INSTALLATION OF SANITARY PIPELINE

GENERAL NOTES for SEWER

A. Gravity Sewer Pipes with Diameter less than φ300 shall be POLYVINYL CHLORIDE (PVC) as specified and to the approval of UN Habitat Engineer.

B. PVC pipes shall have a TRY AXIAL Strength not less than 2.5 Tons/m for φ300 Pipes and 1.6 Tons/m for φ200 pipes.

C. Concrete pipes shall have a TRY AXIAL Strength not less than 0.75 Tons/m for φ400 pipes and 0.60 Tons/m φ300 pipes.

D. All pipe Laying, Type of Bedding, etc… Shall be as specified and as shown on the detail drawings. UN Habitat engineer shall approve all such types of beddings in accordance with the prevailing soil condition where the pipe is to be laid.

E. The top of Manholes shall be flush with the pavement in paved areas as directed by UN habitat Engineer.

F. In Principle, Sewer Pipes are located as shown on the detailed drawings for location of utilities under roads. Final locations shall be modified to suit other existing utilities in the street as directed by UN Habitat engineer. Contractor shall detect all passing utilities and avoid crossings. Contractor shall seek to obtain all available utilities drawings from proper sources.

G. The drawings provided shall not be scaled. Exact dimensions for locations of Manholes, levels, distances, etc… For the purpose of this contract shall be as indicated on the approved construction drawings and as specified.

H. All dimensions on the drawings are in centimeters and all diameters in millimeters unless otherwise indicated.

I. Trench shall be excavated as narrow as possible especially below the line of narrow trench limit.

J. All manholes shall be fitted with medium duty manhole frame and cover with a rubber ring installed at the inner face of the frame and cover section to ensure a NON-ROCKING setting. Covers shall be hinged to Frame.

K. Unless indicated otherwise, manhole covers and frames shall be capable of withstanding a test load of 12 tons.

L. The contractor shall provide suitable opening in the inspection chamber to accommodate future house connections.

M. Details may be modified by UN habitat engineer if site conditions warrant.

N. All connections shall be completed and terminated as directed by UN Habitat engineer.

O. The Following Abbreviations are used:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>Dia. (mm)</td>
<td>Pipe Diameter in Millimeters</td>
</tr>
<tr>
<td>GRD. ELEV</td>
<td>Ground elevation in Meters</td>
</tr>
<tr>
<td>PART. DIST</td>
<td>Partial Distance in Meters</td>
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<tr>
<td>CUM. DIST</td>
<td>Cumulative Distance in Meters</td>
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<tr>
<td>I.L.</td>
<td>Invert Level in Meters (unless otherwise indicated)</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl Chloride Pipe.</td>
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<tr>
<td>MDD</td>
<td>Maximum Dry Density as determined by AASHTO standards in Labs.</td>
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P. Contractor shall provide concrete encasement for sewer pipes passing under water pipes with a clearance of less than 400mm, as specified and approved by UN habitat engineer.

Q. Support for existing utilities to be done where specified and as directed by UN Habitat engineer.

R. Benching details are shown for guidance purposes. Applicable benching shall be determined to suit each condition as directed by the engineer.

S. Dimensions and construction of manholes shall be similar to the provided drawings and details. If contractor has any other suggestion he should have UN habitat engineer approval.

T. Double flexible joint shall be used whenever pipe is connected to a sub-structure such as manhole wall, concrete encasement, etc…

U. Whenever the drawings show a sewer line connecting to an existing manhole fitted with a stub, the contractor shall remove the plug and make the connection to the approval of the engineer.
V. Prior to any construction, the contractor shall establish a new bench mark system, within the project area for setting out of all works, and obtain UN habitat engineer’s approval.

W. Markings of Pipes and Fittings
1. Each pipe shall be clearly marked at the place of manufacture with the following:
   a. Name or distinctive mark of the manufacturer.
   b. Date of manufacture.
   c. Pressure Rating.
   d. Nominal Diameter and laying length.
   e. Strength Class.

GENERAL NOTES for WATER CHANNELS

A. Concrete Sewer Box:
   1. Reinforced Concrete square shape box.
   2. Manholes are to be constructed as indicated on the drawings - It is allowed to build a masonry of hollow block manhole according to UN Habitat engineer’s recommendations.

SUBMITTALS

A. The Contractor shall submit sufficient information to UN-Habitat, in order to verify compliance with the specifications.

B. Quality Assurance QA: Method Statements
   2. The contractor shall provide method statements at least for following activities:
      a. Pipe/ Manhole Installation.
      b. Pipe Testing.

C. Shop Drawings
   The Contractor shall submit shop drawings at least for the following items:
   3. Pipeline profile together with details of all joints, manholes etc.

QUALITY CONTROL

A. Prior TO DISPATCH FROM THE FACTORY, THE Contractor shall notify UN Habitat engineer, in sufficient time to allow them to inspect and test the products.
   1. All notifications shall be made by written “Inspection Requests”.
      a. A copy should be scanned and mailed to UN-Habitat engineer; it should arrive before the day of inspection.

B. Final Inspection:
   Any product found to be fabricated from unapproved materials or incorrectly fabricated, incorrectly installed, poorly fitted or damaged, shall be rejected and removed from the works.
   1. No site repairs will be allowed, unless authorized by UN-Habitat engineer.
   2. The Contractor shall bear all costs for replacing unacceptable work.

DELIVERY, STORAGE AND HANDLING

A. Delivery, storage and handling shall be according to the manufacturer’s recommendations, along with the following provisions:
   1. Transportations, storage and handling shall at all times be performed in a manner to avoid product damage.
   2. Only nylon slings shall be used for lifting products. Steel chains, clamps or cables shall not be allowed lifting purposes.
   3. If stored outside, cover products to prevent weather degradation.
4. Any products found to be incorrectly fabricated shall be marked and set aside.
5. Any products damaged during delivery, storage or installation shall be marked by the Contractor and set aside.

EXECUTION
A. Flushing and Jetting
1. The Contractor shall clean, flush using a jetter tank all water channels, existing pipelines or any other locations related to the sewer line.
2. Contractor shall be piling all large stone and heavy rocks on the banks of the water channel (if the case exists).
3. The Contractor should dispose all solid waste/ garbage away into a proper garbage disposal plant.

B. Excavation
1. Excavation shall be done after asphalt being cut properly and as per the drawings. Warning tapes should be installed all around the construction site.
2. excavated trench should be inspected by UN habitat engineer to make sure that all dimensions are respected.

B. Bedding and Surrounding Material
1. In case, of water submerged areas, a geotextile sheet should cover the whole pipe/bedding zone.
2. Lay 150mm of selected 10mm gravel and compact the whole width except the location under the pipe. A distance of OD/3 should be kept without compaction. (OD means outer diameter).
3. Continue laying the bedding into 150mm layers, compacted except over the pipe. A distance of OD should be kept without compaction.
4. Lay the pipe.
5. Reach a distance of 150mm over the pipe crown and wrap the bedding surround with the early laid geotextile (in case of water submerged pipeline).
6. In order to fully backfill the trench, as dug material can be laid into not more than 450mm layers up to cover level.
7. Sub grade shall be placed at a -100mm below finish level, well compacted with Roller Compactor or equivalent machinery.
8. Asphalt should be placed in places where sewer is done under roads. Otherwise, if network is constructed inside a water channel a Cyclopean Concrete Slab of 100mm minimum should be casted on the cover level at a 3xOD width minimum.
9. Areas where water channel is being rehabilitated, the full line should be inspected by contractor; all leaks should be sealed and casted with proper sealant/ material.

C. Pipe laying and Manhole Installation
1. Due to differential settlements in the region of manholes and adjacent pipe zone, damage to the pipe structure might occur at this zone. To prevent this damage, additional joints on either side of the manhole shall be installed by using short pipe pieces or rocker pipes. A minimum of one flexible pipe shall be installed adjacent to each connection to manholes shall be provided.
2. Manholes should be placed correctly in place, proper care shall be taken when Manholes are transported and handled in place if not casted in place.
3. Soil under manholes shall be well compacted to prevent settlements.
4. Proper Topographic machinery shall be used to control proper alignment and gradient of installed pipeline.
5. Pipes edges shall be cleaned by a soft brush before resting on the bed.
6. Proper care shall be taken to prevent damage to the pipe’s edges.
7. Laying of pipes shall commence from the lowest point of the line.
8. Excavator buckets shall not be used to push pipes together.
9. Each successive pipe shall be kept in alignment with the previous pipe. Proper care shall be taken to maintain true alignment during pushing a new pipe into the edge of an already laid pipe for ease of installation, as well as to avoid any damage to the sealing element.
10. After cutting a pipe for construction requirements, all sharp edges shall be smoothened by means of grinding with suitable disc or any equivalent brush.
11. During pipe installation, manholes should be always closed or shut down by a wood border prior to prevent any debris penetration into the pipes.

12. After testing and finishing all installation, backfilling and asphalting (in case it exists), Ductile Iron covers for manholes shall be installed. (Covers can be installed in previous stages- proper care shall be taken while finishing the job).

13. The Contractor shall provide full detailed shop drawings including all manholes, pipelines and particular details proper for the execution and completion of works.

14. Not to mention that all site construction shall be bounded by warning tapes and to avoid all civilian activities.

D. TESTING

Testing of installed pipelines shall be performed as specified below.

A. Air Test

1. Low-Pressure air test shall be performed in accordance with ASTM 828 (If required by UN habitat engineer).

B. Water Test

1. The part of pipeline under test shall be filled with water to give an effective minimum internal water pressure of 1m at highest point and a maximum of 7m at the lowest point.

2. The pressure of 1m head of water shall be maintained for one hour to allow initial absorption of water. After that, the test pressure shall be maintained for 10 minutes and water added shall be measured. If water consumption in 10 minutes does not exceed one liter per hour per linear meter of pipe per meter of nominal internal diameter of pipe and, if there are no visible leakage through joints, the pipeline shall be deemed to have passed.