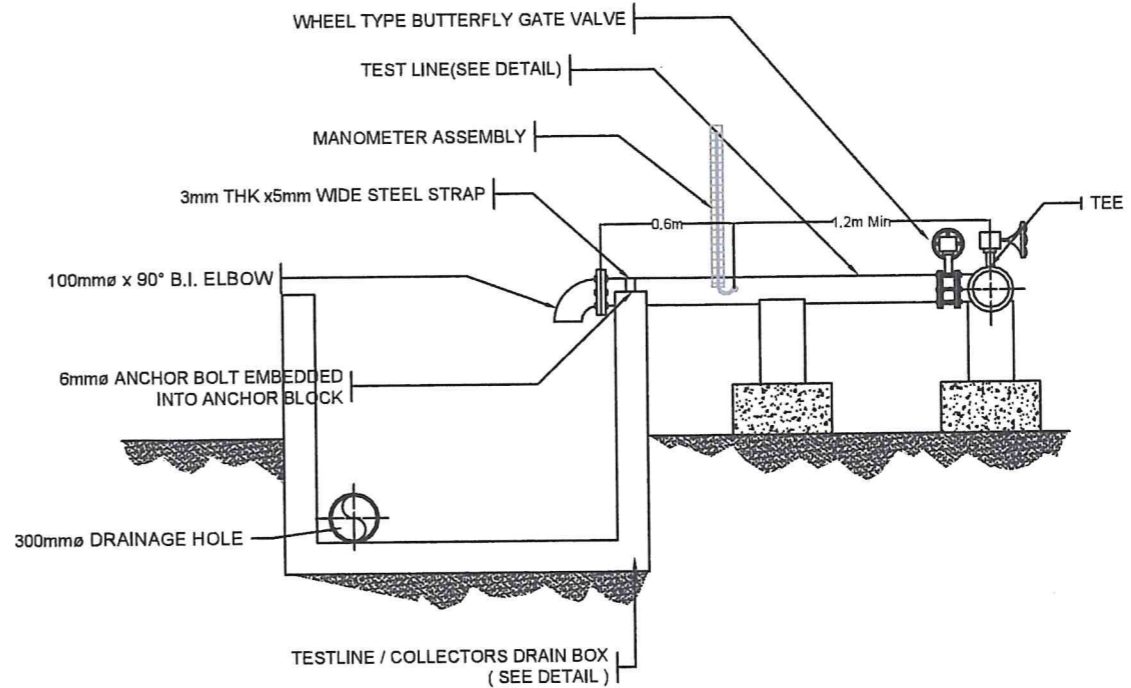


 Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED:	PROJECT TITLE/LOCATION:	SHEET CONTENTS :	SHEET NO.:
	 SHARMAINE E. BRACIA OIC - Division Mgr., PDCD	 SONJUN O. MILLARES OIC - Department Mgr., EED	 ROQUE S. FRANCISCO AGM, U&TS	 FLORENCIO T. MONGOSO JR. General Manager A	PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur	VICINITY MAP CAD BY: EPHRAIM MAGISTRADO	1 / 12 Date: 08-2024



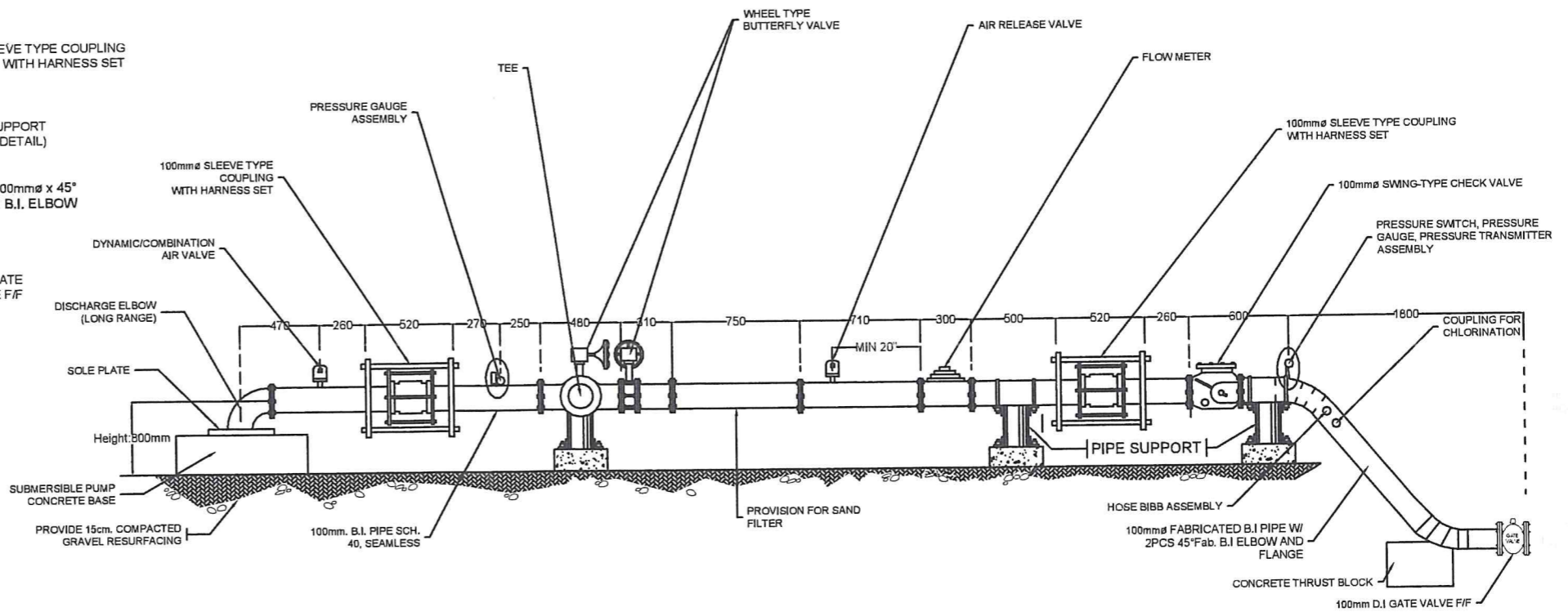
LAYOUT PLAN

N T S



SECTION A-A

N T S

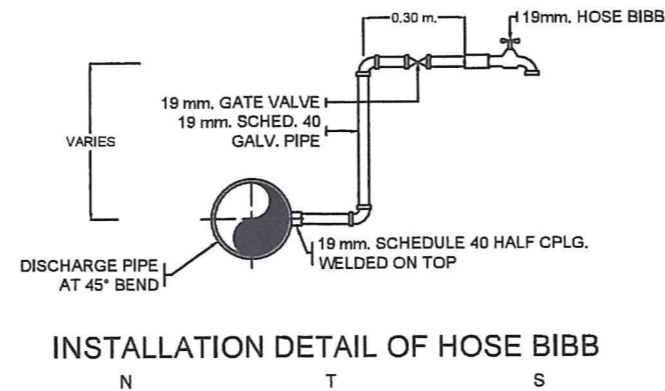


ELEVATION

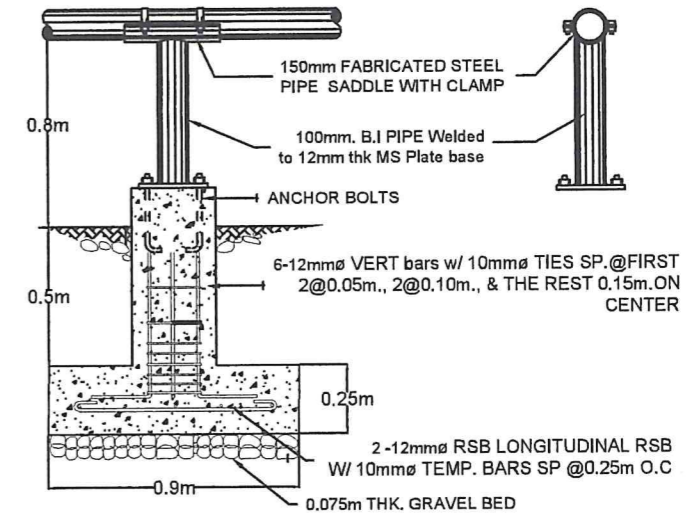
N T S

SCHEDULE OF ORIFICE PLATE

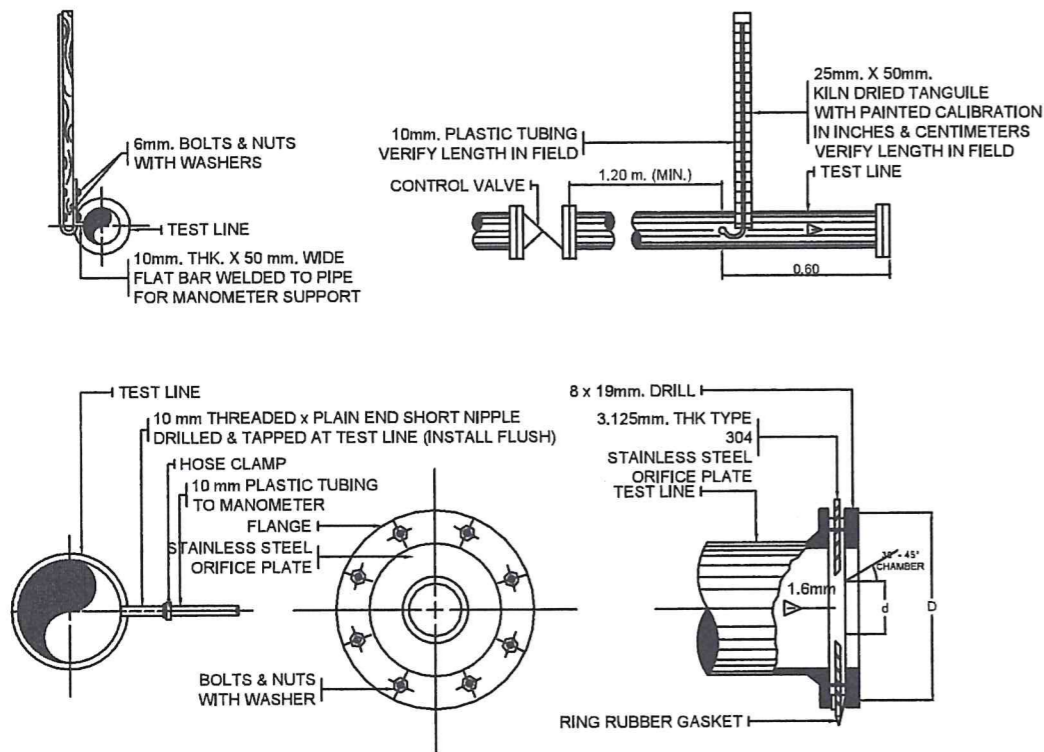
SIZE OF TEST LINE	ORIFICE PLATE BORE, d	PLATE DIAMETER, D
100 mm.	75 mm.	180 mm.
150 mm.	75 mm., 100 mm., 125 mm.	250 mm.
200 mm.	100 mm., 125 mm., 150 mm.	300 mm.
250 mm.	150 mm., 175 mm., 200 mm.	350 mm.



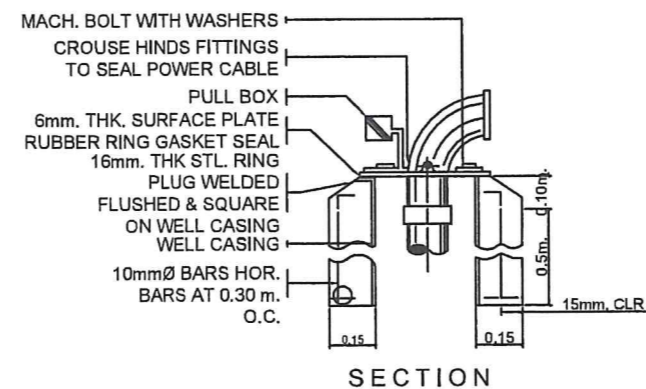
INSTALLATION DETAIL OF HOSE BIBB



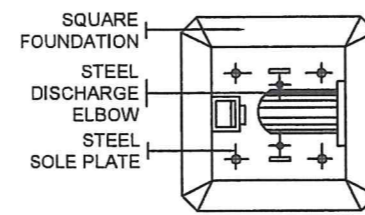
PIPE AND TEE SUPPORT DETAIL



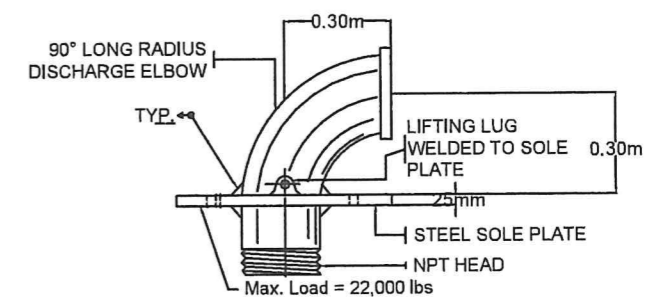
PUMP TEST LINE, ORIFICE AND MANOMETER DETAIL



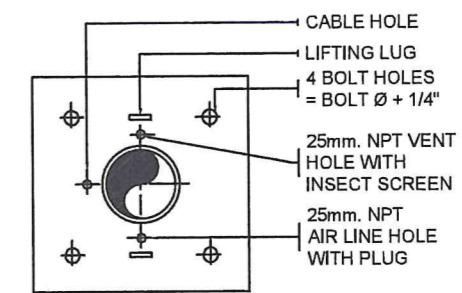
SECTION



PLAN



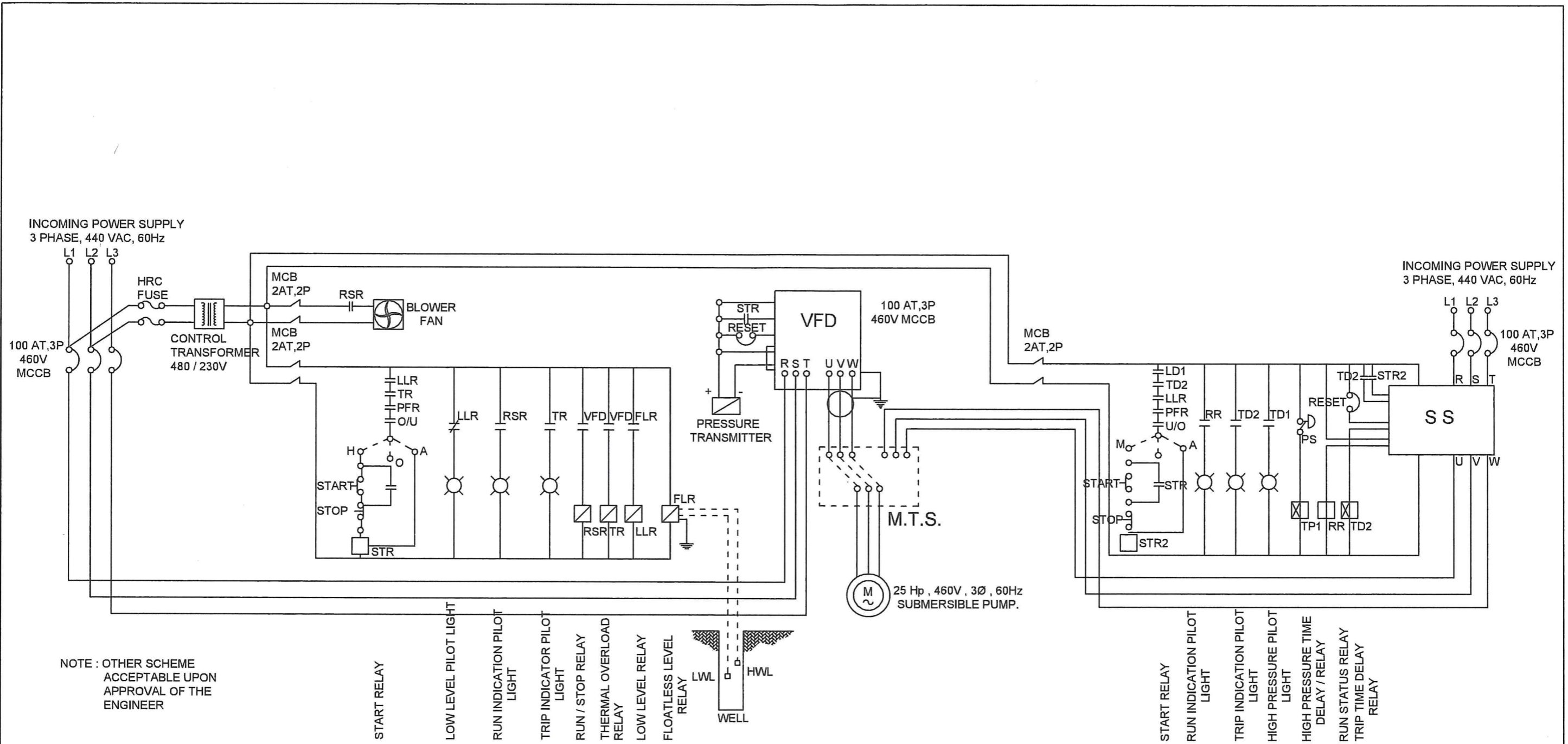
SECTION






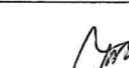
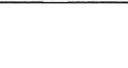
PLAN

SUBMERSIBLE PUMP BASE DETAIL

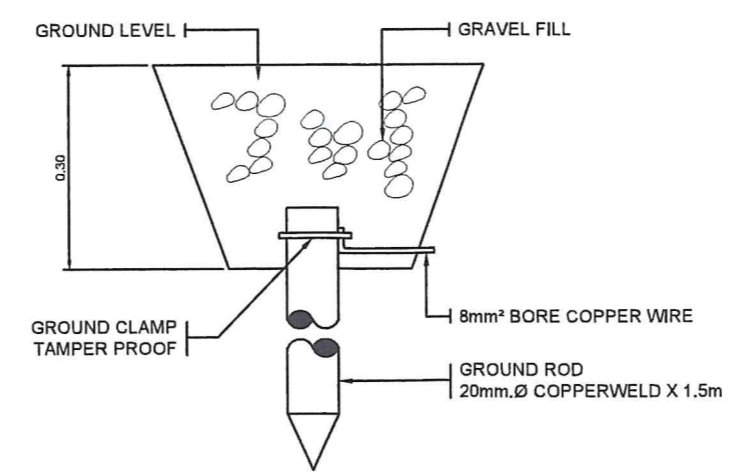
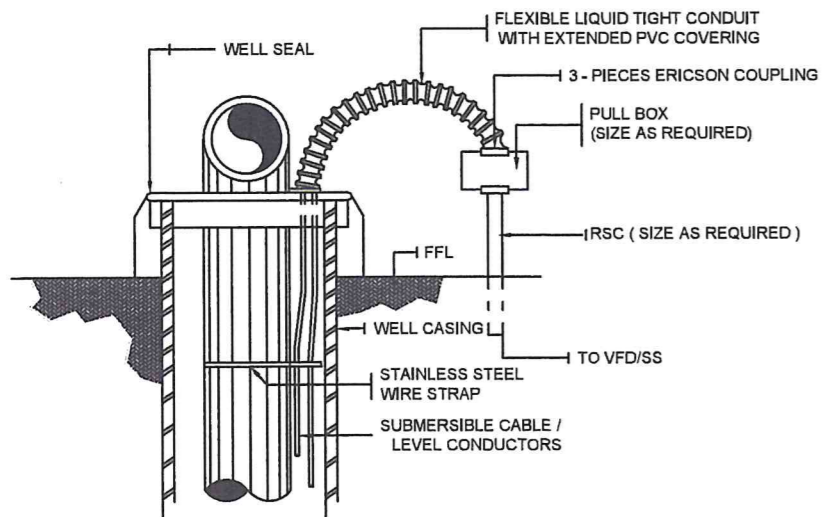
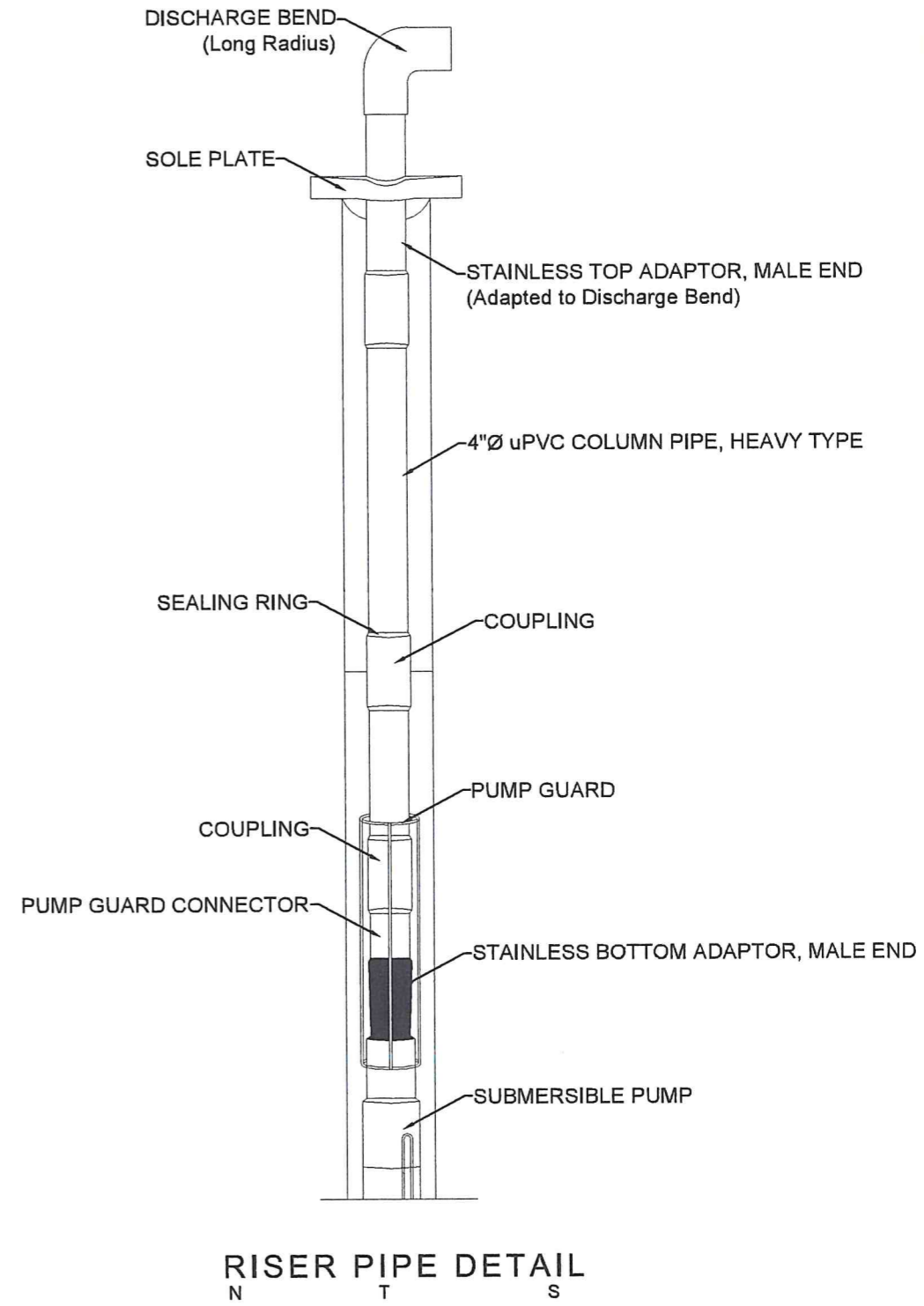
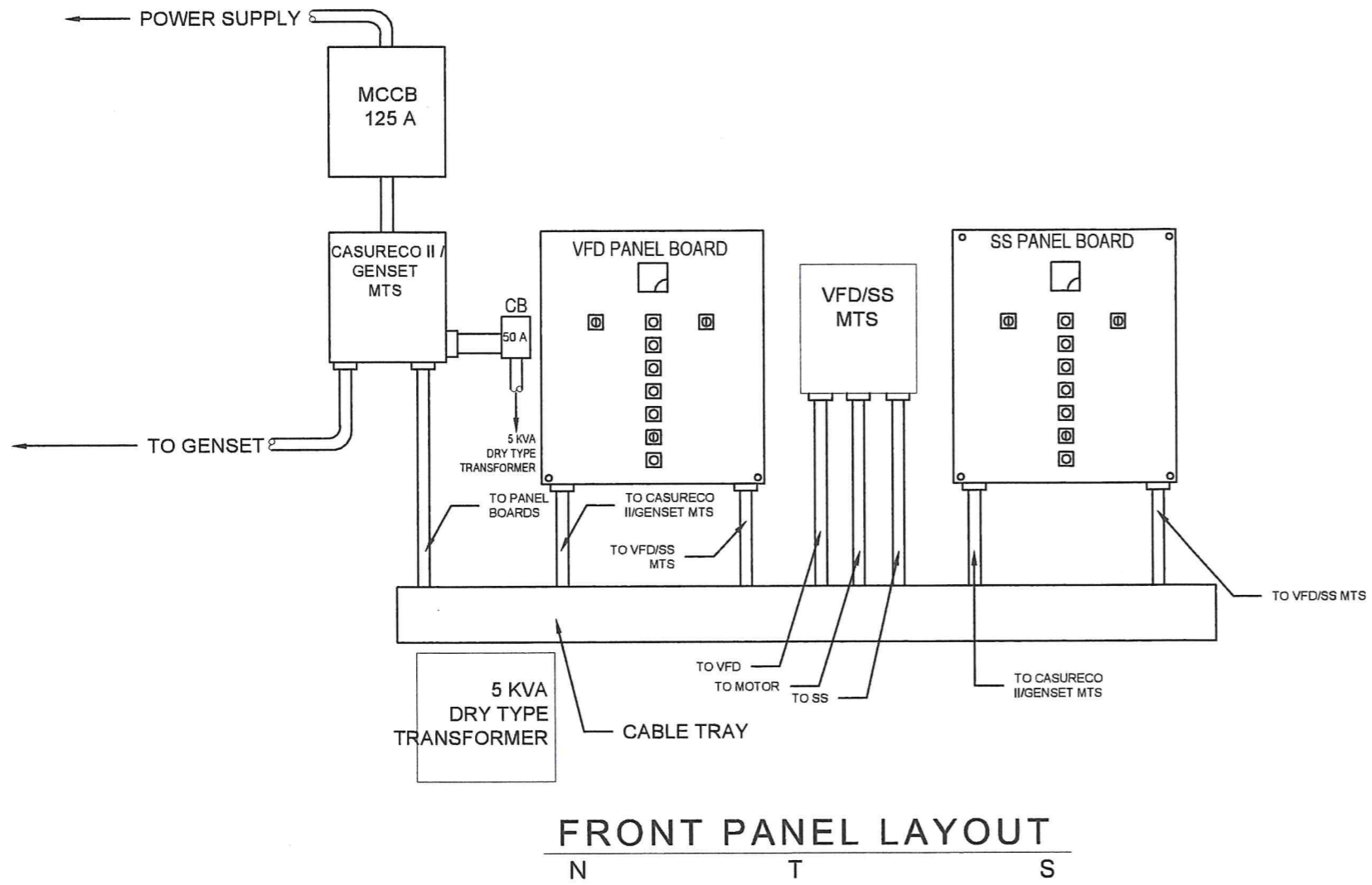
<p>Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City</p>	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED:	PROJECT TITLE/LOCATION:	SHEET CONTENTS:	SHEET NO.:
	SHARMAINE B. BRACIA OIC - Division Mgr., PDCD	SONJUN O. MILVARES OIC - Department Mgr., EED	ROQUE S. FRANCISCO AGM, O&TS	FLORENCIO T. MONGOSO JR. General Manager A	PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur	Standard Mechanical Plan	3
						CAD BY: JL PEÑAS	12
						Date: 08-2024	



VFD AND SOFTSTARTER CONTROL SCHEMATIC DIAGRAM

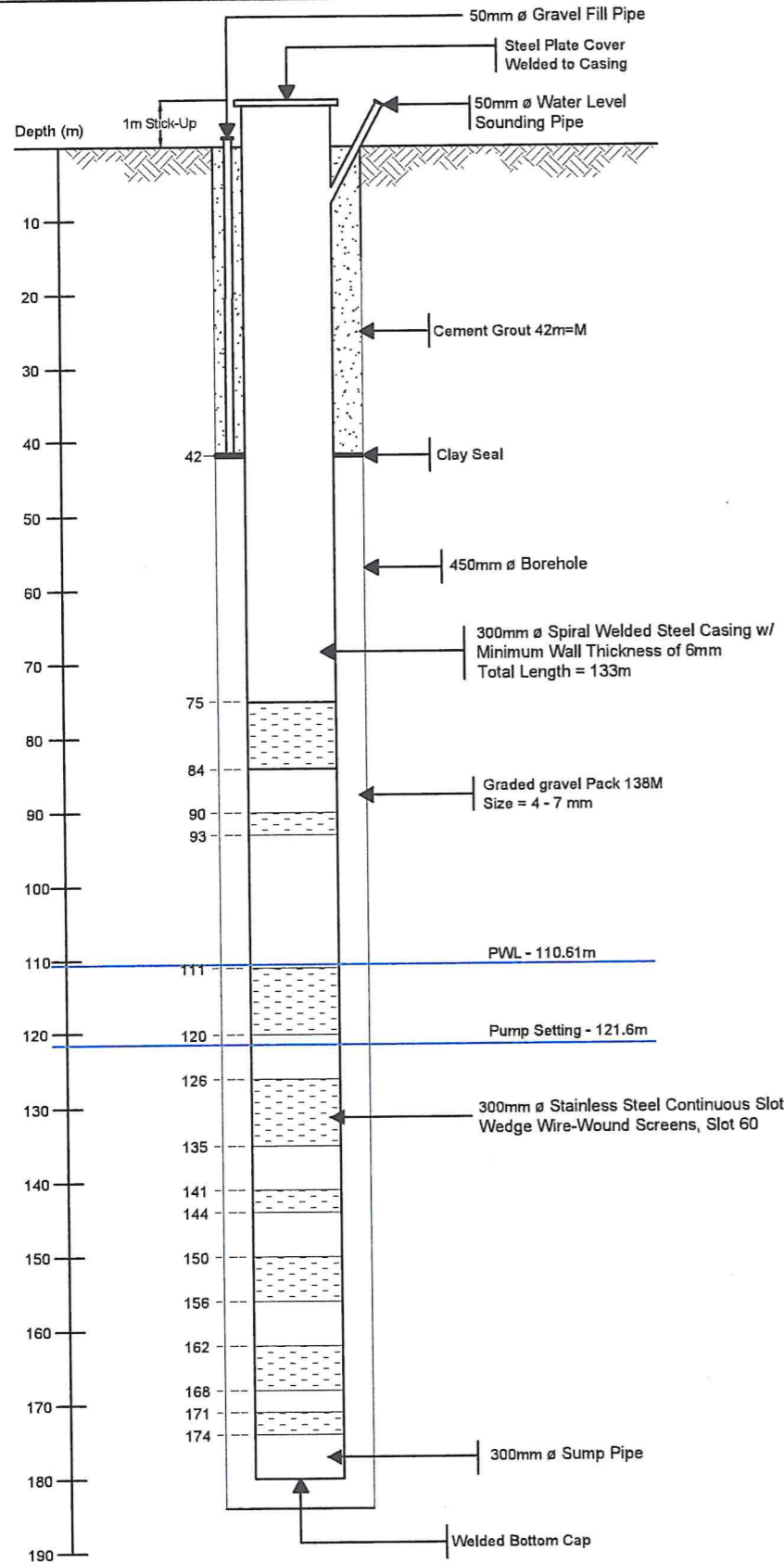
 Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City	PREPARED BY:  SHARMAINE E. BRACIA <small>OIC - Division Mgr., PDCO</small>	CHECKED BY:  SONJUN O. MILLARES <small>OIC - Department Mgr., EED</small>	RECOMMENDING APPROVAL:  ROQUE S. FRANCISCO <small>AGM, O&TS</small>	APPROVED:  FLORENCIO T. MONGOSO JR. <small>General Manager A</small>	PROJECT TITLE/LOCATION: PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION <small>Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur</small>	SHEET CONTENTS: VFD AND SS DIAGRAM	SHEET NO.: 4 / 12 Date: 08-2024
	CAD BY: JL PEÑAS						

EEDF16, REV. 00, APRIL, 2019



<p>Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City</p>	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED :	PROJECT TITLE/LOCATION:	SHEET CONTENTS :	SHEET NO.:		
	SHARMAINE E. BRACIA OIC - Division Mgr., POC	SONJUN O. MILLARES OIC - Department Mgr., EED	ROQUE S. FRANCISCO AGM, O&TS	FLORENCIO T. MONGOSO JR. General Manager A	PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur	Front Panel Layout	5		
								Grounding Rod Detail	
							Motor Cable and Label Conductor	12	
							Riser Pipe Detail		
						CAD BY: JL PEÑAS	Date: 08-2024		

EEDF18, REV. 00, APRIL, 2019



WELL DESIGN
STA. LUCIA II PRODUCTION WELL
Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur

COMPUTATIONS OF LOAD :

PANEL : LIGHTING PANEL
SERVICE : 1 PHASE, 230V , 60 Hz

CKT. NO.	LOAD DESCRIPTION	NUMBER OF						VOLT	V.A.	AMP.				SIZE OF WIRE	CONDUIT	CIRCUIT BREAKER
		L.O.	C.O.	OTHERS	S1	S2	S3			S3W	AB	BC	CA			
1	Lighting Loads + Emergency Light	10						230	1000	4.35				2C - 2.0 mm ² THHN Cu Wire 1C - 2.0 mm ² THHN Cu Wire	20 mm Ø uPVC Pipe	15 AT, 2P
2	Lighting Loads (Perimeter Fence)	12						230	1200	5.22				2C - 2.0 mm ² THHN Cu Wire 1C - 2.0 mm ² THHN Cu Wire	20 mm Ø uPVC Pipe	15 AT, 2P
3	Convenience Outlets							230	900	3.91				2C - 3.5 mm ² THHN Cu Wire 1C - 2.0 mm ² THHN Cu Wire	20 mm Ø uPVC Pipe	20 AT, 2P
4	Convenience Outlets (Chlorination House)		5					230	180	0.78				2C - 3.5 mm ² THHN Cu Wire 1C - 2.0 mm ² THHN Cu Wire	20 mm Ø uPVC Pipe	20 AT, 2P
5	SPARE		1					230	1000	4.35				2C - 3.5 mm ² THHN Cu Wire 1C - 2.0 mm ² THHN Cu Wire	20 mm Ø uPVC Pipe	20 AT, 2P
	TOTAL	22	6					230	4280	18.61				2C - 8.0 mm² THHN Cu Wire 1C - 5.5 mm² THHN Cu Wire	32 mm Ø uPVC Pipe	50 AT, 2P

A. COMPUTATION:

$$I = \frac{4280}{230}$$

$$I = 18.61 \text{ Amp.}$$

FOR SUB-FEEDER CONDUCTOR

Use: 2C - 8.0 mm² THHN Cu Wire + 1C-5.5 mm² THHN Cu Wire in 25 mmØ uPVC Pipe

FOR SUB-FEEDER PROTECTION

Use: 50 AT/50 AF, 2P, 230V, 60 Hz, CIRCUIT BREAKER

B. FOR DRY TYPE TRANSFORMER

For Transformer kVA Rating

$$\text{kVA Rating} = 18.61 \times 230$$

$$\text{kVA Rating} = 4280.30$$

Use: 5kVA, 460/230 V, 1Ø, 60 Hz, Two Winding Dry Type Transformer

C. FOR 25 HP, 460V, 3Ø, 60 Hz, SUBMERSIBLE MOTOR AUTO TRANSFORMER STARTER AT 65% AMP.

$$I_{\text{MOTOR}} = 34$$

MOTOR FEEDER AT 125% FULL LOAD AMPERES

$$I_{\text{MOTOR}} = (1.25) 34$$

$$I_{\text{MOTOR}} = 42.5 \text{ amp.}$$

USE : 3C-14mm² THHN Cu. wire + 1C-8.0mm² THHN Cu. Wire in 32mmØ uPVC Pipe

FOR 25 HP MOTOR OVERCURRENT PROTECTION

$$I = (2.5) 34$$

$$I = 85 \text{ amp.}$$

USE: 100 AT, 3P, 460 V, 60 Hz, CIRCUIT BREAKER

CKT. NO.	LOAD DESCRIPTION	NUMBER OF						VOLT	V.A.	AMP.				SIZE OF WIRE	CONDUIT	CIRCUIT BREAKER
		L.O.	C.O.	OTHERS	S1	S2	S3			S3W	AB	BC	CA			
1	PB	22	6					460	4280	9.30				2-8mm ² THHN Cu. WIRE + 1-5.5mm ² THHN Cu. WIRE	25 mm Ø uPVC Pipe	50 AT, 2P
2	25 HP MOTOR			1				460	27088.48				34	3-14mm ² THHN Cu. WIRE + 1-8.0mm ² THHN Cu. WIRE	32 mm Ø uPVC Pipe	100 AT, 3P
	TOTAL	22	6	1				460	31368.48	9.30			34			125 AT, 3P

D. FOR MAIN-FEEDER CONDUCTOR

$$I_{\text{FL}} = \frac{31368.48 + 25\%(27088.48)}{460 \times \sqrt{3}}$$

$$I_{\text{FL}} = 47.87 \text{ amp.}$$

USE : 3-38mm² THHN Cu. Wire +1C-14mm² THHN Cu. Wire in 40mmØ RSC Pipe

FOR MAIN-FEEDER PROTECTION

$$I = \frac{4280 + 250\%(27,088.48)}{460 \times \sqrt{3}}$$

$$I = 90.37 \text{ amp.}$$

USE : 125 AT, 460 V BOLT-ON TYPE CIRCUIT BREAKER

FOR SERVICE DISCONNECTION:

USE : 125 AT, 460 V BOLT-ON TYPE CIRCUIT BREAKER

E. FOR TRANSFORMER KVA RATING

$$\text{KVA RATING} = \frac{47.87 \times 460 \times \sqrt{3}}{1000}$$

$$\text{KVA RATING} = \frac{38.14}{3}$$

$$\text{KVA RATING} = 12.71$$

USE : 3-25 KVA DISTRIBUTION TRANSFORMER

F. FOR FUSE LINK RATING

$$I = \frac{25}{7.62}$$

$$I = 3.28$$

USE : 3 amp. Fuse Link

G. FOR GENERATOR SET KVA RATING

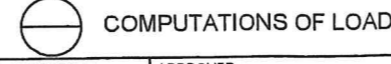
$$\text{KVA RATING} = \frac{47.87 \times 460 \times \sqrt{3}}{1000}$$

$$\text{KVA RATING} = 38.14$$

USE : 50 KVA, 3Ø, 460V Generator Set

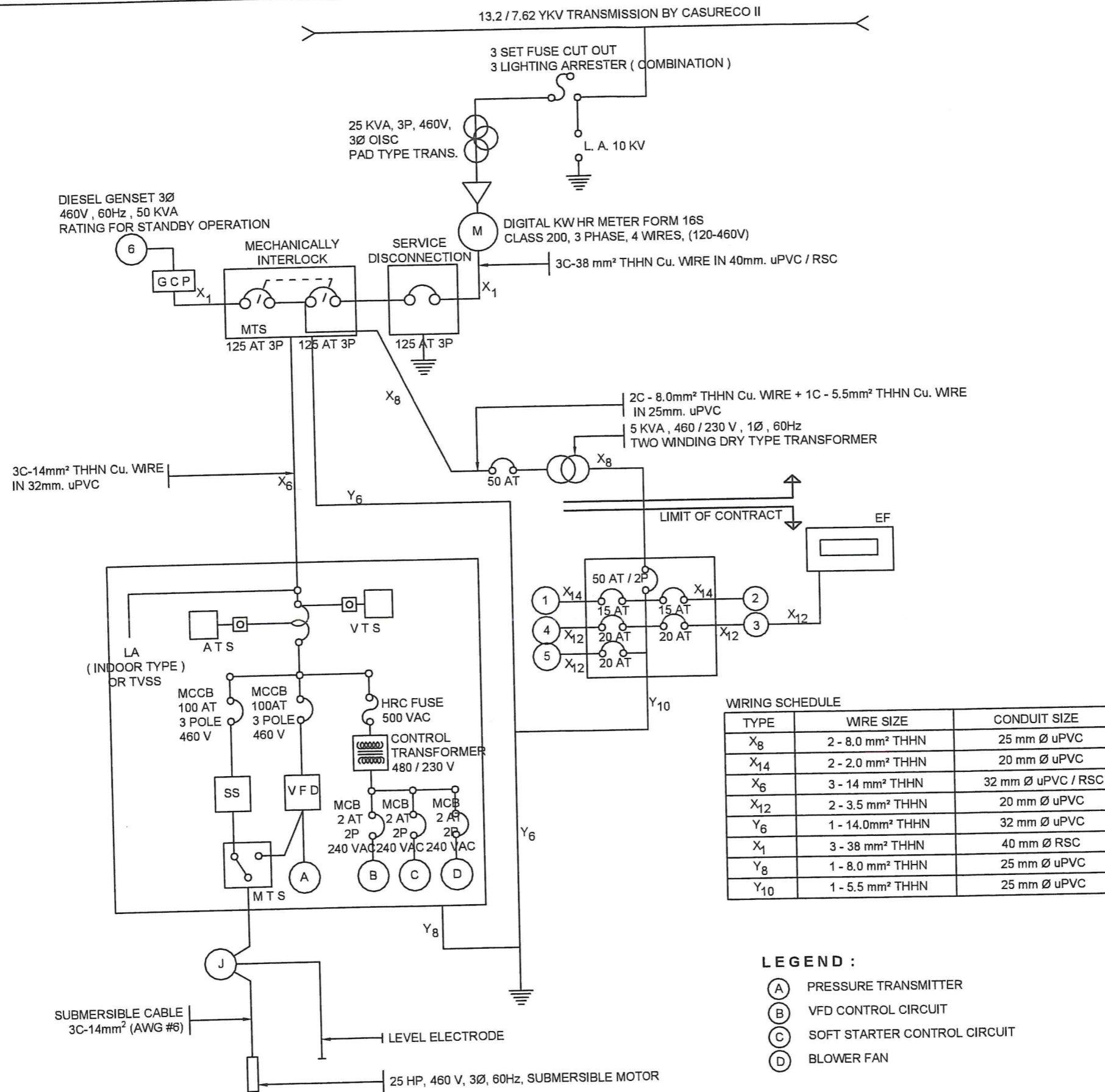


WELL DESIGN



COMPUTATIONS OF LOAD

 Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED :	PROJECT TITLE/LOCATION:	SHEET CONTENTS :	SHEET NO.:
	SHARMAINE E. BRACIA OIC - Division Mgr., PDCD	SONJUN O. MILAJARES OIC - Department Mgr., EED	ROQUE S. FRANCISCO AGM, O&TS	FLORENCIO T. MONGOSO JR. General Manager A	PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur	AS SHOWN	6 12



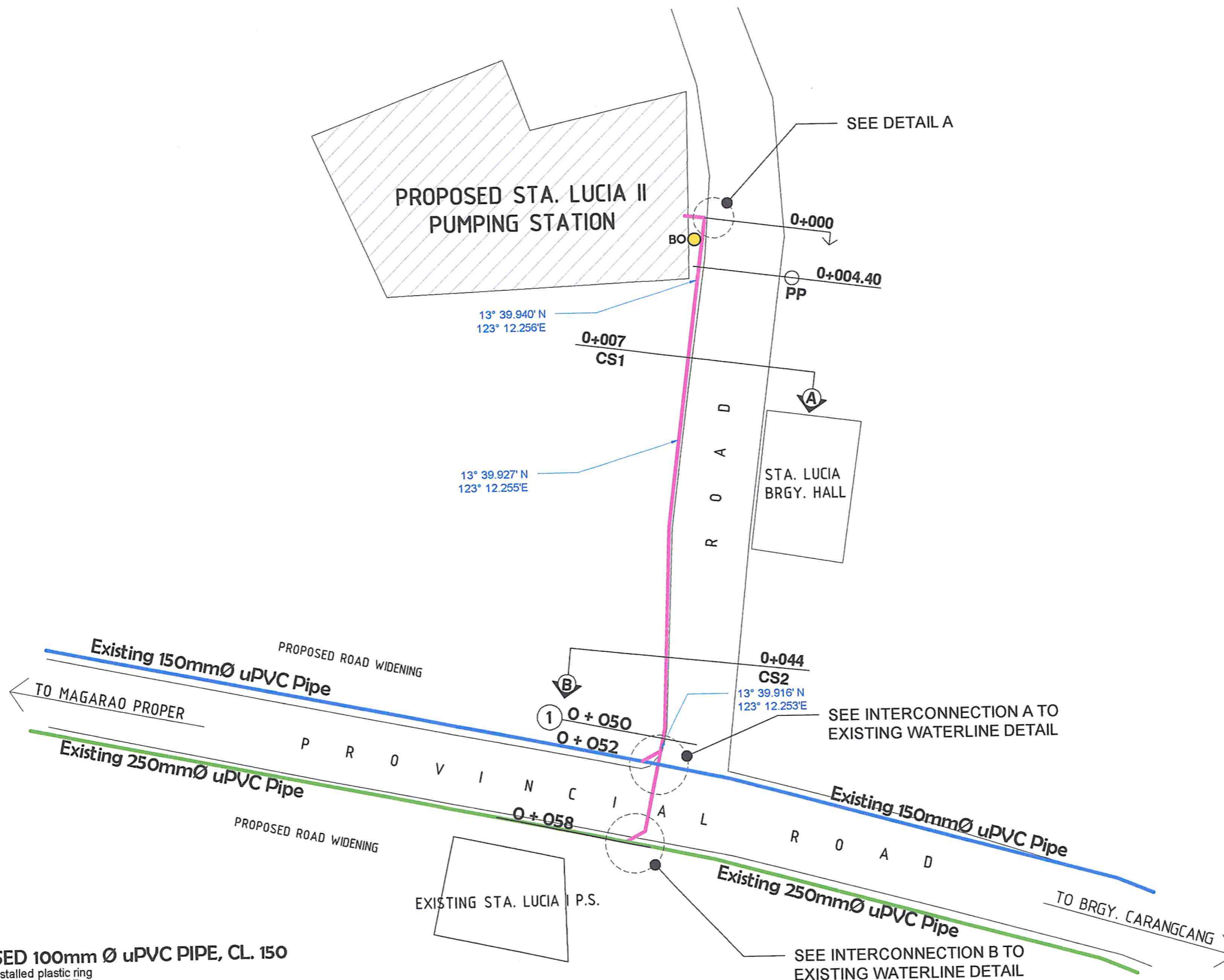
SINGLE LINE DIAGRAM

<p>Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City</p>	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED:	PROJECT TITLE/LOCATION:	SHEET CONTENTS :	SHEET NO.:
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Date: 08-2024 CAD BY: JL PEÑAS							

EEDF18, REV. 00, APRIL, 2019




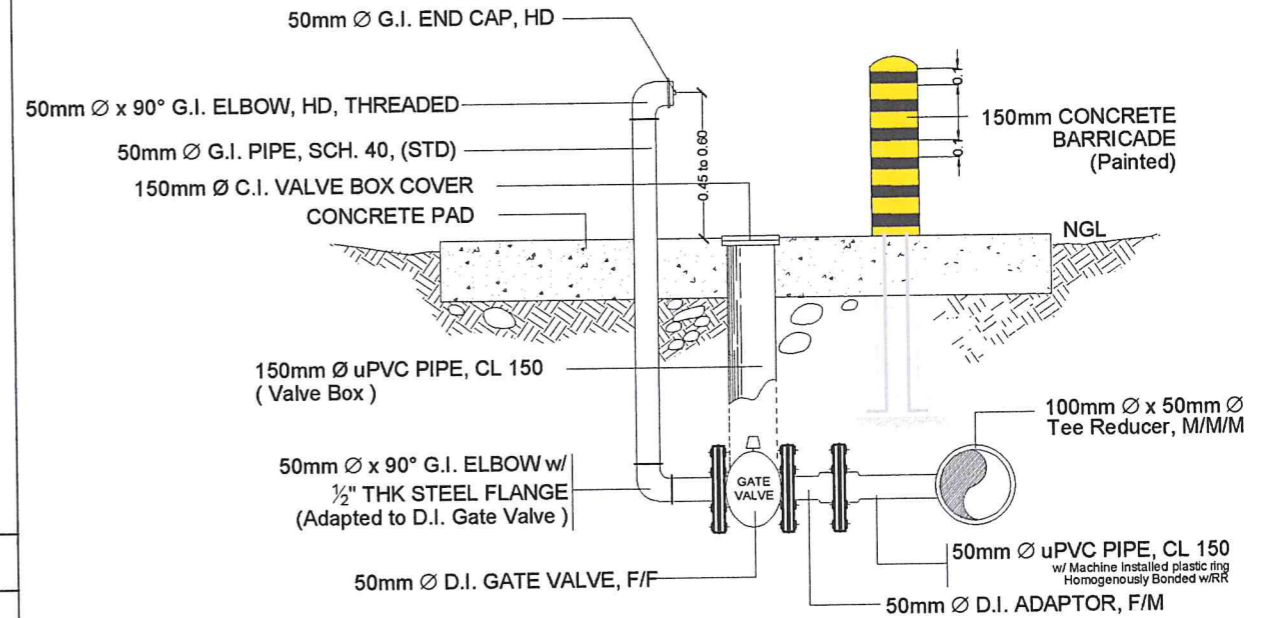
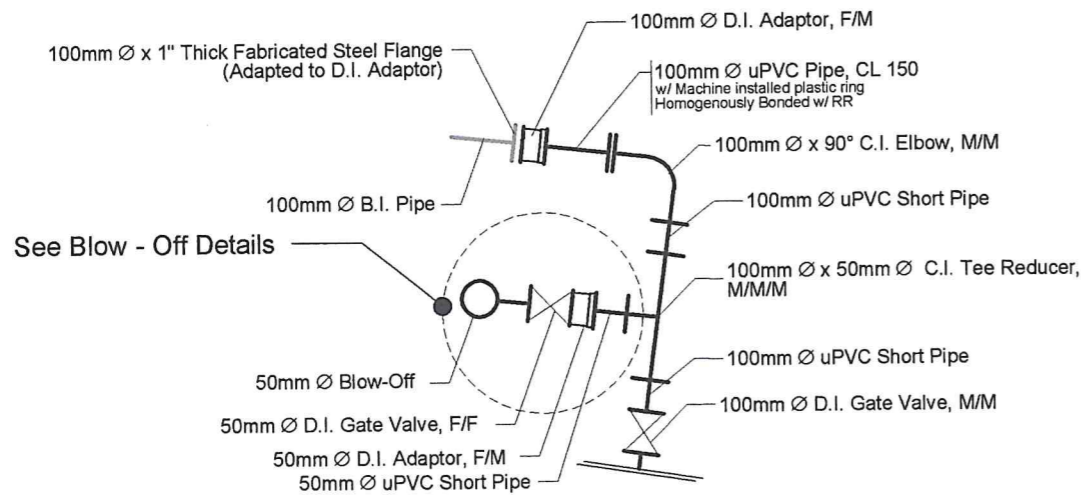
SCALE: 1 : 400 MTS.



LEGEND :

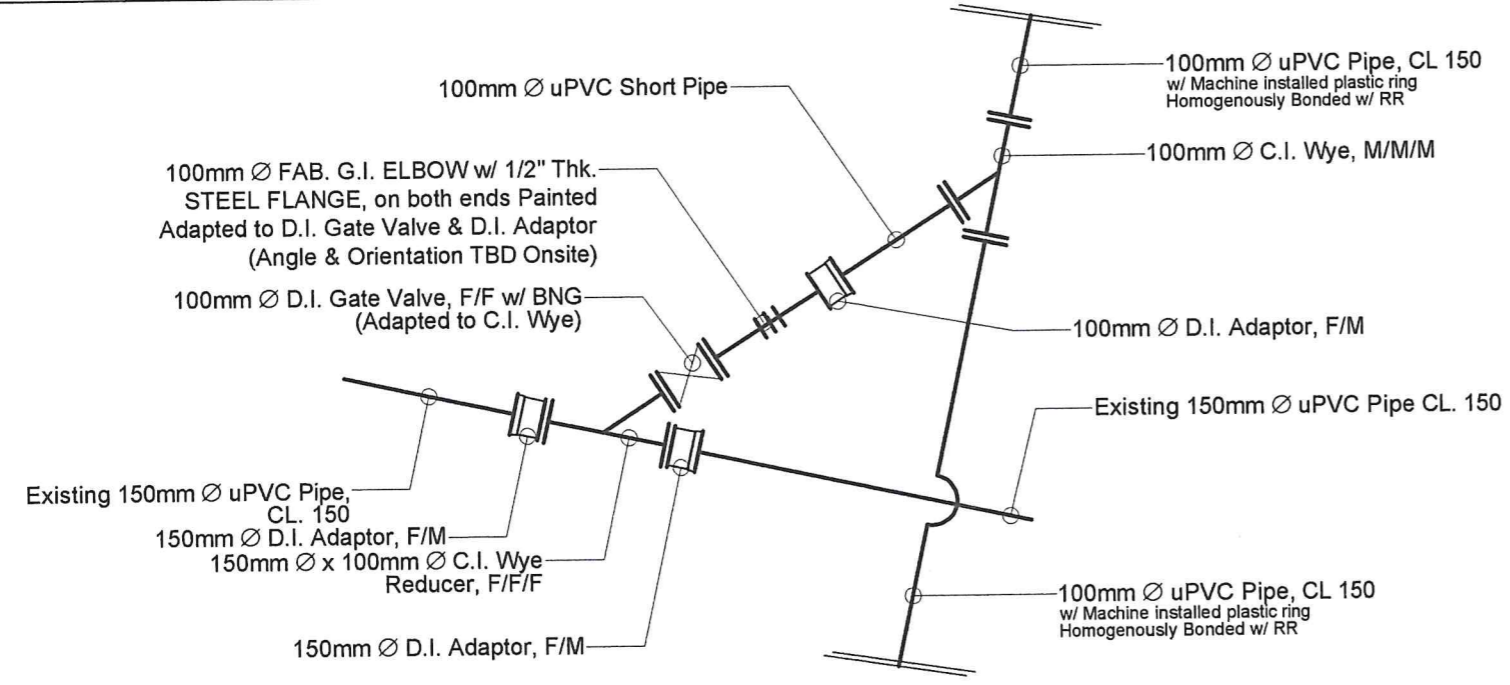
- PROPOSED 100mm Ø uPVC PIPE, CL. 150
w/ Machine installed plastic ring
Homogenously Bonded w/RR
- EXIST. 250mm Ø uPVC PIPE, CL. 150
- EXIST. 150mm Ø uPVC PIPE, CL. 150
- NEWLY INSTALLED 50mm Ø BLOW-OFF

 Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED :	PROJECT TITLE/LOCATION:	SHEET CONTENTS :	SHEET NO.:
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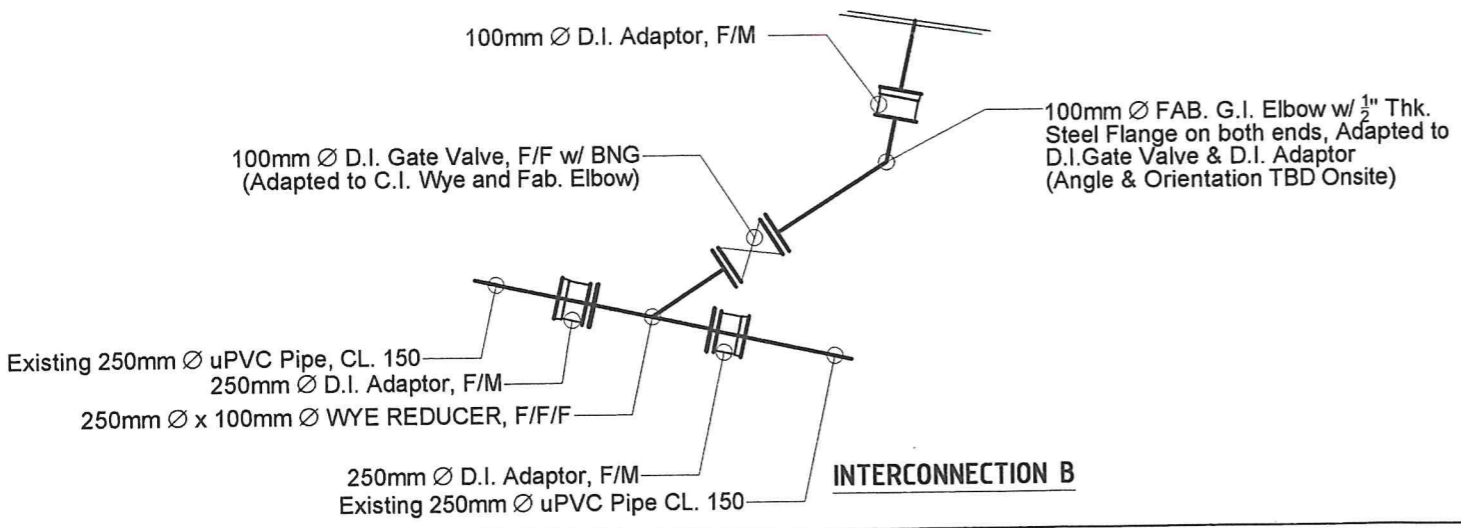


INSTALLATION OF FITTINGS DETAILS N.T.S.

BLOW-OFF DETAILS N.T.S.

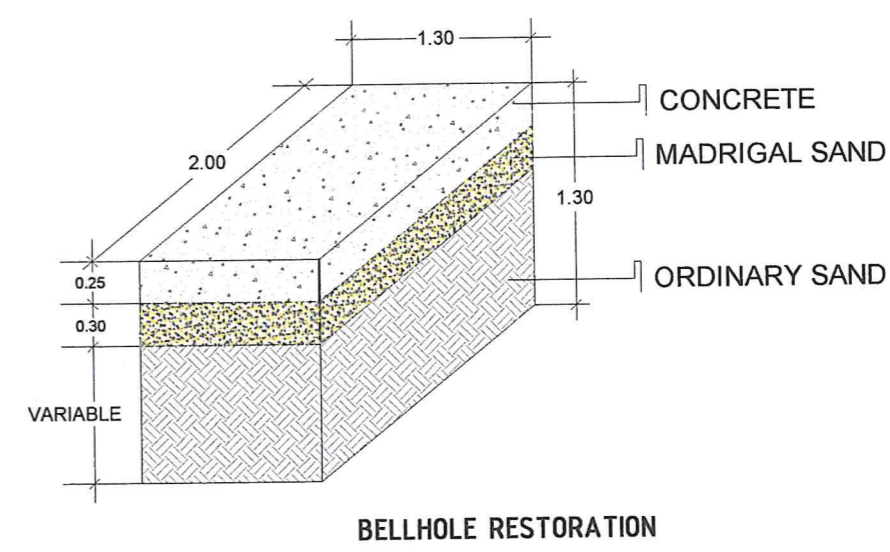
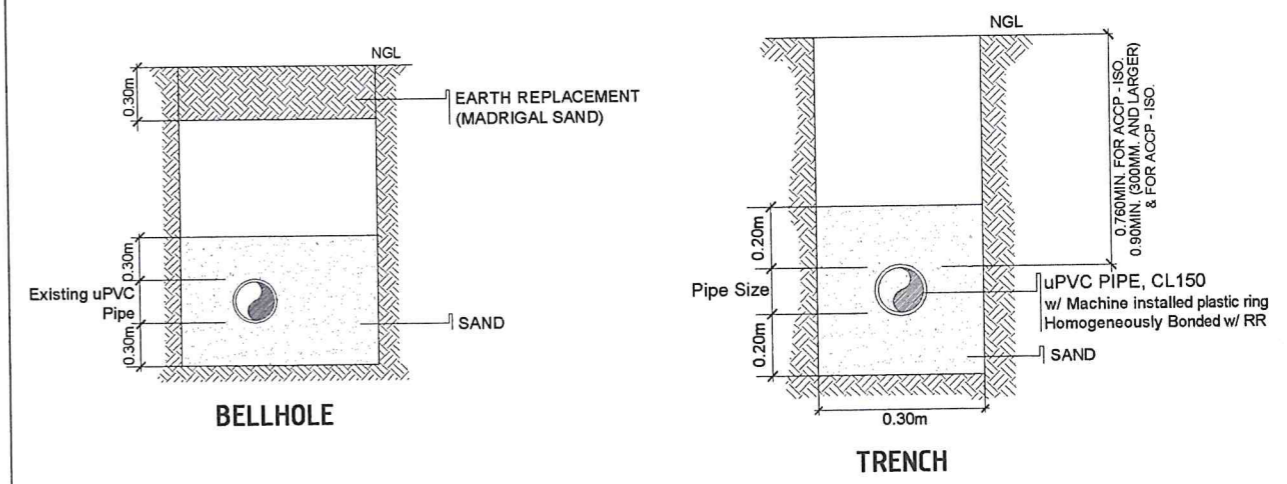


INTERCONNECTION A



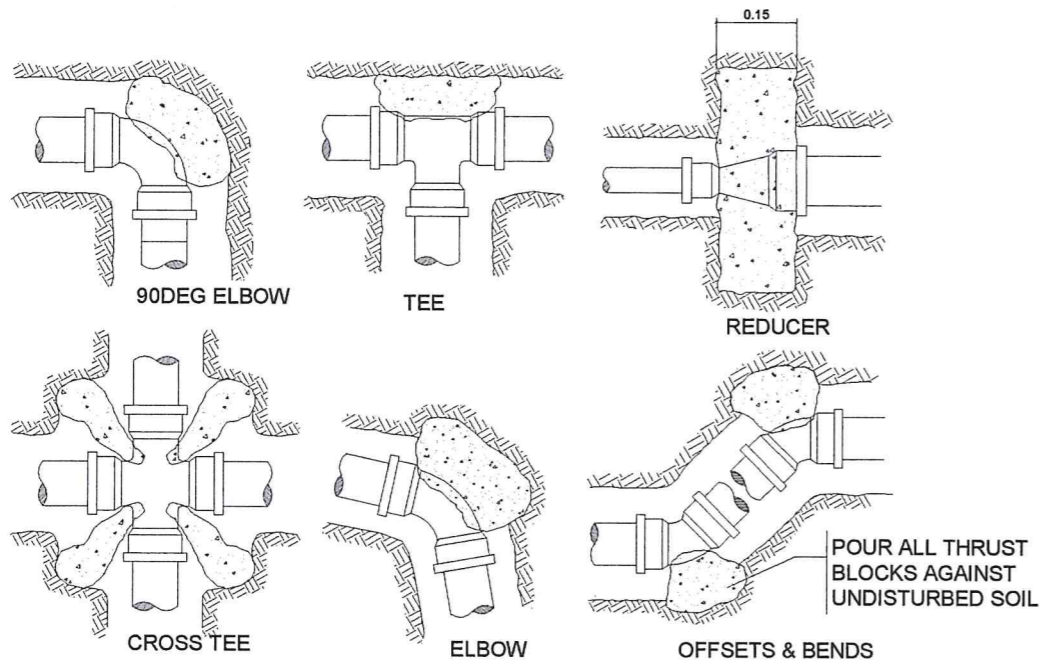
INTERCONNECTION B

INTERCONNECTION TO EXISTING WATERLINE DETAILS N.T.S.



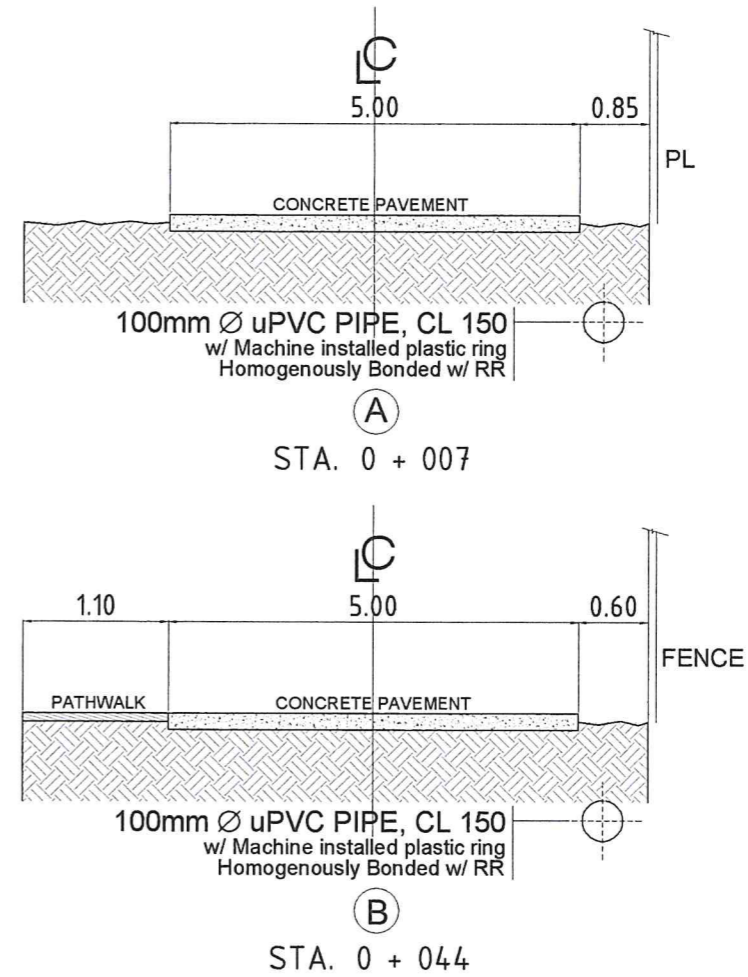
BELLHOLE AND TRENCH DETAILS N.T.S.

<p>Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City</p>	PREPARED BY:	CHECKED BY:	RECOMMENDING APPROVAL:	APPROVED:	PROJECT TITLE/LOCATION: PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION	SHEET CONTENTS:	SHEET NO.:
	SHARMAINE E. BRACIA OIC - Division Mgr., PDCD	SONJUN O. MILLARES OIC - Department Mgr., EED	ROQUE S. FRANCISCO AGM, O&TS	FLORENCIO T. MONGOSO JR. General Manager A		INTERCONNECTION TO EXISTING WATERLINE INSTALLATION OF FITTINGS DETAILS BLOW-OFF DETAILS BELLHOLE AND TRENCH DETAILS CAD BY: EPHRAIM MAGISTRADO	



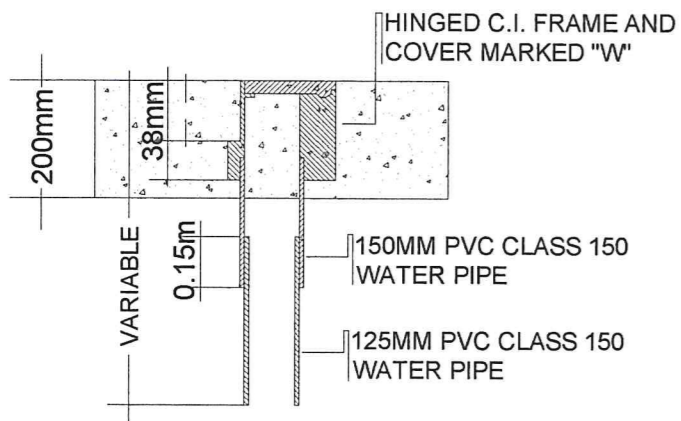
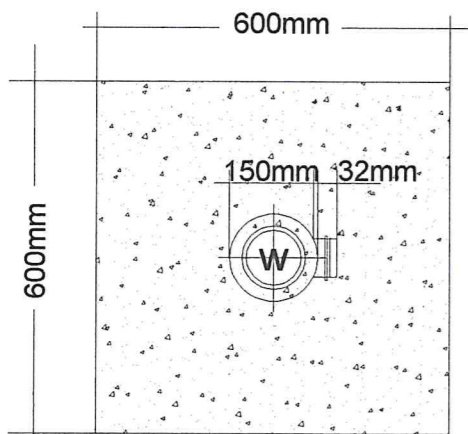
CONCRETE THRUST BLOCK DETAILS

N.T.S.



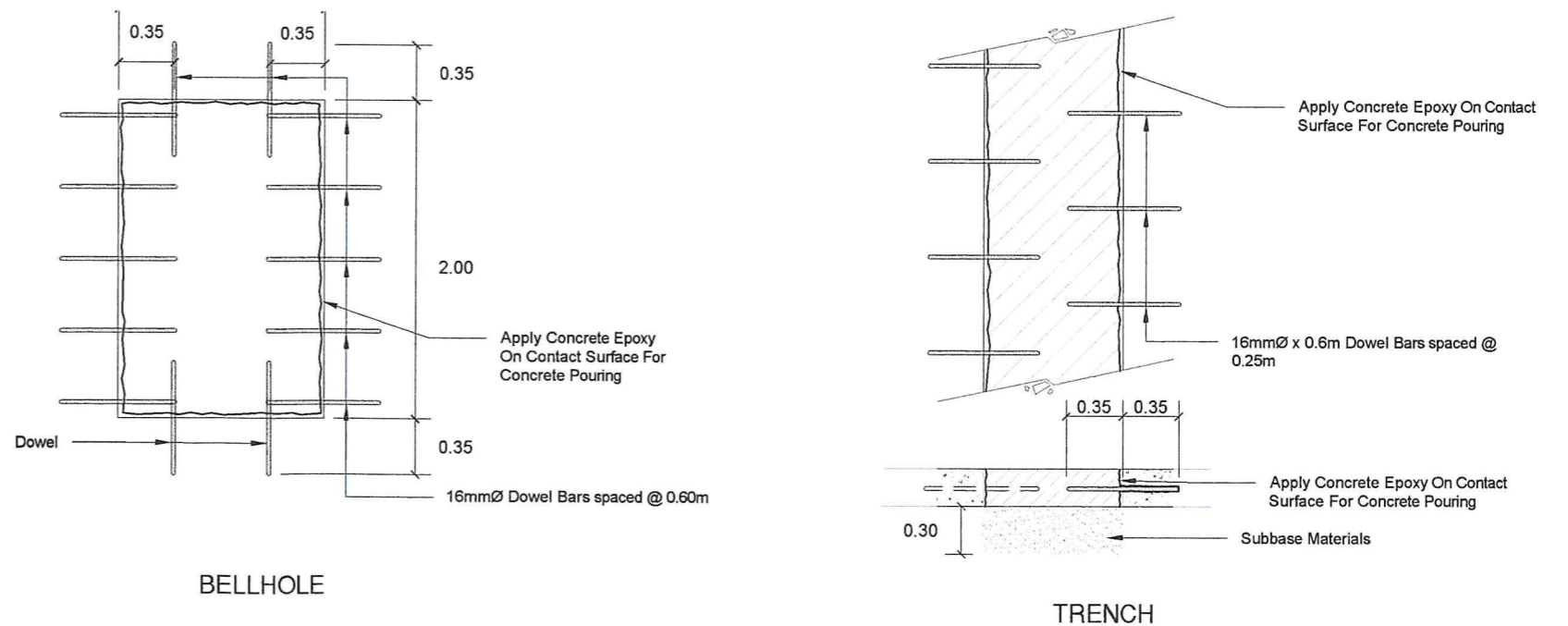
ROAD CROSS-SECTION DETAILS

N.T.S.



VALVE BOX AND COVER DETAILS

N.T.S.



DOWELLED DETAILS

N.T.S.

SPECIFICATIONS:

1. WARNING SIGNS

a. National and Main Streets :

The Contractor shall provide the following signs :

- a.1 Slow down signs (WS-1) at 50 meters before and after the project. (See WS-1 details)
- a.2 Slow down signs (WS-1) at 25 meters before and after the project. (See WS-1 details)
- a.3 Road signs (WS-2) at every 10 meters along the entire length of the excavation with warning tape stretch on top of the road signs. (See WS-2 details)

b. Secondary or Interior Streets

The Contractor shall provide the following signs :

- b.1 Road signs (WS-2) at 25 meters before and after the project. (See WS-2 details)
- b.2 Road signs (WS-2) at every 10 meters along the entire length of the excavation with warning tape stretch on top of the road signs. (See WS-2 details)

c. Pathways/Footwalks :

The Contractor shall provide the following signs :

- c.1 Road signs (WS-2) at 5 meters before and after the project. (See WS-2 details)
- c.2 Road signs (WS-2) at every 10 meters along the entire length of the excavation with warning tape stretch on top of the road signs. (See WS-2 details)

2. EXCAVATION WORKS

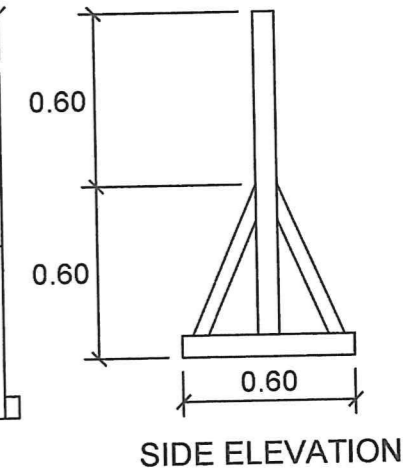
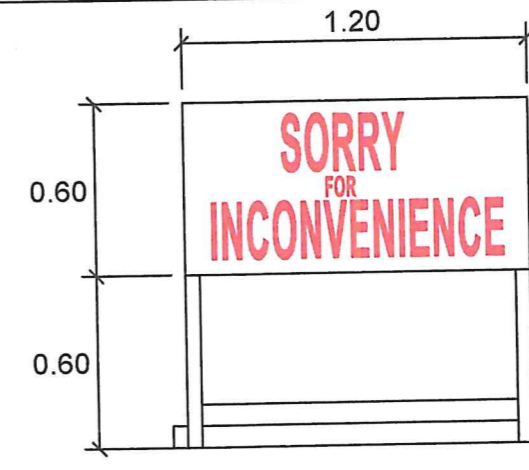
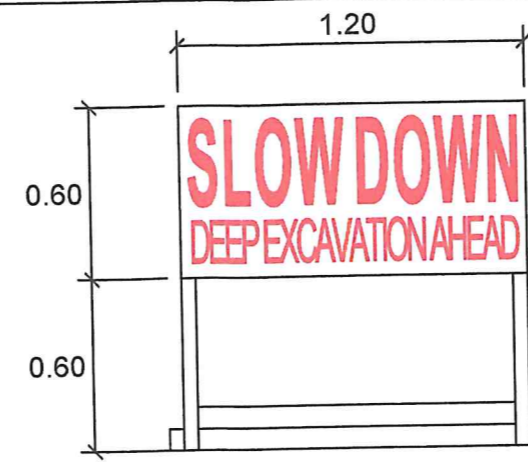
- a. The contractor shall furnish labor, tools, materials and other facilities for the satisfactory performance to complete the excavation works. The contractor shall make all necessary excavation to grade as indicated on the plans and provided in these specifications.
- b. Trenches for water pipelines shall be made wide enough to allow good workmanship. A table shown on the drawing gives the recommended widths and depths for various pipe sizes.
- c. Whenever the methods used for the dewatering trenches and the other pits are found ineffective and inadequate, the contractor shall construct dewatering trenches or wells in order to rapidly collect the water as the case may be.

3. SHEETING AND BRACING

- a. The contractor shall provide all shoring, sheeting and bracing necessary or required to perform and protect the excavation work and to safeguard the workmen and the public.
- b. The contractor shall provide a steel plate covering with a minimum thickness of 1" for all excavation works on national and main streets; and a minimum thickness of 3/4" for all excavation works on the secondary and interior streets to ensure safety of the pedestrians.
- c. All sheeting and bracing works shall be provided at the expense of the contractor.

4. PIPE AND FITTING LAYING

- a. uPVC(unplasticized polyvinyl chloride) Pipes/Bends, Class 150 with machine installed plastic ring, homogeneously bonded with rubber ring and should conform with ISO standard.
- b. G.I.(Galvanized Iron) Pipes/Elbows, Heavy Duty, schedule 40 and should conform with ISO standard.
- c. D.I.(Ductile Iron) FITTINGS
 - Relevant characteristics and performance requirements for gate valves, ductile iron body, bonnet guard flange and wrench nut, electronically applied fusion bonded epoxy resin coating, stainless stem, ductile iron encapsulated with EPDM-rubber compound wedge, bronze wedge nut, stainless steel 304 hexagon gland bolts, ASTM D2000 buna "N" nitrate rubber bonnet gasket, open O-ring stem seals, O-ring gland seal with 2 major components (Body and Bonnet).
 - Relevant characteristics and performance requirements for universal flange adaptor with complete bolts, nuts and gaskets - ductile iron body with epoxy resin coating with stainless steel 304 hexagon bolts.
 - Should conform with ISO standard.
- d. C.I.(Cast Iron) FITTINGS
 - Relevant characteristics and performance requirements for universal various fittings with complete bolts, nuts and gasket.
 - Gasket should be 2 ply neoprene or equivalent.
 - Should conform with ISO standard
- e. No fabricated fitting/material shall be used/installed unless it has been approved by the Engineer-in-Charged.
- f. The pipe shall be located/installed within road right-of-way
- g. Any pipe having its grade, alignment or joint disturbed after laying shall be taken up and relaid. No pipe shall be laid after in water or when trench or weather conditions are unsuitable for work. Water shall be kept out of trench until the jointing is completed. When work is not in progress, open ends of pipe and fittings shall be plugged or closed so that no trench water, earth or foreign substance will enter the pipes or fittings.



BACK ELEVATION

FRONT ELEVATION

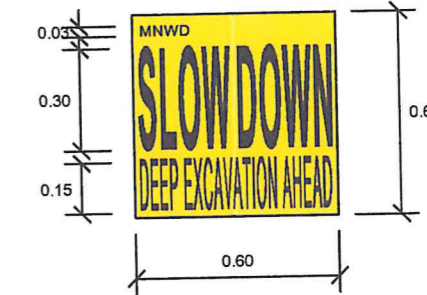
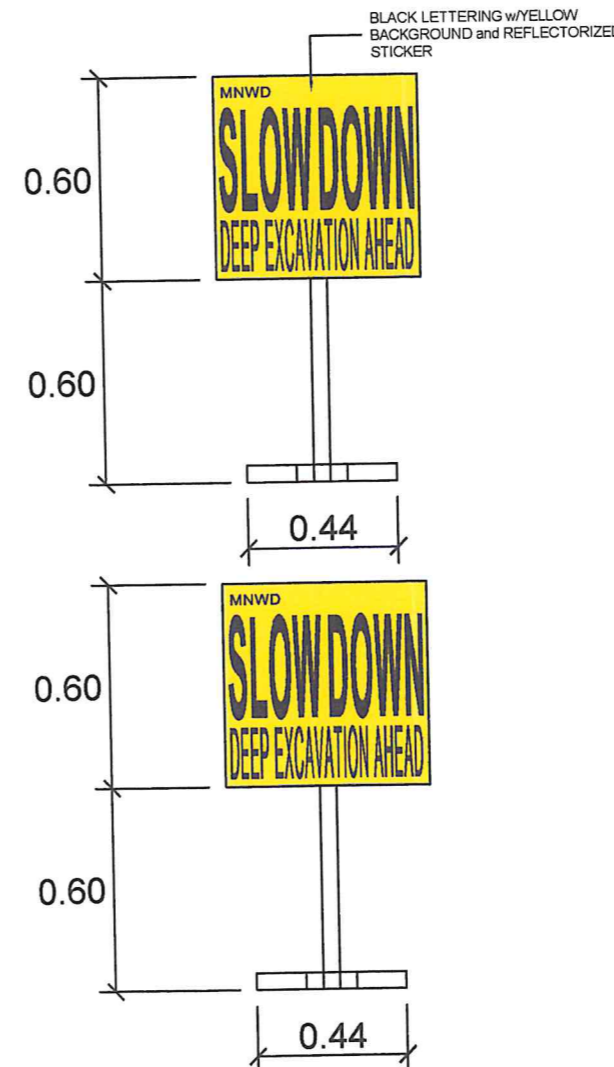
SIDE ELEVATION



DETAILS OF LETTERING

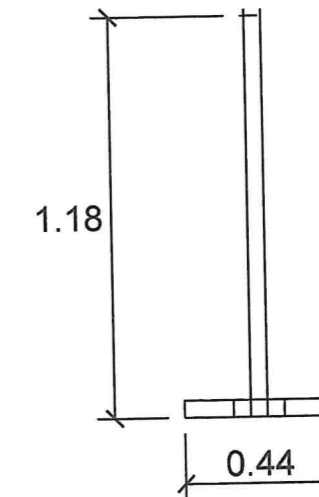
SCALE 1:17.5 m




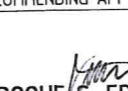

DETAILS OF ROAD SIGN (RS-1)



DETAILS OF LETTERING

SCALE 1:17.5 m



 <p>Republic of the Philippines METROPOLITAN NAGA WATER DISTRICT 40 J. Miranda Avenue, Naga City</p>	PREPARED BY:  SHARMAINE E. BRACIA OIC - Division Mgr., PDCD	CHECKED BY:  SONJUN O. MILLARES OIC - Department Mgr., EED	RECOMMENDING APPROVAL:  ROQUE S. FRANCISCO AGM, O&TS	APPROVED:  FLORENCIO T. MONGOSO JR. General Manager A	PROJECT TITLE/LOCATION: PROPOSED PUMP & ELECTRO-MECHANICAL EQUIPMENT, DISCHARGE LINE, ELECTRICAL EQUIPMENT, GENERATOR SET, AND TRANSMISSION LINE AT STA. LUCIA II PUMPING STATION Zone 5, Barangay Sta. Lucia, Magarao, Camarines Sur	SHEET CONTENTS : SPECIFICATIONS DETAILS OF ROAD SIGNS CAD BY: EPHRAIM MAGISTRADO	SHEET NO.: 11 12 Date: 08-2024
	EEDF18, REV. 00, APRIL, 2019						

- h. Pipe under drainage structures and/or culverts shall have reinforced concrete encasement unless otherwise specified by Engineer-in-Charge.
- i. Proper equipment, tools, instruments and facilities satisfactory to the engineer-in-charge shall be provided and used by the contractor for the safe and efficient execution of the work. All pipes, fittings, valves and accessories shall be carefully lowered into the trench by means of suitable equipment and in such manner as to prevent damage to them. Under no circumstances shall pipes or accessories be dropped or dumped into the trench, all foreign matter or dirt shall be thoroughly removed from the interior of the pipes and accessories, before lowering into the trench, any defective, damaged or unsound pipe shall not be lowered into the trench.
- j. Deflection from a straight line or grade, as required by horizontal curves, vertical curves or effect shall be made with proper bends and elbows.
- k. Install caution/warning tape 30 cm below the natural grade line.
- l. No installation of pipes/fittings shall be done unless excavation has been approved by the Engineer-in-Charge.

5. CONCRETE THRUST BLOCK

- a. Concrete thrust blocks, anchor blocks or welded joints shall be provided at all junctions, changes in direction exceeding 11 1/2 degrees or where otherwise shown.

TABLE OF MINIMUM THRUST BLOCK BEARING AREAS IN SQUARE METERS FOR PIPE SIZES 50mm TO 600mm Ø				
PIPE SIZE mm (in)	TEE & DEAD END	90 DEG. BEND	45 DEG. END	22.5 DEG. BEND
50 (2")				
75 (3")	0.0500	0.0700	0.0400	0.0200
100 (4")	0.0900	0.1200	0.0700	0.0400
150 (6")	0.2000	0.2800	0.1500	0.0800
200 (8")	0.3500	0.5000	0.2700	0.1400
250 (10")	0.5500	0.7700	0.4200	0.2100
300 (12")	0.7900	1.1100	0.6000	0.3100
350 (14")	1.0700	1.5200	0.8200	0.4200
400 (16")	1.4000	1.9800	1.0700	0.5500
450 (18")	1.7700	2.5100	1.3600	0.6900
500 (20")	2.1900	3.1000	1.6800	0.8500
600 (24")	3.1500	4.4600	2.4200	1.2300

6. PIPELINE TRENCH BACKFILL

- a. Selected borrow materials having the sand equivalent shall first be brought up to mid diameter of the pipe and compacted, then backfilling at 150mm(6in.) and compaction shall be repeatedly done until fully backfilled.
- b. Blasted rock, broken concrete or broken pavement materials and large boulders, shall not be used as backfill materials.
- c. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage.
- d. When backfill material is not enough, it shall be sourced from outside but must conform with the general condition on materials quality.
- e. Prior to backfilling, a backfilling permit shall be secured from the MNWD Engineer-in-Charge.

7. INSTALLATION OF VALVES AND VALVE BOX COVER

- a. Valves and valve box covers shall be installed as shown on the drawings. Valves shall be set plumb center with valve box cover. Valves shall have the interiors cleaned of all foregoing matters before installation.

8. FIRE HYDRANTS AND BLOW OFFS

- a. Where no curbs exist, the hydrant/blow-off shall be located within 1.50 meters of the road right-of-way or as directed by the Engineer-in-Charge and barricades shall be installed as shown in the drawing

9. BRIDGE AND CULVERT CROSSING

- a. The work shall include furnishing of all materials, labor, tools equipment and other facilities for the satisfactory performance to complete the bridge and culvert crossing as specified herein.
- b. Bridge and culvert crossing shall be installed in accordance with the MNWD approved design.
- c. Steel or G.I. pipes shall be painted blue.

10. CONCRETE CUTTING AND BREAKING

- a. The work shall include furnishing of all labor, tools equipment and other facilities for the satisfactory performance to complete the concrete cutting and breaking works as specified herein.

11. RESTORATION WORKS

- a. Furnish all materials, labor, tools, equipment and perform all works necessary as specified herein.
- b. All damaged roads and driveways, if any, on account of the performance of the work covered by the contract, the same shall be restored into its original condition.
- c. ASTM ISO type 1 for normal Portland cement, unless the Engineer-in-Charge approved as change.
- d. Fine aggregate to be used in the composition of concrete shall consist of sand, stone or other inert materials with similar characteristics or a combination thereof having clean, hard, strong, durable, uncoated grains and free from injurious amount of dust, lumps, soft or flaky particles, shale, alkali, organic matter, ham or clay.
- e. Coarse aggregate shall consist of crushed stones, gravel or other approved inert materials with similar characteristics as the fine aggregate and shall well graded as to maximum size of 3/4" in diameter.
- f. Cold mix asphalt with emulsifier, unless the Engineer-in-Charge approved as change.
- g. Class "A" concrete shall consist of one(1) part cement to a total of five(5) parts of fine and coarse aggregates measured separately.
- h. Concrete mixing shall be done using one(1) bagger concrete mixer / transit mixer.
- i. Depositing Concrete
 - Before pouring of concrete, debris shall be removed from space to be occupied by the concrete.
 - During concrete pouring, it shall be thoroughly spanted and compacted by means of a rod.
 - Water shall be removed from excavated portion before concrete is poured.
- j. Depositing of Asphalt
 - Before pouring of cold mix asphalt, debris shall be removed from cured concrete.
 - Used of vibratory compactor/roller must be observed during compaction of cold mix asphalt.

12. HYDROTESTING

- a. Furnish all materials, labor, tools equipment except pressure gauge to be provided by MNWD and perform all unless necessary or specified herein.
- b. After the pipes have been laid, the joints completed and the trench partially backfilled but with joints exposed for examination, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of 150 psi.
- c. The duration or each pressure test shall be at least two (2) hour unless otherwise specified by the engineer.
- d. Each section of pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a hydrotesting machine connected to the pipe in manner satisfactory to the engineer. During the filling of the pipe and before applying the test pressure, all air shall be expelled from the pipeline. To accomplish this, taps shall be made, if necessary at points of highest elevation, and after completion of the test, the taps shall be tightly plugged unless otherwise specified.
- e. During the test, all exposed pipes, fittings, valves, hydrants, joints and coupling shall be carefully examined. If found to be cracked or defective, they shall be removed and replaced by the contractor. The test shall be repeated until satisfactory results are obtained.
- f. Hydrotesting points are indicated in the plans and it should be strictly followed, no further works are allowed before the start of hydrotesting prior to the mentioned work.

13. DISINFECTION

- a. Furnish all materials, labor, tools equipment and perform all unless necessary or specified herein.
- b. Before being placed in service, and before certification of completion by the engineer, all new water mains or extensions to existing system, or valved section of such extension or any replacement in the existing water system shall be disinfected with chlorine.
- c. The preferred point of applications of the chlorinating agent is at the beginning of the pipeline, extensions, or any valved section and through a corporation stop inserted on the top of the newly laid pipe.

14. FLUSHING

- a. Furnish all materials, labor, tools equipment and perform all unless necessary or specified herein.
- b. After chlorination, all treated water shall be thoroughly flushed from newly laid pipeline and replaced with water throughout its entire length. Water sample shall be collected by MNWD for laboratory examination, with cost chargeable to the Contractor until all samples passes the NSDW requirement.

15. AS-BUILT PLAN

- a. After completion of works, the contractor shall submit a preliminary "As-Built Plan" of the project prior to the conduct of the final inspection of MNWD project Engineer-in-Charge.

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