

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

**EXHIBIT 12**

**SANITARY SEWER SPECIFICATIONS**

Recommended for Approval: Paul Noran  
Paul Noran P.E., Veolia Water

Date: 8/9/06

Approved: Fred Cornaglia  
Fred Cornaglia  
Taunton Public Works Commissioner

Date: 8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

**Taunton's Requirements for New Sanitary Sewer Service**

**1. APPROVAL PROCESS**

- 1.1** The objective of the requirements for new sanitary sewer service is to assure the sewer system capacity is available and sewer system expansion including new infrastructure and service connections are properly engineered and constructed to provide long term reliable sanitary sewer service. New sanitary sewer service shall include any new or modifications to the sanitary sewer system infrastructure including service laterals
- 1.2** There are several Boards within the City including the Planning Board and the City Council that may be involved in the approval of new sanitary sewer systems. There is also the Committee under the Department of Public Works (DPW) that must approve sanitary sewer extensions. All of the Boards and Committee's will be required to get an approval by the Commissioner of Public Works for sanitary sewer system additions, modifications or changes.
- 1.3** The Commissioner of Public Works or his designee shall have an opportunity to review and approve all new sanitary sewer service. New sanitary sewer service can be provided by either new connections to existing sanitary sewers or through the construction of sanitary sewer extensions.
- 1.4** The Commissioner of Public Works or his designee shall have an opportunity to review and approve all new sanitary sewer service as follows:
- Determine the system has capacity to accommodate the new service
  - Assure the new system or service has been properly engineered
  - Assure the new system or service has been properly constructed
  - Assure the new system has had the required quality control and acceptance testing performed with satisfactory results
  - Assure the new system or service has As-Built plans
  - Assure the new system is incorporated in the City GIS system for sanitary sewers

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

- 1.5 The DPW will review the impact of any additional flow through the sanitary sewer system at the applicant's cost to ensure that the sanitary sewers and Pump Stations have sufficient safe capacity. All calculations and hydraulic evaluations shall be certified by a professional engineer in the state of Massachusetts.
- 1.6 Preliminary and Final Plan submissions for all sanitary sewer construction shall include a separate set of plans (vertical and horizontal plans) showing all ties of sanitary sewer connections, stationing of all manholes, elevations of all manholes inverts, stationing of all wyes, and a calculation of the additional flow, as well as any other information required. Plans for sanitary sewer system additions, modifications and changes must be reviewed and approved by the DPW Commissioner.
- 1.7 DPW will review the Final Plans and either approve them, amend them, or reject them and request a new submittal. The DPW Commissioner will issue a formal letter of approval or disapproval.
- 1.8 After the DPW Commissioner approves the Final Plans and specifications, the developer shall submit the name of a qualified sanitary sanitary sewer contractor whom he proposes to do the work, together with a breakdown of items, quantities and unit prices for the project. After reviewing the breakdown submitted and investigating the qualifications of the proposed contractor, the DPW Commissioner shall make the final determination whether to allow the developer to use his proposed contractor or, if this contractor is unacceptable to the City, to submit another contractor for approval. Any contractor approved by DPW will require the appropriate State and City licenses required to perform the work.
- 1.9 No work can commence of any sanitary sewer installation without the DPW Commissioner approval of the plans and the contractor.
- 1.10 DPW will oversee the inspection of the construction consisting of excavation, laying of sanitary sewer mains and street laterals, installation of manholes, backfilling to the elevation of the existing ground, camera inspection, and vacuum testing; and shall perform the flow test. The The City will have the final decision on acceptance of new sanitary sewer system assets.
- 1.11 The City shall may require more vigorous and frequent inspections at the work site, including full time inspection to assure the approved contract documents are being followed. The City will require the

**Taunton Sanitary Sewer Collection System Service Contract****Exhibit 12: Sanitary Sewer Requirements**

Applicant to pay the additional inspection fees in advance.

- 1.12 The construction and laying out of all sanitary sewer lines other than Building Drains and Building Laterals pursuant to this section shall be subject to the inspection of DPW. If at any time DPW determines that the construction of such sanitary sewer lines is not being performed in accordance with the plans and specifications as approved, he shall forthwith notify the Applicant and the DPW Commissioner to this effect in writing. The City may then order the suspension of all further work by and of payments to the contractor until such corrections are made as will produce complete compliance with the plans and specifications.
- 1.13 The City of Taunton Rules, Regulations and Ordinances shall incorporate the requirements as outlined in this document by reference to the "Taunton Requirements for New Sanitary Sewer Service" This document covers the requirements for new or expanded sanitary service within the City. The TR-16 Guides for the design of Wastewater Treatment Works (by the New England Interstate Water Pollution Control Commission), provide the general specifications for construction of sanitary sewers and represent the minimum acceptable standards and design for construction. These guidelines shall be the basis for all design plan reviews and construction inspections. Where there is a conflict between these documents, the precedence shall be in the order identified above.
- 1.14 The construction of any new wastewater pumping station shall be in accordance with general specifications identified as Exhibit A entitled Taunton Sewage Pumping Stations Specifications. A reference document for the preparation of Exhibit A was Chapter 3 "Wastewater Pumping Stations" in the TR-16 Guides for the Design of Wastewater Treatment Works (by the New England Interstate Water Pollution Control Commission, the most recent edition). The pumping station shall be constructed with instrumentation and telemetry system compatible with the current Supervisory Control and Data Acquisition (SCADA) system located at the wastewater treatment plant. Additional requirements for pumping stations is outlined in the attached Exhibit A.
- 1.15 The DPW Commissioner shall provide an acceptance letter for a new sanitary sewer system or extension as a condition of Bond release.
- 1.16 Before final approval of any sanitary sewer system, the contractor shall submit to DPW two (2) sanitary sewer as-built plans with GIS coordinates for each manhole noted. The as-built plans shall be on

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

copy-tuff and in a computer .dxf version file format, and meet the following requirements:

- a. All record plans are required to be in a uniform size of 24" by 36".
  - b. Scale for plans: Horizontal 1 inch = 40 feet, Vertical 1 inch = 4 feet.
  - c. Station figures to be shown on all manhole structures.
  - d. Distance of laterals are to be shown with depths of end of pipe at the property line.
  - e. Ties to the "Y"'s and end of laterals are to be shown from permanent structures.
  - f. Ledge and selected materials are to be shown in the profile.
  - g. Slope, size and type of pipe to be shown in profile.
  - h. All utilities encountered during construction to be shown on profile.
  - i. Sanitary sewer record plan and storm drain plans are to be drawn separately.
  - j. The record plan shall be drawn so as the north designation shall be pointing in the upper quadrant. An ID Table needs to be provided on the plans.
  - k. The X and Y coordinate shall be the Massachusetts State Plane Feet Coordinates.
  - l. The elevations shall be based on the City of Taunton's Mean High Water (MHW) data or the Massachusetts state standards for the vertical coordinates.
- 1.17** After the New Plat work is completed to its satisfaction, DPW shall review the as-built plans and GIS data submitted by the Applicant and shall accept this information only if the as-built plans and GIS data comply with and the City requirements. After this data is approved by DPW, DPW shall approve the sanitary sewer plan for the New Plat or subdivision and submit to the DPW Commissioner a Final Inspection report consisting of, but not limited to, the field data, inspection reports, test results, video tapes, one (1) set of as-built plans, and all documentation relating to the project, for the City's records. The DPW Commissioner shall forward copies of the pertinent information to Engineering and the IT Department. Veolia Water shall submit an O&M cost estimate with the final report which shall be used to modify it's Service Fee after review and approval by the DPW, effective thirty (30) days from its submission or on a date agreeable to both Veolia Water and the DPW. This information shall be submitted prior to submission of the final bill for this work unless the Applicant fails to

**Taunton Sanitary Sewer Collection System Service Contract****Exhibit 12: Sanitary Sewer Requirements**

furnish all the information required within thirty (30) days of the completion of the field work.

- 1.18** A process will be developed to assure all review, engineering, construction and acceptance testing required for new sanitary sewer service is paid for in advance of the work being performed by the City.
- 1.19** All sanitary sewer lines on public property constructed pursuant to the provisions of the preceding section shall become the property of the City when said installation is successfully tested and accepted by the City. After such sanitary sewer lines have been connected with the public sanitary sewer, all the normal costs of operating and maintaining the Sanitary sewer Mains shall be borne by the City. However, the City may backcharge the contractor for any abnormal conditions for a period of twelve (12) months after acceptance.
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- 1.20** Private sanitary sewers and sanitary sewers extending into adjacent communities which connect to the City sanitary sewer, shall be installed in conformance with the City Sanitary sewer Use Ordinance and these regulations unless otherwise approved by the DPW Commissioner.
- 1.21** No person shall make connection of roof downspouts, floor drains, sump pumps, exterior foundation drains, areaway drains, or other sources of surface runoff or groundwater to a building sanitary sewer, Building Drain, Building Lateral, or Street Lateral which in turn is connected directly to a public sanitary sewer or septage system.
- 1.22** The sanitary sewer lateral from the sanitary sewer main shall be the full ownership and maintenance responsibility of the property owner. The property owner shall be required to install, repair, replace and maintain their sewer lateral out to the sanitary sewer main. Any work on the sewer lateral must be performed by a contractor licensed by the City. The required permits to work on a sewer lateral must be obtained from the City prior to work being performed in the public right of way. One of the required permits will be the City Street opening permit requirements and specifications.
- 1.23** Any excess inflow or infiltration identified by the City from a sanitary sewer lateral must be corrected by the property owner within 90 days of notification by the City. Excess inflow and infiltration will be 500 gallons per day per inch diameter per mile of pipe.

**2. SANITARY SEWER STANDARDS**

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

**2.1 Design Flows**

The Applicant for new or expanded sanitary sewer service will provide details on the quantity and quality of sanitary sewer wastes being proposed. DPW will evaluate the quantity and quality of the proposed sanitary sewer waste to determine its acceptability and hydraulic impact on the sanitary sewer system based on data and calculations provided by the Applicant's Engineer.

**2.2 Design Guidelines**

Design guidelines for sanitary sanitary sewer collection systems and pump stations shall follow the latest edition of the TR-16 entitled "Guides for the Design of Wastewater Treatment Works" as published by the New England Interstate Pollution Control Commission. The specifications for the pump stations shall be in accordance with Exhibit A.

**2.3 Minimum Size**

No gravity sanitary sewer main shall be less than eight (8) inches (20.3 cm) diameter.

**2.2 Depth**

The minimum cover shall be four (4) feet over the crown of the pipe, except that insulation may be provided for sanitary sewers that cannot be placed at a depth sufficient to prevent freezing upon the approval of the DPW Commissioner.

**2.3 Buoyancy**

Buoyancy of sanitary sewers, manholes and structures shall be considered and flotation of the pipe, manholes and structures shall be prevented with appropriate construction where high groundwater conditions are anticipated.

**2.4 Slope**

All sanitary sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second (0.61 m/s) nor greater than 10.0 feet per second (3.05 m/s), based on Manning's formula using an "n" value of 0.013. Velocities greater than 10 fps or less than 2.0 fps (0.61 mps) when flowing full, will be unacceptable.

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

The minimum and maximum slopes for a sanitary sewer main shall be as follows:

<u>Sanitary Sewer Size</u>	<u>Minimum Per Cent (Feet per 100 foot)</u>
8 inches (203 mm)	0.40
10 inches (254 mm)	0.28
12 inches (305 mm)	0.22
14 inches (356 mm)	0.17
15 inches (381 mm)	0.15
16 inches (406 mm)	0.14
18 inches (457 mm)	0.12
21 inches (533 mm)	0.10
24 inches (610 mm)	0.08
27 inches (686 mm)	0.067
30 inches (762 mm)	0.058
36 inches (914mm)	0.046
42 inches (1067 mm)	0.037

The City will not accept flow velocities greater than 12 feet per second.

Sanitary sewers shall be laid with a uniform slope between manholes. The City shall not accept pipe deflections greater than 5%.

**2.5 Peak Flow Depths**

Sanitary sewers of a diameter from eight (8) inches (20.3 cm) through twenty-one (21) inches (53.3 cm) shall be designed so that they are flowing at a depth no greater than 0.6 times the diameter of the sanitary sewer at peak flow rates.

Sanitary sewers of a diameter larger than twenty-one (21) inches (53.3 cm) shall be designed so that they are flowing at a depth no greater than 0.7 times the diameter of the sanitary sewer at peak flow rates.

**2.6 Alignment**

All new sanitary sewer lines shall be installed with straight alignment between manholes, using a laser system for alignment and degree of slope. Each manhole floor and invert shall be within 0.01 feet of that on the approved plan.

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

**2.7 Changes in Pipe Size**

Installing a smaller sanitary sewer downstream from a larger sanitary sewer in general will be considered unacceptable.

At the juncture between a sanitary sewer and one of larger diameter, the inverts of the sanitary sewers shall be designed so that the peak flow lines match.

**2.8 Materials**

Gravity sanitary sewer pipe shall be PVC SDR 35 for gravity sewers for pipe sizes through 15" and PS 46 for pipe sizes 18" and larger, conforming to ASTM Specifications D-3034.. All pipe shall have compression joints with an elastomeric gasket type conforming to ASTM D-3212.. For certain conditions, the City may approve an alternate pipe material.

**2.10 Easement**

Any sanitary sewer main shall include a fifteen (15) foot wide easement on each side of it (a total of thirty (30) feet) to provide for maintenance, within which no permanent structures may be installed. Where an easement extends onto private property, in the event the City, or the City's designee, desires to inspect, maintain, clear, repair, replace, alter, add to or remove its sanitary sewer main, or otherwise to excavate the subject easement on private property, and/or to install a new sanitary sewer main, the City will take whatever steps are required to do so in a manner causing a minimum of inconvenience to the property owner and interference with their use of the land. However, the property owner shall make no claim against the City for any losses or damages, including without limitation, loss of business, consequential damages or losses, it may sustain by reason of any inconvenience or interference in connection therewith. Any additional expenses incurred by the City in taking such steps to cause minimum inconvenience and interference shall be reimbursed by the property owner. The City shall restore the area to the condition when the sanitary sewer main was installed; the property owner shall be responsible for any additional restoration costs.

**3. SIPHONS****3.1 Sizing**

Siphons shall have no less than two barrels with a minimum pipe size

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

of 6 inches and should be provided with necessary appurtenances for convenient flushing and maintenance.

The design shall provide for sufficient heads and pipe sizes to secure velocities of at least 3.0 feet per second (0.92 m/s) for average flows under initial conditions.

### **3.2 Manholes**

Manholes shall have adequate clearances for cleaning equipment and for inspection and flushing.

The inlet and outlet details shall be arranged so that the normal flow is diverted to one barrel and so that either barrel may be taken out of service for maintenance. Provide a hose connection to the siphon for flushing purposes.

## **4. AERIAL CROSSINGS**

### **4.1 Support**

Provide appropriate support for all joints and pipes used for aerial crossing. The supports shall withstand frost heaves as well as overturning, settlement, flooding, thermal expansion, vibrations, and other loads that may act against the piping.

### **4.2 Freeze Protection**

Provide precautions against freezing by insulation and increased slope. Provide expansion joints between above-ground and below-ground sanitary sewers. Where buried sanitary sewers change to aerial sanitary sewers, use special construction techniques to minimize damage from frost heaves.

### **4.3 Physical Protection**

For aerial stream crossings, consider the impact of flood waters and debris. The bottom of the pipe shall be now lower than the 100-year flood elevation. Ductile iron pipe with restrained mechanical joints.

## **5. PROTECTION OF WATER RESOURCES**

### **5.1 Location of Sanitary Sewers in Streams**

The top of all sanitary sewers entering or crossing streams shall be

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

sufficiently below the natural bottom of the stream bed to protect the sanitary sewer line. The following minimum cover requirements must be met:

- a. 1 foot (30.5 cm) of cover where the sanitary sewer is located in rock.
- b. 3 feet (91.4 cm) of cover in other material, except that more than 3 feet may be required in major streams.
- c. In paved stream channels, place the top of the sanitary sewer line at least 1 foot (30.5 cm) below the channel pavement.

Position sanitary sewers located along streams sufficiently outside of the stream bed to allow for stream widening in the future and for the prevention of siltation during construction.

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## **5.2 Structures**

Locate sanitary sewer manholes or other structures outside of streams whenever possible. Where structures must be located in a stream, they shall not interfere with the free discharge of flood flows.

## **5.3 Alignment**

Sanitary sewers shall cross streams perpendicular to the flow without a change in grade.

## **5.4 Materials**

Sanitary sewers entering or crossing streams shall be watertight and free from changes in alignment or grade. Joints shall be restrained in order to prevent movement from stream forces. In major streams, provide ball-and-socket or restrained joints designed for hard service applications. Provide mechanical joints with retainer glands for smaller streams.

Backfill materials shall be stone, coarse aggregate, washed gravel, or other material that will not readily erode, cause siltation, damage pipe during backfill, or corrode the pipe. On large stream crossings, place riprap over the sanitary sewer pipe to prevent erosion.

# **6 MANHOLE STANDARDS**

## **6.1 Location**

Manholes shall be installed at the end of each line; at all changes in

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

grade size, or alignment; at all intersections; and at distances not greater than three hundred (300) feet (91.4 m) or as approved by the DPW Commissioner.

## **6.2 Manhole Materials**

Manholes shall be constructed of precast reinforced concrete, ASTM Designation: C-478, latest edition; or as approved by the DPW Commissioner, and shall have O-ring or bituminous based gasketed joints. A twelve (12) inch bedding of compacted stone shall be placed underneath any manhole. The minimum internal diameter shall be 48 inches (1.2 m).

All new manhole joints and pinholes shall be parged from the outside and inside to prevent infiltration. Following which, a bituminous coating shall be installed on the exterior.

Inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible watertight connection or with another watertight connection arrangement that allows for differential settlement of the pipe and the manhole.

All inverts and tables shall be constructed with red sanitary sewer bricks. At least one row of red sanitary sewer bricks shall be installed between the manhole frame and structure to meet the finished grade. The bricks shall be well cemented below, on top, and between each other. However the inside and outside faces of the bricks shall not be covered with cement or mortar.

Ladder bars furnished for manholes and concrete chambers shall be designed in accordance with the latest requirements of ASTM C-478 of gray iron construction (minimum tensile strength of 40,000 psi) or fabricated of a minimum 3/8 inch round steel step encapsulated with copolymer polypropylene plastic. The manhole top and ladder bars shall be installed aligned for ease of entry.

## **6.3 Manhole Frame Materials**

Cast iron manhole frames and covers with thirty (30) inch diameter openings shall be used, Cat. No. L7-193 and LT-103 as manufactured by E.L. LeBaron Foundry Co. or approved equal. Materials used in the manufacture of the castings shall conform to ASTM A48 of latest revision, Class 30 or better. All frames and covers shall have machined bearing surfaces to prevent rocking and rattling. All frames and covers shall receive a factory painting of a manufacturer recommended black asphaltum or bitumastic coating which shall be

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

smooth and durable with no tendency to scale or chip off.

On each manhole two (2) complete rings of a 1/2 inch diameter approved flexible butyl rubber joint sealant shall be installed between the bottom of the frame and the top of the concrete of the manhole. At least two stainless steel 3/4 inch anchor bolts shall be installed to secure the frame to the manhole, aligned with the center line of the road to minimize rocking.

All covers shall have clearly embossed the year of construction and the word "SANITARY SEWER" in three (3) inch letters.

In areas prone to flooding, watertight covers shall be installed in paved areas and locking covers equal to Type 2 as manufactured by E.L. LeBaron Foundry Co. with three keys per cover in non-paved areas under the direction of the DPW Commissioner.

#### **6.4 Flow Drop**

Provide a minimum 0.1 foot drop through the manhole.

Provide a minimum 0.2 foot drop through the manhole where there is a change in direction of greater than 45 degrees.

Wherever sanitary sewers enter manholes such that the inlet invert of the sanitary sewer is above, but less than 2 feet above, the manhole bottom, a channeled, steel troweled concrete fillet shall be constructed to prevent the flow from splashing into the manhole.

Manhole uncontrolled internal drops shall not exceed 2.0 feet.

Manhole drops in excess of 2.0 feet must be built with a vented external-drop manhole. The outside drop connection shall be encased in concrete.

#### **6.5 Bench**

Provide a bench on each side of every manhole channel. The bench should have a slope no less than 0.5 inch per foot and no greater than 1.0 inch per foot. No street lateral, sanitary sewer main, or drop manhole pipe shall discharge onto the surface of the bench.

### **7. BUILDING DRAINS**

#### **7.1 Conformance**

The connection of the building drain into the public drainage system shall conform to the requirements of the building and plumbing code to

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

other applicable rules and regulations of the City, or the procedures set forth in appropriate specifications of the ASTM and Water Environment Federation Manual of Practice No. 9, latest edition. All such connections shall be made gastight. Any deviation from the prescribed procedures and materials must be approved by the DPW Commissioner before installation.

**7.2 Minimum Size**

The pipes for Building Drains, the lowest horizontal piping of a drainage system which receives the discharge from wastewater pipes inside the walls of the building and conveys it to the Building Lateral, shall be not less than four (4) inches in diameter, but larger sizes may be required by the DPW Commissioner.

**7.3 Depth**

Whenever possible, the Building Drain shall be brought to the building at an elevation below the basement floor.

No plumbing fixtures shall be installed where the overflow rim of the lowest plumbing fixtures are below the next upstream manhole in the public drainage system, except where:

- a) A sewage grinder pump is utilized to pump sewage to the Building Drain, upon approval of the DPW Commissioner, or
- b) A backwater valve is installed only for plumbing fixtures installed where the overflow rim of the lowest plumbing fixtures are below the next upstream manhole in the public drainage system, upon approval of the DPW Commissioner.

In either of the above cases, the City shall have no responsibility for the installation, operation, and maintenance of said equipment.

**7.4 Materials**

The Building Drain, shall begin a minimum of six (6) inches (15.2 cm) inside the foundation wall, through the foundation wall, and to five (5) feet (1.5 meters) outside the inner face of the building wall shall be four (4) inch (10.2 cm) diameter PVC, cast iron, or ductile iron pipe.

**8. SANITARY SEWER LATERALS**

**8.1 Ownership and Responsibility**

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

The sanitary sewer lateral from the customers property to the sanitary sewer main shall be the full ownership and maintenance responsibility of the property owner. The property owner shall be required to install, repair, replace and maintain their sewer lateral out to the sanitary sewer main. Any work on the sewer lateral must be performed by a contractor licensed by the City. The required permits to work on a sewer lateral must be obtained from the City prior to work being performed in the public right of way. One of the required permits will be the City Street opening permit requirements and specifications.

The DPW Commissioner shall require the Applicant at their cost to CCTV an existing clay sewer lateral that will be used to provide service to determine the condition of the exiting sewer lateral. Repair, rehabilitation or replacement of the sewer lateral shall be required prior to the tie-in being completed.

For all new or modifications for connections to the sanitary sewer lateral a cleanout at the property line shall be required to be installed by the property owner at their expense. The cleanout will be required to meet the Taunton specifications for clean outs.

**8.2 Minimum Size**

The pipes for Building Laterals and Street Laterals from the public sanitary sewer main, but never nearer to the connected building than the end of the Building Drain, shall be not less than six (6) inches (15.2 cm) in diameter, but larger sizes may be required by the DPW Commissioner.

**8.3 Depth**

Sanitary sewer service connections, Street and Building Laterals, from the public sanitary sewer to the Building Drain shall be laid at such depth and gradient and in such location as the DPW Commissioner may determine.

**8.4 Slope**

Building Lateral and Street Lateral pipes shall be laid with a minimum gradient of at least one-quarter inch per foot (2.1 cm/m).

**8.5 Alignment**

All pipe shall have compression joints. The following design standards for sanitary pipes and laterals shall be followed.

**8.6 Materials**

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

Gravity sanitary sewer pipe shall be ASTM Rigid Schedule 40 or heavier PVC Pipe for sanitary sewer use conforming to ASTM Specifications D-3034, or as approved by the DPW Commissioner. All pipe shall have compression joints with an elastomeric gasket type conforming to ASTM D-3212; or as approved by the DPW Commissioner.

**8.7 Installation**

Street and Sanitary sewer Laterals shall be laid accurately to straight lines and gradients, except that:

- a) If angles in the alignment of building sanitary sewers are unavoidable, the changes in direction or gradient shall be provided with special means for flushing and cleaning in accordance with the particular requirements of the DPW Commissioner. When completed, the inside of a sanitary sewer service connection shall be left smooth and clean.
- b) Building Laterals, from the property line to the Building Drain, shall end with a cleanout, a six (6) inch (15.2 cm) by six (6) inch (15.2 cm) by four (4) inch (10.2 cm) PVC Schedule 40 wye with a four (4) inch (10.2 cm) PVC Schedule 40 standpipe and brass threaded cover located at ground level. The outlet of the wye shall be located at the property line and shall connect to the Street Lateral.
- c) Where practical, the Street Lateral, from the Sanitary sewer Main to the Building Lateral at the Property Line, shall tie into a manhole, the hole shall be bored and patched around the Street Lateral inside and outside of the manhole to prevent infiltration and movement of pipe. The Street Laterals shall empty into inverts going with the flow of wastewater. No service connection pipe will be installed below the invert grade of the sanitary sewer structure. If the Street Lateral enters the manhole equal to the invert or equal to the table, the table shall be rebuilt to make an invert for the new service to provide a smooth flow line for the connection.
- d) Street Laterals shall otherwise enter the sanitary sewer main above the spring line, angled so that the lateral sewage enters flowing with the sewage in the sanitary sewer main. The Street Lateral shall be attached to the sanitary sewer main with a Fernco type coupling. The Street Lateral may include a 6" PVC Schedule 40 angle, not greater than 45°, to provide the proper flow alignment.

No service pipes for other utilities, such as water, gas and the like,

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

whether City owned or privately owned, shall be laid in the same trench with a building sanitary sewer, except by written approval of the DPW Commissioner.

If during inspection a Building Lateral clean out trap can not be penetrated for lateral inspection or cleaning, the property owner shall replace it with a PVC wye at their expense.

If the Building Lateral to be connected with a Street Lateral is found to extend within the limits of the City street, the Owner or his Contractor will be required to take out a street opening permit form the City.

### **8.8 Inspection**

The contractor installing the Building Lateral and Street Lateral shall make a submittal as per Section 1 above, including details of the cleanout and sanitary sewer main connection.

The applicant for the building sanitary sewer connection permit shall notify DPW when the Street Lateral is to be installed. The installation of the Street Lateral shall be made under the supervision of DPW .

The applicant for the building sanitary sewer connection permit shall notify the Plumbing Inspector when the Building Drain and Building Lateral are ready for inspection, and connection to the Street Lateral. The installation of the Building Drain and Building Lateral shall be made under the supervision of the Plumbing Inspector.

The contractor installing the Building Lateral and Street Lateral shall provide two (2) copies of as-built drawings of the installation acceptable to DPW to both DPW and the Building Inspector with dimensions to locate the cleanout.

### **8.9 Separate and Independent Building Sanitary Sewer and Drain Laterals**

No sanitary sewer service connection shall serve more than one building, except by permission of the DPW Commissioner. A separate and independent Building Lateral shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private sanitary sewer is available or can be constructed to the rear building through an adjoining alley, court, yard or driveway, the Building Lateral from the front building may be extended to the rear building and the whole considered as one Building Lateral, but the City does not and will not assume any obligation or responsibility for damage caused by or resulting from any such single connection aforementioned. The rights appurtenant to such single connection or

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

extension from a front building to a rear building shall be recorded with each of the respective deeds.

**9. PRESSURE SANITARY SEWER SYSTEMS**

**9.1 Pressure Lateral**

When a building can not be serviced by a gravity lateral to the main sanitary sewer, a pumped lateral may be installed directly to the closest manhole on the sanitary sewer main with the approval of the DPW Commissioner. In such instances, the minimum pipe size allowable for a pumped lateral shall be 1 ¼ inches and the system shall be designed for a minimum flow rate 2 feet per second. Such a system shall have minimum 70 working gallon receiving tank. The City shall have no responsibility for the operation and maintenance of said equipment, including the pressure lateral to the manhole or pressure main. Pressure laterals shall discharge to a pressure sanitary sewer main via a wye or to a manhole, but not directly into a gravity sanitary sewer main. The lateral to the main shall include a plug valve type curb stop and box as well as a flapper type check valve. The system shall be designed to limit the maximum Total Dynamic Head at any point in the system to 60 psi (138 feet) or less.

**9.2 Septic Tank Effluent Pumping (STEP)**

A property owner may install a sewage grinder pump to discharge the treated discharge from their septic tank to the Street Lateral or main sanitary sewer with the approval of the DPW Commissioner. In such instances, the minimum pipe size allowable for a pumped lateral shall be 1 1/4 inch and the pump shall meet all the requirements of Section 9.3. The City shall have no responsibility for the operation and maintenance of said equipment.

**9.3 Grinder Pumps**

Sewage grinder pumps shall have an oil filled hermetically sealed motor, hardened stainless steel cutter rotor and disc, automatic alternate direction, stainless steel fasteners, and a seal leak alarm, as approved by the DPW Commissioner. Unapproved grinder pumps will be required to be replaced with pumps approved by the DPW Commissioner at the property owner's expense. The pump and discharge piping shall be designed for a minimum flow rate of 2 feet per second in the discharge piping at diurnal peak flow periods. The grinder pump shall have a minimum pumping capacity of 9 gpm at the

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

design peak system head.

The collection tank shall be resistant to corrosion and stress cracking. The tank shall be capable of withstanding the pressure exerted by saturated soil conditions at the maximum burial depth.

The pumping system shall be equipped with visual and audio alarms to signal high water level in the collection tank. The alarms shall be detectable in the building's occupied space.

The grinder pump controls shall be mounted in an exterior weatherproof, lockable enclosure (NEMA 3R).

Electrical power supply to the grinder pump shall be capable of being switched from utility service to portable emergency generator supply in the event of an extended power outage. The connection point for the emergency power supply shall be readily accessible, located with the grinder pump exterior control box.

The grinder pump motor shall have inherent protection against running overloads or locked rotor conditions and shall incorporate an automatic reset, integral overload protector.

All electrical work shall be performed in accordance with National Electrical Code (NEC) standards and applicable state and local codes. The grinder pump core shall have a lifting eye and cable to facilitate removal.

#### **9.4 Cleanout/Flushing Connections**

A cleanout/flushing connection manhole or structure shall be placed on each lateral at the property line with an inlet valve, wye, and cleanout valve so that the line from the property to the sanitary sewer main can be isolated and pressurized from the cleanout or rodded. They shall also be installed at all terminal ends, every 1,000 feet of continuous runs, and wherever two or more mains meet and feed into another main.

#### **9.5 Pressure Sanitary sewer Main**

A pressure sanitary sewer main shall be designed to provide a velocity of 2 feet per second at the average daily flow of the installed system. All pressure laterals shall enter via a wye. All bends shall be long radius sweeps. The pipe material shall be Class 200, SDR 21 PVC or greater. The minimum size pressure/force main shall be 4 inch.

Air relieved valves shall be installed at high points. Vacuum valves shall be added as required to relieve negative pressures. All low pressure sanitary sewer system buried piping shall be marked by 3-inch wide

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

detectable tracer tape suitable for burial and detection by metal or pipe locators.

Thrust blocks shall be installed at all bends, tees and changes in direction of sufficient size to resist maximum system thrust. Surge protection shall be provided as required.

All fittings, valves, quick connects, cleanouts, air/vacuum valves and other appurtenances shall be of corrosion resistant materials and appropriate to the application according to the manufacturer's recommendations.

The low pressure sanitary sewer system shall be pressure and leakage tested in accordance with applicable AWWA C600 standards. Force mains shall be tested to at least 2 times the maximum operating pressure.

#### **9.6 Air/Vacuum Release Valves**

To release air trapped in the pressure lines, site automatic air/vacuum release valves at high points in the system and at intervals of no more than 2,000 feet along any continuous runs. Air/vacuum release valves shall be located in a manhole or structure to allow access for repair and maintenance. Also, place air/vacuum release manholes at least 14 pipe diameters downstream of the location where hydraulic jumps occur. Hydraulic "jumps" form in sections where the pipeline intersects with the hydraulic grade line. Air bubbles formed by hydraulic jump conditions are carried downstream with the wastewater flow.

Cleanout and air/vacuum manholes shall include frost-proof covers. All piping with the manholes shall be adequately supported.

## **10. INSTALLATION**

### **10.1 Trenching**

All excavation for sanitary sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the City.

Ledge rock, boulders, and large stones shall be removed, providing a minimum of 4 inches (10.2 cm) below and on each side of all pipe(s). Minimum bedding requirements for sanitary sewer pipe construction

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

shall be Class B as described in the American Society of Testing Materials standard ASTM C 12.

**10.2 Backfilling**

No backfill shall be placed against newly constructed masonry or concrete structures unless authorized by DPW. Only after the manhole structures have been inspected can the area around the manhole structure be backfilled.

All backfill shall be of suitable selected bank run or plant processed sand and gravel with a maximum sieve size of  $\frac{3}{4}$  inch material, approved by the City.

Debris, frozen material, large clods, stones, organic mater, or other unsuitable materials for backfill shall not be used.

For additional bedding and backfill details, see City Standards CR-10/S-1, that are available in the Department of Engineering.

**10.3 Compaction**

The backfill under and beside the pipe shall be compacted for pipe support evenly on both sides of the pipe in layers so that the pipe remains aligned. These layers shall be compacted to not less than 95% of maximum density according to AASHTO T180 and shall be no more than 8-inches thick after compaction.

After successful pressure tests, all sanitary sewer lines and manholes structures shall be cleaned and flushed by the contractor.

**10.4 Sanitary Sewer Flow Test**

After the contractor has cleaned and flushed the system, the City shall perform a flow test which consists of running water into the upstream manhole and inspecting the system after the water is turned off for any standing water in the manholes or pipes.

**10.5 Street Repairs**

All repairs to City streets shall be in accordance with the most recent revision of the City of Taunton Specifications for Utility Company Repairs to City Streets.

**11. INTERNAL INSPECTION/TESTING OF SANITRAY SEWERS**

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

**11.1 Sanitary Sewer Main Camera Inspection**

After the sanitary sewer manhole structures and sanitary sewer pipes are installed, but before the manhole inverts are installed, the contractor will camera inspect and video tape the sanitary sewer main lines to the satisfaction of DPW who shall be present for the entire period to verify that there are no discrepancies in the pipes.

**11.2 Sanitary Sewer Main Leakage Testing**

After the camera inspection is completed, the contractor shall air pressure test the sanitary sewer mains and laterals with the DPW inspector present to approve the test. Leakage tests shall include water or low pressure air testing. The leakage exfiltration or infiltration shall not exceed 100 gallons per inch of pipe diameter per mile per day. The test shall be conducted with a minimum positive head of 2 feet.

The low pressure air test will have a starting pressure of four (4) psi. The allowed pressure drop during the test will be 0.5 psi. The time for the test will vary depending on the size and length of pipe being tested. The contractor must explicitly identify what repairs or modifications he makes, at his expense, to the inspector.

**11.3 Service Laterals (Connections)**

Service Laterals (Connections) to the sewer main shall be watertight and not protrude into the sewer. All materials used for the service laterals (connections) shall be compatible with the other materials to be joined. All sewer laterals shall have a cleanout at the property line meeting the technical requirements of the DPW.

**11.4 Manhole Camera Inspection**

All manhole structures shall be inspected by DPW and video taped after the inverts are installed for proper installation of brickwork and proper angles of inverts.

**11.5 Manhole Inspection and Testing**

Once the manhole structures are completed, the contractor shall conduct a manhole air vacuum test, with the City present to approve the test. The vacuum test will consist of ten (10) inches of mercury for three (3) minutes or a longer amount of time if the inspector deems necessary. The vacuum pressure shall not drop more than 1 inch of mercury for the manhole to pass the test. The contractor must

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

explicitly identify what repairs or modifications he makes, at his expense, to the Inspector.

## **12. PROTECTION OF WATER SUPPLIES**

### **12.1 Relation to Water Structures**

Sanitary sewers shall be located far away from public water supply wells or other potable water supply sources and structures. Engineer plans shall show all existing waterworks units, such as basins, wells, or other treatment units that are within 200 feet of the proposed sanitary sewer.

### **12.2 Relation to Water Mains**

Whenever possible, lay out sanitary sewers at least 10 feet from any existing or proposed water main. A sanitary sewer may be installed closer than 10 feet to a water main provide that it is laid out in a separate trench with the crown of the sanitary sewer at least 18 inches (46 cm) below the invert of the water main. Exceptions require the approval of the DPW Commissioner.

Whenever sanitary sewers must cross water mains, lay out the sanitary sewer so that the top of the sanitary sewer is at least 18 inches (46 cm) below the bottom of the water main. The sanitary sewer joints shall be equidistant and located as far away as possible from the water main joints. When the sanitary sewer can not meet the above requirements, relocate the water main to provide for this separation or reconstruct it with mechanical-joint pipe for a distance of 10 feet on each side of the sanitary sewer. One full-length water main should be centered over the sanitary sewer so that both joints will be as far from the sanitary sewer as possible. Where a water main crosses under a sanitary sewer, adequate structural support should be provided for the sanitary sewer to maintain line and grade.

When it is impossible to achieve horizontal and/or vertical separation as stipulate above, both the water main and the sanitary sewer shall be constructed of mechanical-joint cement-lined ductile iron pipe or another equivalent that is watertight and structurally sound. Both pipes shall be pressure tested to 150 psi to ensure they are watertight.

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

**EXHIBIT A-TAUNTON SEWAGE PUMPING STATION SPECIFICATIONS**

**TAUNTON, MASSACHUSETTS**

**1.01 GENERAL**

The specifications for sewage pump stations will follow the guidelines set forth in Chapter 3 Wastewater Pumping Stations as outlined in TR-16 as published by the New England Interstate Water Pollution Control Commission.

**1.02 DESIGN**

Wastewater pumping station shall handle peak flows for the present and within the planning period as outlined in the Comprehensive Wastewater Management Plan for the geographic area to be served by the proposed pumping station.

The pump station shall be accessible by vehicles and personnel in all weather conditions. Wastewater pumping stations shall be protected from flooding the 100 year storm event.

Pump stations shall be designed to architecturally fit within the area. Noise, security odor control and landscaping shall be provided.

Prior to initiating detailed engineering design for a new or expanded pump station, a basis of design shall be prepared by the engineer and submitted to the DPW for approval.

**1.03 PUMPING SYSTEM – GENERAL**

- A. Normally sewage lift stations shall be either wet well/dry well, submersible or suction lift. The wet well/dry well would be for the larger deeper pump stations. The determination as to the type of pump station will be based on the application and determined by City Department of Public Works Commissioner (DPW).
  
- B. The Developer will furnish and install a complete automatic pumping system for the Pump Station. The principal equipment included in the pumping system shall include two non-clog pumps, valves, electrical and mechanical facilities, and related appurtenances. Discharge flow equipment shall be located in a separate chamber and will include piping, valves, check valves, gauges etc.  
A separate control panel and pedestal, will house motor controls and the liquid level control system. All pump station facilities shall be located in either a vault or a structure. This will include the generator and the motor control center.

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

C. The pump station will be provided with telemetry and instrumentation as necessary to communicate pertinent pumping and alarm data to the Taunton WWTP SCADA system. The SCADA system provided shall be compatible to and coordinated with the Taunton WWTP. The Taunton WWTP must approve the equipment and contractor. Pertinent data and information from the SCADA system will be as follows:

- ✓ High water in the wetwell
- ✓ Low water in the wetwell
- ✓ Loss of one or more phases in the electric power or a power failure
- ✓ Generator running indication
- ✓ High water level in the pump room sump
- ✓ Loss of the alarm transmission
- ✓ Loss of air pressure in the bubbler tube system/level sensing trouble or failure
- ✓ Standby power failure or pump malfunction
- ✓ Intrusion on all doors and hatches
- ✓ Flow for the larger pump stations

D. The finished pump station shall be subject to a 30-day trial period before station acceptance by the City of Taunton. All costs associated with this trial period shall be at no cost to the City of Taunton. City of Taunton WWTP personnel will be allowed access to the station at anytime during the trial period for monitoring and station reliability checks. After acceptance by the City, a one year unconditional warranty would be provided by the Contractor.

E. Prior to the 30-day trial period, the developer shall provide 2 complete sets of comprehensive written Operation & Maintenance manuals to Taunton WWTP.

F. The station will be provided with an independent engine generator sized to adequately power peak flow under power failure conditions for a period of 24 hours.

#### 1.04 SUBMERSIBLE PUMPS

A. The most common pumping stations will be submersible. Details for submersible stations are provided herein.

B. The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two Stainless Steel guide rails extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined watertight connection.

- C. Major pump components shall be of gray cast iron, ASTM A-48, Class35B, with smooth surfaces devoid of blowholes or other irregularities. All exposed nuts or bolts shall be AISI type 316 stainless steel construction. All fasteners shall be coated with an Anti-Seize compound during construction. All metal surfaces coming into contact with the pumpage shall be protected by spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings or gaskets. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
- D. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of the sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal.
- D. The pump motor shall be induction type with a squirrel cage rotor, shell type design housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with a moisture resistant Class F insulation rated for 311° F. The stator shall be dipped and baked three times in Class F varnish and shall be heat shrink fitted into the stator housing. The motor shall be designed for continuous duty handling pumped media of 104 ° F and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 260 ° F shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with a threaded compression type binding posts permanently affixed to a terminal board. The motor shall have a voltage tolerance of plus or minus 10%.
- E. The motor shall be designed for operation up to 104° F ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided showing the curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no load characteristics. The motor horsepower shall be

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

adequate so that the pump is non- overloading throughout the entire pump performance curve from shut-off through run-out.

- F. The pump shaft shall rotate on Roller and /or Ball type bearings. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two angular contact bearing to compensate for axial thrust and radial forces.
- G. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating solid tungsten carbide ring. The upper, secondary seal unit located between the lubricant chamber and the motor housing, shall contain one stationary solid tungsten carbide seal ring and one positively driven rotating solid tungsten carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. All stationary and rotating seal faces shall be constructed of solid tungsten carbide to facilitate re-lapping. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely on the pumped media for lubrication.
- H. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Coupling shall not be acceptable. The pump shaft shall be AISI431 stainless steel.
- I. The impeller can be of gray cast iron, Class 35B, dynamically balanced, non-clogging design having a long throughlet without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater.
- J. A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.
- K. Pump motors shall have cooling characteristics suitable to permit continuous operation in a totally, partially, or non-submerged condition. The pump and motor shall be capable of

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

running without damage for extended periods. Pump and motor shall be explosion proof, suitable for Class 1, Division 1, Group C or D applications.

- L. A leakage sensor shall be available to detect water in the stator chamber. The Float Leakage Sensor (FLS) switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and / or remote.

**1.05 SERVICE REQUIREMENTS DURING STARTUP OR WARRANTY PERIOD**

- A. The pump manufacturer and /or supplier must be able to respond to a service call within 4 hours on every day of the year.
- B. The pump manufacturer and/ or supplier must be able to provide a rental or replacement back up pump within 8 hours of a service call on every day of the year.
- C. The pump manufacturer and/ or supplier must have all replacement parts available within 8 hours of a service call on every day of the year.
- D. The pump manufacturer shall provide station start up training at no charge to the City of Taunton.

**1.06 MIX FLUSH VALVE**

- A. One pump shall be provided with one Mix Flush Valve System suitable for Class 1, Division 1, Group C and D installations. The valve will mix the wastewater automatically. The valve is to be mounted directly on one pump volute to direct part of the pumped discharge to flush solids into suspension at the start of each pumping cycle. The valve shall be positioned on the pump volute to provide a non-clogging operation. The valve shall be open at the beginning of each pumping cycle producing a jet flow, with a minimum pressure of 15 psi and close under full pump discharge after a predetermined time. The valve shall be operated by the liquid being pumped through a self-contained hydraulic system. A means of adjustment should be provided to achieve a 30-second flushing period for different flow and load conditions.

**1.07 CONTROL PANEL - GENERAL**

- A. A pump station control panel shall be provided for the pump station. The control panel shall respond to a level measuring device to automatically start and stop the pump station as well as sound an alarm upon high \ low wet well levels. Pump station controls including telemetry and generators will be installed in a weatherproof structure.

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

- B. The pump control panel shall be the standard system of the manufacturer as modified for this application. Any control panel must be approved by personnel of the Taunton WWTP

#### 1.08 OPERATION REQUIREMENTS

- A. The control panel shall consist of a main and emergency circuit breaker, a motor circuit protector, and a magnetic starter for each pump motor, and circuit breakers as required. All pump operations shall be accomplished by a level measuring device with all control components mounted in one common enclosure. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assemble shall provide for means to manually select or automatically alternate the position of the "lead" and "lag" pump after each pumping cycle.

#### 1.09 LEVEL CONTROL SYSTEM

- A. The preferred level control system shall be a conductivity measuring device, comprising a multi-sensored probe in conjunction with a Programmable Logic Controller. The system shall operate using extra low voltage as a method of determining liquid level. The level is sensed when the electrical conductivity of the liquid allows a small current to flow, which activates the controller.
- B. The exposed surfaces of the conductivity probe shall be constructed from premium quality uPVC extruded tube and Avesta 254 SMO high-grade stainless alloy. Sensor points of Avesta 254 SMO are to be spaced equally along the length of the probe assembly with the corresponding, individually numbered control cables accessible in the attached flexible multi-colored support cable. The flexible probe cable shall be capable of carrying the weight of the probe without the need for additional support and shall be sealed and secured to the tip of the probe by a synthetic rubber compression fitting. The probe shall be pressure injected with an epoxy resin encapsulate to form a rigid homogenous unit.
- C. The level sensing probe length shall be as determined by the engineer, as appropriate, but in any case not to exceed 2.5 meters overall length. The probe shall be suspended, using a stainless steel hook from a stainless steel mounting bracket and cleaning squeegee, secured with stainless steel type 318 fasteners and positioned at an appropriate place at the top of the wet well. This shall be done in accordance with the manufacturer installation instructions.

**Taunton Sanitary Sewer Collection System Service Contract****Exhibit 12: Sanitary Sewer Requirements**

- D. The probe cable shall be routed from the wet well to the control panel via a separate dedicated conduit. For ease of selection of the pump duty (on and off) levels and high (or low) level alarm setpoint, each of the 10 probe input wires shall be terminated at a terminal strip inside the control panel.
- E. **Programmable Logic Controller:** The panel mounted pump controller shall operate in conjunction with the multi-sensored probe by providing extra low voltage AC (12 VAC, 0.8mA max) via the numbered probe cables. It shall be capable of controlling and monitoring 2 pumps and alarms by activating the pump starters and alarm devices. The controller shall incorporate front panel LED indicator lamps that give readouts of cycle and setting status, as well as keypad switches to control the operation, tests the alarm..
- F. **LED Indication:** The controller face shall include LED indicators to display the following:
- Pump run
  - Manual / Off / Automatic
  - Next Pump
  - High (or Low) Level Alarm
  - Alarm Status (Latch of Automatic reset)
- G. **Key Pad:** The keypad shall include membrane type keys to operate or control the following functions:
- Manual / Off / Automatic selection
  - Time-delay (15 second) actuation of pump control
  - Level alarm reset and alarm latch-off-auto selection
  - Alternation (duty mode selector)
- H. **Dipswitches** will be provided to select the following program functions:
- Charge or discharge modes
  - High / Low level alarm choice
  - Sensitivity settings: 1K-,4K-,20K-, or 80K-ohm
- I. The pump controller shall accept inputs from the conductivity probe. Connection shall be simplified by the marrying of numbered probe cables (1-10, as terminated at a distinct terminal strip inside the control panel) to the appropriate terminals on the rear of the Programmable Logic Controller.
- J. The pump controller shall provide volt-free (dry contact) relay outputs for the following:

**Taunton Sanitary Sewer Collection System Service Contract  
Exhibit 12: Sanitary Sewer Requirements**

Pump 1 – change over contacts (SPDT)  
Pump2 – change over contacts (SPDT)  
High and Low level alarm (flash and constant) (SPDT)

#### 1.10 ACCESS HATCHES

- A. All station access hatches shall be FDRN-6 Light duty (300PSF)-access hatch.
- B. Material shall be 6061-T6 aluminum for bars, angles and extrusions. Unit shall be designed for a minimum live load of 300 lbs. / sq. ft. . Deflection shall not exceed 1/150<sup>th</sup> of the span.
- C. Each door shall be equipped with an aluminum hold open arm. Door shall lock open in the 90° position. Each hold open arm shall have a red vinyl grip handle. Hold open arm shall be fastened to the frame with a ½- inch grade 316 stainless steel bolt.
- D. Channel frame shall be of extruded aluminum, with a continuous 1 ¼ inch anchor flange. Channel frame shall be a minimum of ¼ inch thick, with a minimum cross section of 7 ½ inches.
- E. The FDRN style hatch shall be supplied with a 1-½ inch threaded drain coupler on the underside of the channel frame for pipe connection.
- F. Hinges shall be of heavy-duty design. Material shall be a brass alloy with a 65,000-psi tensile strength. Each hinge shall have a 3/8-inch grade 316 stainless steel pin. Hinges shall be bolted to the angle frame and diamond plate, with 316 stainless steel bolts and ny-lock nuts.
- G. Hatch shall be furnished with an exposed padlock clip and an aluminum lift handle. The lift handle shall be flush with the top of the ¼ inch diamond plate.
- H. The hatch shall be provided with a hinged aluminum “Safe Hatch” designed to combine covering of the opening per OSHA Standard 1910.23 and shall include fall through protection and controlled confined space entry. Safety grates shall be made of 6061-T6 aluminum with a minimum ultimate strength of 38,000 psi and minimum yield strength of 35,000psi, as per ASTM B221. Grate design shall use safety factors as defined in the Specifications for Aluminum Structures, by the Aluminum Association, Inc. 5<sup>th</sup> Edition, December 1986 for Bridge Type Structures.

8/9/06

**Taunton Sanitary Sewer Collection System Service Contract**

**Exhibit 12: Sanitary Sewer Requirements**

- I. Aluminum grating shall be designed to withstand a minimum live load of 300 pounds per square foot. Deflection shall not exceed 1/150 th of the span. Grate opening shall be 5inch X 5 inch, which will allow for visual inspection of the pit and float adjustment once the hatch is open.
  
- J. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90° position once opened. Design of the system must assure fall protection is in place after the hatch door is closed, thereby protecting the next station attendant.
  
- K. Each grate shall have an opening arm with a red vinyl grip handle, which will allow opening of the grate, while providing the grate as a barrier between the operator and the pit. The grating system will allow any attendant to make visual inspection without entering the confined space.
  
- L. Grating shall be painted with OSHA type safety orange paint.
  
- M. All welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.

**1.11 Field Testing and Acceptance**

The Contractor shall be required to prepare a detailed plan for acceptance testing of a new pumping station. The plan shall be approved by DPW prior to the scheduling of a field acceptance test. The City will approve the time and date for scheduling the field acceptance test. The City shall be provided the O&M Manuals prior to the field acceptance testing.