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## TECHNICAL SPECIFICATION – SEWERAGE

### GENERAL

#### 1.1 Introduction

This specification covers the construction of new sewer lines within various urban towns/cities in Bhutan as shown on the drawings and listed in Bill of Quantities.

#### 1.2 Scope of the Works

The contract is construction of sewer network in **Dechencholing LAP**, under **Thimphu City Corporation**. The scope of works includes the following.

Pipe trenching works: excavation, backfilling and other associated work.

Laying of **UPVC** pipes with associated manholes, including reinstatement of existing surfaces such as pavements and the safe guards of private and public property and commissioning of works.

Diversion of all sewers, storm water or other pipes, staging and propping of water mains and any other surfaces or walled drains met with the reconstruction of any fences and walls which may be interfered with.

Appropriate measures to ensure and safe guard smooth traffic flow minimizing the obstacles caused by contractual work.

#### 1.3 Standards

In the specification, reference is made to relevant code of practice with ISI (Indian Standard Institution) and Specification of Building and road works 2007 of SQCA.

#### 1.4 Quality of materials and workmanship

The quality and workmanship shall be at the approval of the engineer. All materials shall be approved manufacture and origin, sample delivered to site for test or approval by the engineer and contractor shall provide required information as to weight, quantity, strength constituents , description etc. No materials of any description of shall be used without prior approval by the engineer and any condemned as unfit for use in the works shall be removed immediately from the site by and without re-compensation to the contractor.

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## **1.5 Samples**

Samples of all materials shall be deposited with the engineer and approved prior to ordering or delivery to site. The engineer reserves the right to test any sample to destruction and retain samples until the end of retention period. No payment shall be made for the samples and contractor must include the rates and prices for the cost of sample.

## **1.6 Types of Pipes**

The pipes used will be uPVC with quick fit joints. The pipes produced shall meet the required pressure class and grade of PE 80 as per IS 4985: 2000.

## **1.7 Liaison with Police**

The contractor shall keep himself in close contact with police and other relevant agencies of the areas concerned regarding their requirements in the control of workmen, passage through township or control of traffic and shall provide all assistance or facilities which may be required by such officials in executing their duties connecting to the work.

## **1.8 Signboards**

The contractor shall erect signboards in prominent positions adjacent to the works to the satisfaction of engineer.

## **2.0 Pipe Laying**

1. On arrival at site, pipes are carefully checked for damaged ends, cracks or other defects and defective pipes if any shall be kept aside for the consent of engineer. The damaged pipes are then replaced as per the direction of engineer.
2. Contractor must ensure that pipes are properly handled by his people at time of unloading at site and under no circumstances pipes are dropped or thrown from the vehicle.
3. Pipe laying will not commence until the bottom of trench is ready and pipe bed have been approved.
4. Pipes must be stored with proper and stacking without exposing it direct temperature like sun and heat. Pipe must not be subject to stresses/load which will spoil the shape.
5. Pipe must be brought to correct alignment and pipes are laid accurately to required gradient and spot invert levels are checked at every 4 metres of horizontal distance.

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### **3.0 Bedding and protecting pipes**

1. No bedding materials will be placed in trenches containing water.
2. Sand bedding of required thickness to be provided along the trench and get approved by the engineer.
3. Where there is high ground water table all pipe will be surrounded in an approved free-draining materials.
4. For testing pipe lines, the pipe joints are required to be kept exposed.

### **4.0 Plugs**

1. Immediately after pipe laying, the open end of the pipe are temporarily sealed with wooden plugs or appropriate stopper to prevent entry of materials which might damage the pipe walls and to prevent the blockage of line.
2. No equipment, clothing and apparel must left inside the pipeline.
3. Whenever any plug is removed, immediately the length of pipe examined for harmful material or obstruction and will be cleaned as required.

### **5.0 Jointing of pipes**

1. Joints are fixed strictly in accordance with the Manufacturer's instructions.
2. Before fixing any joints, jointing surfaces are thoroughly cleaned and dried and maintained until the joints are made or assembled.
3. Pipes must be securely positioned to prevent the avoidable movement during and after the joints are made.

### **6.0 Cutting pipes**

1. PE pipe cutting will be done by an appropriate method and apparatus particular for the material and type of joint.

### **7.0 Backfilling trenches**

1. If the engineer feels that the excavated soil is unfit for backfilling, the contractor shall replace it with appropriate backfill materials.
2. To meet the required specification of testing pipe line trenches will be partially backfilled for anchorage with joints exposed.
3. It is advisable to backfill the trenches as immediate as possible after all required test have been done.

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4. No back fill materials shall be placed in trenches containing water.
  5. Trenches in roads or verges, backfill material shall be compacted in layers of 200mm thick to achieve required proctor density. Power rammers or vibrating plate compactors will be used to compact the backfilling from one metre above the crown level of the pipe to the surface.
  6. Trenches in open or fields, backfill above 500mm over the crown of pipe shall be carefully done by machine, provided material slides or rolls into position and does not drop from a height.
  7. The backfill material must not include any stones or boulders of dimensions exceeding 150mm in any direction. Type D material shall be used as indicated in the drawing.
  8. Contractor shall backfill the shallow trenches or banking any pipes wholly or partly above the level of ground at least over 500mm above the pipe crown and sown with grass.
  9. Where banking is formed proper drainage is essential to prevent surface water accumulation behind the banking.

## **8.0 Testing of pipe lines-General**

- i. The contractor shall provide water, fittings, pipe stoppers, water pumps, pressure guage and necessary labor and tools for hydraulic testing of the sewer pipe line.
- ii. Trenches must kept dry until the pipes have passed by the Engineer.
- iii. Water for all testing must be obtained from an approved source.
- iv. Contractor shall give the Engineer not less than 24 hours notice to conduct test of the section of sewer pipe line. Wherever, possible testing will be carried out manhole to manhole.

## **8.1 Testing of sewer**

### **i) Water test**

A test pressure of 1.2 metres head of water above the soffit of the sewer will be applied at the high end but not more than 6 metres at the low end by means of stand pipe. Steeply graded sewers will be tested in stages where the above maximum head will be exceeded if the whole section is tested once. A period of one hour will be allowed for absorption. The loss of water over a period of 30 minutes will be measured by adding water from a measuring vessel at a regular interval of 10 minutes and noting the quantity required to maintain the original water level in the stand pipe. The average quantity of water added for sewers up to 300mm nominal bore must not exceed .06 litre per hour per 100linear metres per mm of nominal bore of sewer. For sewers exceeding 300mm nominal bore, the average quantity of water added must not exceed 0.12 litre per hour 100 linear metres per mm of nominal bore of the sewer.

### **8.2 Sewer will be tested:**

- i. after laying the pipes but before backfilling over joints and
- ii. after backfilling has been completed.

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## 9.0 Cleaning of Sewers

- i. Immediately before being handed over to the employer every sewer line will thoroughly cleaned and flushed with clean water from manhole to manhole with water jetting system. Manhole and chambers will be washed down, emptied and left to dry.

## 10.0 Manholes

- i. Manholes will be constructed in accordance with the drawings and specifications and positions as detailed on the drawings or as directed by the Engineer.
- ii. Step irons are not required where the depth is less than 900 mm and while the depth exceeding 5 metres a ladder may be used instead of step irons. Step irons shall be hot dipped galvanized as per the required size.
- iii. Step irons shall be fixed to the walls with special type of epoxy but not with cement mortar.
- iv. Internal walls of the manholes painted with at least with two coats of bitumen painting but exclusive of benching. Cast iron cover shall also be bitumen painted.
- v. The difference in height of inlet and outlet pipe of each manhole shall be maintained at least at 75 mm for normal gradient flow.
- vi. Access or manhole covers are provided straight to the inlet or outlet of pipe for shallow manholes.