

## *Section VI. Specifications*

This set of specifications shall govern the method of installation and the kind of materials to be used for the proposed distribution line and its appurtenances at Zone 1 to Zone 2, Barangay Panicuason to Zone 3, Barangay Carolina, Naga City.

The plans, detail drawings and these specifications shall be considered as complementing each other so that what is mentioned in one, although not mentioned or shown in the other, shall be considered as appearing on both. In case of conflict between the two, the same should be referred to the Designing Engineer for resolution.

### GENERAL CONDITIONS

All parts of the construction shall be furnished with first class workmanship to the fullest talent and meaning of the plans and these specifications and to the entire satisfaction of the engineer-in-charge and the MNWD.

The installation works must conform with all the requirements of the **Department of Public Works and Highways** rules and regulations as well as the local rules and regulation of the City of Naga.

All materials to be used herein shall be of high quality and premium brands, and shall be inspected and approved by the Engineer-in-charge before using and installation.

### SECTION 1 – STAKING OUT LINE GRADES

1.1 The Contractor shall accurately stake out lines of the pipes to be installed and shall establish all grades, necessary thereof after which, approval by MNWD shall be secured before any excavation work is commenced.

### SECTION 2 – SAFETY AND HEALTH PLAN

#### GENERAL CONDITIONS:

This set of conditions shall be observed and shall govern all methods of construction/installation of waterlines and its appurtenances.

Furnish all necessary safety signs/warning signs specified herein. Lights, detours, barricades, temporary pedestrian walks and bridges, crossings steel plates and other safety control measures and precaution for the general safety of the public.

#### 2.1 MAIN OBJECTIVES

The main objectives of this conditions are to be able to protect lives, properties and environment and abide by the requirements of the government agencies concerned.

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The main concern of this conditions shall not only be for the safety of the contractor's workers but for the safety of general public as well. The construction/installation site shall be properly enclosed, warning and safety signs shall be provided in strategic places where they can be read not only by the workers but by the public.

## 2.2 TRAINING AND ORIENTATION

Before the commencement of the project, the contractor should adequately and suitably inform workers of potential safety and hazards to which they may be exposed at the construction site, and instructed and trained on the measures available for the prevention, control and protection against those hazards.

Specialized instruction and training should be given to:

- a. Drivers and operators of lifting, transport, earth moving and materials – handling equipment and machinery or any equipment of specialized or dangerous nature.
- b. Workers engage in excavation at least one meter deep or deep enough to cause damage.
- c. Workers as signalers.

## 2.3 GENERAL SAFETY WITHIN CONSTRUCTION/INSTALLATION AREA:

Strictly observe and comply with all provisions/conditions of the Department of Public Works and Highways and Local Government Unit as to the safety of the General Public and its environment.

## 2.4 ENVIRONMENTAL CONTROL

Monitor the control of noise, vibration and hazardous air-borne contaminants such as gases, fumes, mist or vapors. A regular street sweeper shall be assigned to control the spillage of excavated materials and the likes which move beyond the construction limit/line.

## 2.5 PROVISION FOR AND USE OF PERSONAL PROTECTIVE EQUIPMENT

The Contractor shall furnish all workers with protective equipment for eyes, face, hands and feet, lifeline safety belts/harness, protective shields and barrier whenever necessary by reason of the hazardous work process or environment, or other mechanical irritants or hazardous capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical agent.

## 2.6 SAFETY SIGNS/WARNING SIGNS, LIGHTS

GENERAL: The Contractor shall furnish all necessary safety signs/warning signs, specified herein, lights, detours, barricades, temporary pedestrian walks and bridges, crossing steel plate and other safety control measures and precaution for the general safety of the public.

## 2.6.1 WARNING SIGNS

### 2.6.1.1 National and Main Streets :

The Contractor shall provide the following signs:

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

### 2.6.1.2 Secondary or Interior Streets

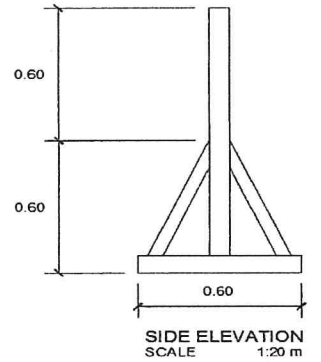
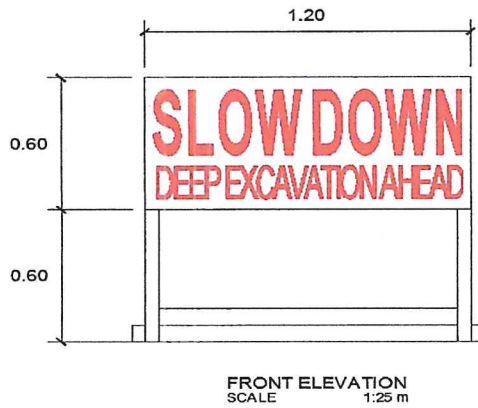
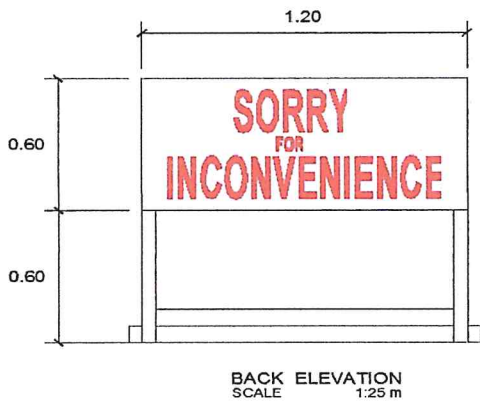
The Contractor shall provide the following signs:

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

### 2.6.1.3 Pathways/Footwalks :

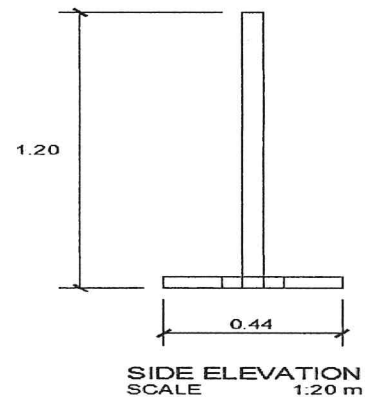
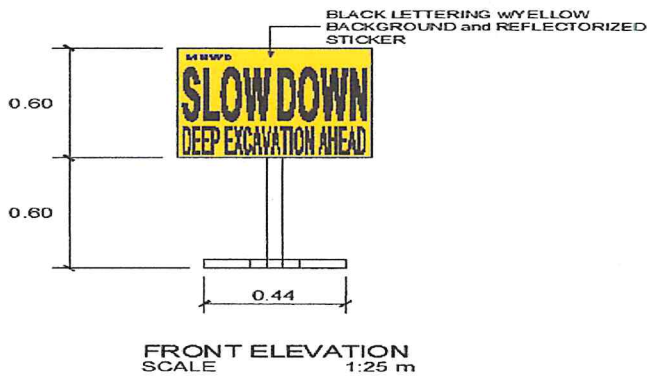
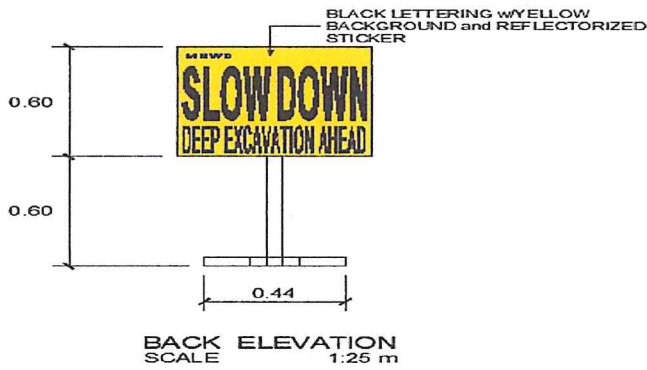
The Contractor shall provide the following signs:

- a. Road signs (RS-2) at 5 meters before and after the project. (See RS-2) details)
- b. Road signs (RS-2) at every 10 meters along the entire length of the excavation with warning tape strength on top of the road signs. (See RS-2 details)



DETAILS OF LETTERING  
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**DETAILS OF ROAD SIGN (RS-1)**



**DETAILS OF ROAD SIGN (RS-2)**

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SECTION 3 – PIPELIN

DETAILS OF ROAD SIGN (RS-2)

3.1 EXCAVATION WORKS

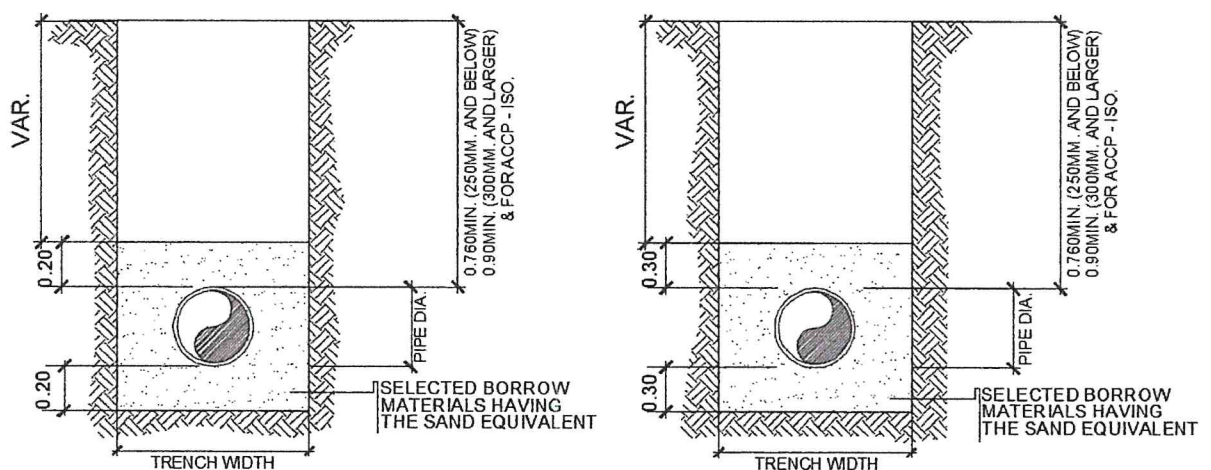
3.1.1 The contractor shall furnish labor, tools, materials and other facilities for the satisfactory performance to complete the excavation works.

The contractor shall make all necessary excavation to grade as indicated on the plans and provided in these specifications.

3.1.2 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.

TABLE OF TRENCH DIMENSION (MNWD STANDARD SPECIFICATION BOARD RESOLUTION NO. 47 - I Series 2013: DERIVATION OF UNIT COST FOR PIPELINE SAND BEDDING AND SAND COVER)

PIPE DIAMETER (mm)	50	75	100	150	200	250	300	350
WIDTH (m)	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.50



**TRENCH DETAILS**  
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- 3.1.3 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.

### 3.2 SHEETING, BRACING, AND COVERING

- 3.2.1 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.
- 3.2.2 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 ¾" for all excavation works on the secondary and interior streets to ensure safety of the pedestrians.
- 3.2.3 All sheeting, bracing, and covering works shall be provided at the expense of the contractor.

## SECTION 4 – INSTALLATION OF PIPES AND FITTINGS

### 4.1 PIPE AND FITTING LAYING

- 4.1.1 uPVC (un-plasticized polyvinyl chloride) Pipes/Bends, Class 150 with machine installed plastic ring, homogenously bonded with rubber ring and should conform with ISO standard.
- 4.1.2 G.I. (Galvanized Iron) Pipes/Elbows, Heavy Duty, schedule 40 and should conform with ISO standard.
- 4.1.3 FITTINGS

#### 4.1.3.1 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.

#### 4.1.3.2 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.

4.1.3.3 No fabricated fitting/material shall be used/installed unless it has been approved by the Engineer-in-Charged.

4.1.4 The pipe shall be located/installed within road right-of-way

4.1.5 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.

4.1.6 Pipe under drainage structures and/or culverts shall have reinforced concrete encasement unless otherwise specified by Engineer-in-Charge.

4.1.7 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 dump 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.

4.1.8 Deflection from a straight line or grade, as required by horizontal curves, vertical curves or effect shall be made with proper bends and elbows.

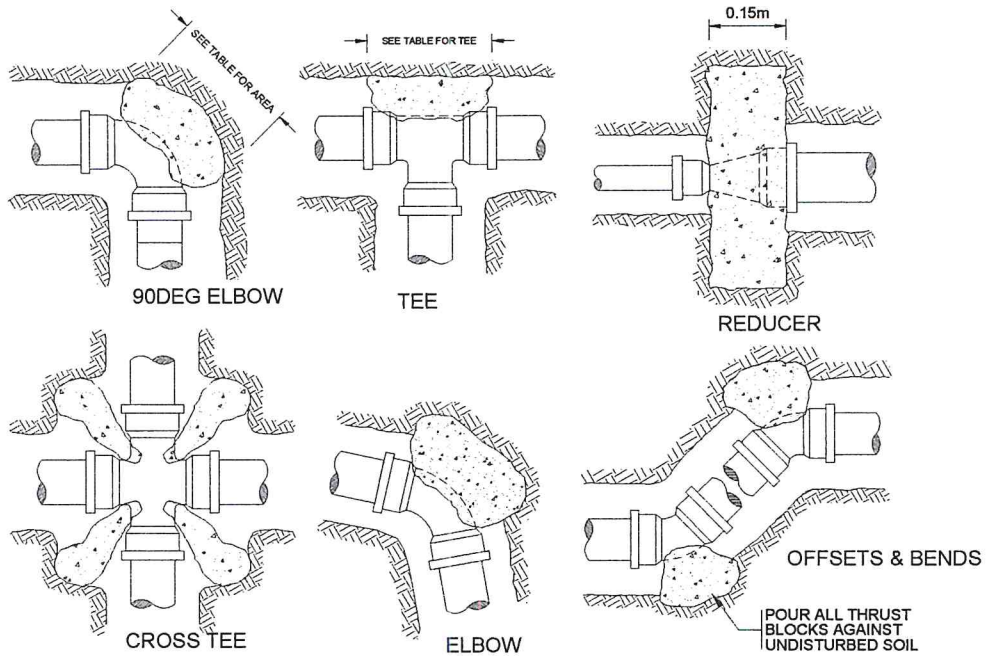
4.1.9 Install caution/warning tape 30 cm below the natural grade line.

4.1.10 No installation of pipes/fittings shall be done unless excavation has been approved by the Engineer-in-Charge.

#### SECTION 5 – CONCRETE THRUST BLOCKS



5.1 Concrete thrust blocks, anchor blocks or welded joints shall be provided at all junctions, changes in direction exceeding 11 ½ degrees or where otherwise shown.



## CONCRETE THRUST BLOCK DETAILS

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. BEND	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

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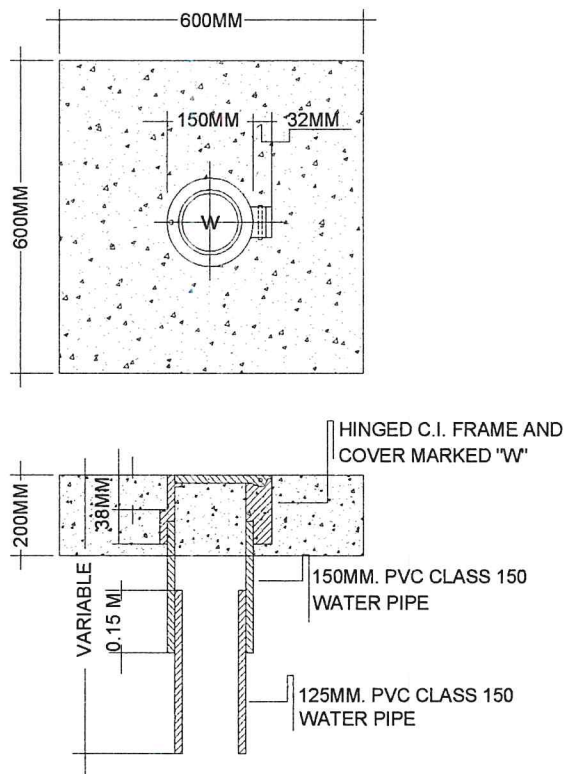
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SECTION 6 – PIPELINE TRENCH BACKFILL

- 6.1 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.
- 6.2 Blasted rock, broken concrete or broken pavement materials and large boulders, shall not be used as backfill materials.
- 6.3 Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage.
- 6.4 When backfill material is not enough, it shall be sourced from outside but must conform with the general condition on materials quality.
- 6.5 Prior to backfilling, a backfilling permit shall be secured from the MNWD Engineer-in-Charge.

SECTION 7 – INSTALLATION OF VALVES AND VALVE BOX COVER

- 7.1 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.
- 7.2 Install concrete pad for every valve box cover installed as shown in the drawings.



VALVE BOX and COVER DETAIL  
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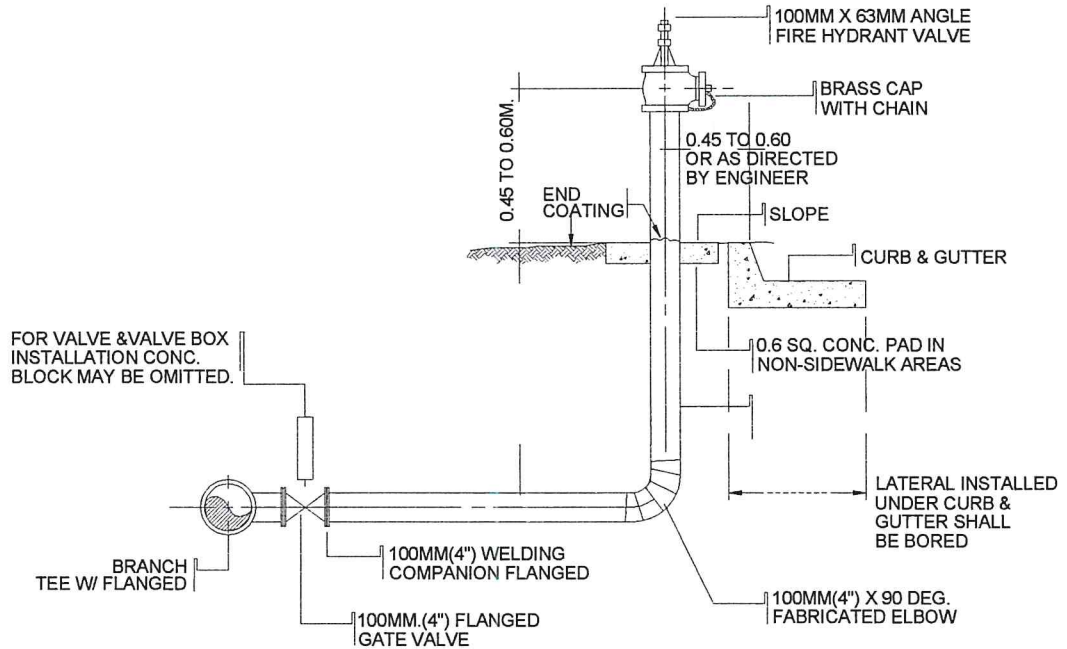
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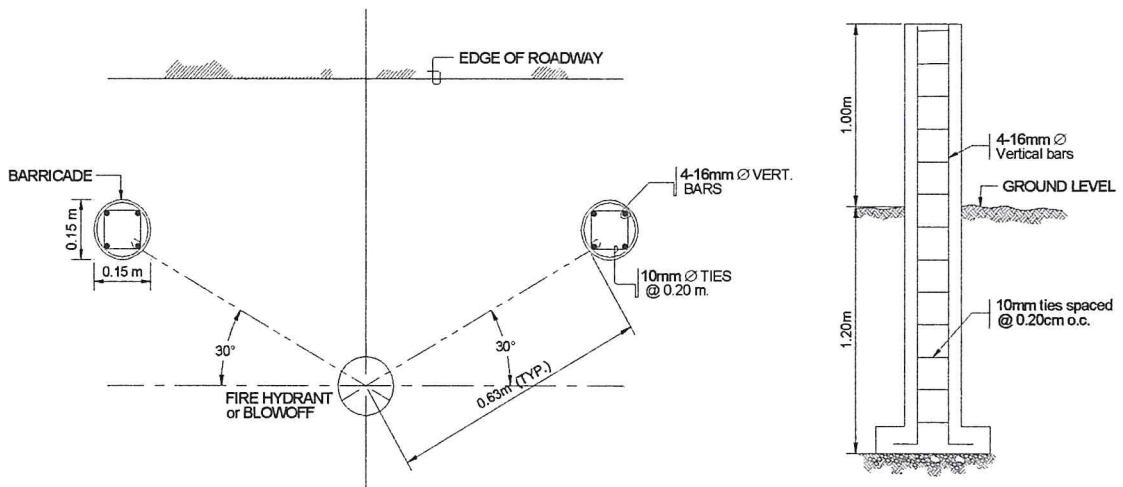
SECTION 8 – FIRE HYDRANTS AND BLOW OFFS

8.1 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



**FIRE HYDRANT DETAILS**

NOT TO SCALE



PLAN FOR SETTING BARRICADE

ELEV. OF CONC. BARRICADE

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- 8.2 Residential fire hydrants shall be painted red. Blow-off shall be painted blue. Barricades in yellow and black as specified by Engineer-in-charge.

#### SECTION 9 – BRIDGE AND CULVERT CROSSING

- 9.1 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.
- 9.2 Bridge and culvert crossing shall be installed in accordance with the MNWD approved design.
- 9.3 Steel or G.I. pipes shall be painted blue.

#### SECTION 10 – CONCRETE CUTTING AND BREAKING

- 10.1 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.

#### SECTION 11 – RESTORATION WORKS

##### 11.1 ROADS AND DRIVEWAYS

- 11.1.1 Furnish all materials, labor, tools, equipment and perform all works necessary as specified herein.
- 11.1.2 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.
- 11.1.3 Portland cement  
ASTM ISO type 1 for normal Portland cement, unless the Engineer-in-Charge approved as change.
- 11.1.4 Aggregates
- 11.1.4.1 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 there of 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.
- 11.1.4.2 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 ¾” in diameter.



11.1.5 Asphalt

Cold mix asphalt with emulsifier, unless the Engineer-in-Charge approved as change.

11.1.6 Concrete Proportions

11.1.6.1 Class "A" concrete shall consist of one(1) part cement to a total of five(5) parts of fine and coarse aggregates measured separately.

11.1.7 Concrete Mixing

11.1.7.1 Concrete mixing shall be done using one(1) bagger concrete mixer / transit mixer.

11.1.8 Depositing Concrete

11.1.8.1 Before pouring of concrete, debris shall be removed from space to be occupied by the concrete.

11.1.8.2 During concrete pouring, it shall be thoroughly spanted and compacted by means of a rod.

11.1.8.3 Water shall be removed from excavated portion before concrete is poured.

11.1.9 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.

11.2 LANDSCAPE

11.2.1 All landscape work that is damaged, if any, on account of the performance of the work covered by the contract shall be placed and put into perfect condition by the contractor at its own expense..

SECTION 12 – HYDROTESTING

12.1 Furnish all materials, labor, tools equipment except pressure gauge provided by MNWD and perform all unless necessary or specified herein.

12.2 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.



- 12.3 The duration of each pressure test shall be at least two (2) hour unless otherwise specified by the engineer.
- 12.4 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.
- 12.5 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.
- 12.6 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.

#### SECTION 13 – DISINFECTION

- 13.1 Furnish all materials, labor, tools equipment and perform all unless necessary or specified herein.
- 13.2 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.
- 13.3 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.

#### SECTION 14 – FLUSHING

- 14.1 Furnish all materials, labor, tools equipment and perform all unless necessary or specified herein.
- 14.2 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.

#### SECTION 15 – AS-BUILT PLAN

- 15.1 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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