

**BUFFALO SEWER AUTHORITY  
CAPITAL PROJECTS PROGRAM  
QUEEN CITY CLEAN WATERS - EDISON MARTHA OLS**

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## SECTION 46 46 13

### TIPPING SEDIMENT FLUSHING TANKS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install tipping sediment flushing tanks (TSFTs) in the buried combined sewer storage tank including: TSFTs, flushing tank fill system, supports and anchors, and appurtenances necessary for a complete installation.
- B. Coordination:
1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the tipping sediment flushing tanks .
  2. Notify other contractors in advance of the installation of the tipping sediment flushing tanks to provide other contractors with sufficient time for the installation of items included in their contracts that must be installed with, or before, tipping sediment flushing tanks.
- C. Related Sections:
1. Section 40 67 17, Process Control Panels and Enclosures.

##### 1.2 REFERENCES

- A. -Abbreviations and Acronyms:
1. PLC: Programmable Logic Controller.
  2. OIT: Operator Interface Terminal.
  3. TSFT: Tipping sediment flushing tank.

##### 1.3 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturers: A minimum of 10 years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for a minimum of five years.
- B. Component Supply and Compatibility:
1. Obtain all equipment included in this Section regardless of the component manufacturer from a single tipping sediment flushing tank manufacturer.
  2. Require the tipping sediment flushing tank manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.

3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the tipping sediment flushing tank manufacturer.

#### 1.4 SUBMITTALS

- A. Action Submittals: Submit for approval, the following:
  1. Shop Drawings:
    - a. Detailed structural, mechanical drawings showing the component fabrications and the interfaces with other components. Include dimensions, size, and location of connections to Work under other Sections.
    - b. Manufacturer's literature, illustrations, specifications identification of materials of construction, rated capacities, dimensions of individual components, profiles and finishes.
    - c. Make, model, weight and horsepower of each component.
    - d. Performance data for each component, including capacity.
    - e. External utility requirements such as water and drainage for each component.
    - f. Functional description of internal and external instrumentation and controls to be supplied including list of parameters monitored, controlled, or alarmed.
    - g. Power and control wiring diagrams including terminals and numbers.
  2. Delegated Design Submittals: Provide Project-specific information as required and as necessary to clearly show calculations, dimensions, logic and assumptions, and referenced standards and codes on which design is based.
    - a. Submit design calculations for each TSFT system including, but not limited to, the following:
      - 1) The calculated freeboard available at the moment the unit begins to tip.
      - 2) Provide the distance from the centerline of the unit to the back wall, as well as the predicted trajectory of the flush water.
      - 3) Provide calculations for the determination of both the static and dynamic loading at the supports.
  3. Testing Plans, Procedures and Testing Limitations.
- B. Informational Submittals: Submit for acceptance, the following:
  1. Qualifications Data: as specified in Paragraph 1.3.A. for:
    - a. Manufacturer.
  2. Manufacturer's Instructions:
    - a. Installation data: setting drawings, templates and directions for installation of anchor bolts and other anchorages.
    - b. Instructions for handling, start-up, and trouble shooting.
  3. Source Quality Control Submittals:
    - a. Test and Evaluation Reports.

4. Field Quality Control Submittals.
    - a. Test and Evaluation Reports.
    - b. Certificates: Submit certificate of proper installation.
    - c. Manufacturer Reports.
  5. Special Procedure Submittals:
    - a. Testing Plans, Procedures and Testing Limitations.
    - b. Routine maintenance prior to start-up.
- C. Closeout Submittals: Submit for acceptance, the following:
1. Operation and Maintenance Data: in accordance with Section 01 78 23, Operations and Maintenance Data.
  2. Warranty Documentation: in accordance with Section 01 78 36, Warranties, and Article 1.7 of this Section.
  3. Record Documentation: in accordance with Section 01 78 39, Project Record Documents.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements: Comply with the requirements of Section 01 65 00, Product Delivery Requirements and the following:
1. Take precautions to prevent damage to the tipping sediment flushing tanks during transportation and delivery to the Site. Take extreme care in loading and unloading the equipment and accessories. Deliver in undamaged condition in manufacturer's unopened containers or packaging, dry with identifying labels intact and legible.
  2. Arrange deliveries of products with proper sequencing and scheduling in accordance with the approved Construction Schedule. Allow time for inspection prior to installation.
- B. Storage and Handling Requirements: Comply with the requirements of Section 01 66 00, Product Storage and Handling Requirements and the following:
1. Store all products in strict accordance with the manufacturer's recommendations as approved by the ENGINEER with all labels and seals intact and legible.
  2. Provide off-site storage and protection when conditions on Site does not permit on-site storage or protection.
  3. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.
  4. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- C. If, in the process of delivery, storage or handling, any products are damaged, replace or repair such products to as new condition. All repairs shall be made by the manufacturer or manufacturer's representative at no additional cost to the OWNER.

## 1.6 SITE CONDITIONS

- A. Environmental Requirements:
  - 1. The TSFTs and their proximity switches will be installed within a combined sewage holding tank which will be considered a confined space as well as a NEC Class 1, Div.1, Group D classified area.
    - a. All equipment and appurtenances to be installed within the tank should be suitable for the noted environment.
    - b. All precautions required for confined space entry shall be taken when installing the equipment or entering the tank for any reason. See Section 01 41 28, Confined Space Entry Permit, for detailed requirements.

## 1.7 WARRANTY

- A. General Warranty: The special [warranty/warranties] specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special [warranty/warranties].
- B. Special Warranty on Tipping Sedimentation Flushing Tank design and/or manufacturing defects:
  - 1. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, or at option of OWNER, remove or replace materials or equipment specified in this Section found to be defective during a period of two years after the date of Substantial Completion except as noted below:
    - a. Each tipping sedimentation flushing tank system (the support system complete with bearings and anchoring and the tipping tank) shall be guaranteed against manufacturing and design defects for a period of two (2) years from the date of Substantial Completion or three years from the date of installation, whichever is less.
    - b. Any and all electrical or electronic components shall be guaranteed for a period of one year from the date of Substantial Completion or two years from the date of installation, whichever is less.
    - c. The manufacturer warrants that the flushing system will effectively remove the sediments deposited on the basin floor using only a single flush, under "normal" loading conditions, which is defined as 2-inch deposition across the entire tank floor. If the deposition across the entire tank floor is in excess of 2-inches, a second flush may be required.

## 1.8 MAINTENANCE

- A. Extra Materials:
  - 1. Spare Parts: Furnish, tag and box for shipment and long term storage the following spare parts:
    - a. Two sets of 316 Stainless Steel bearings for each size bucket provided.

2. Extra Stock Materials: Furnish, tag and box for shipment and long term storage the following extra stock materials:
  - a. Sufficient lubricants for two years operation at the manufacturer's recommended lubrication interval.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT PERFORMANCE

- A. Equipment Description: The system shall consist of 15 stainless steel TSFTs located along the upstream side of the storage tank at the height indicated on the Drawings and supported on sidewall supports. Each TSFT shall consist of a stainless steel tank having a flushing length of 19'-3" for a flushway width of 20'-9" balanced on an axis such that when each tank is empty, the tank will remain in an upright position in which it can be filled from above with water until it reaches a predetermined fill level at which the center of gravity of the filled tank will cause the tank to tip, pivoting around the axis point, spilling its contents towards and down the upstream wall of the tank. The subsequent velocity wave of water created when each tank tips shall wash the debris and settled materials deposited along the upstream wall and floor of the storage tank to a sump and discharge channel at the other side of the tank. Once each tank has discharged its contents it shall return automatically to its stable upright position using only the force of gravity.
- B. Design Criteria: Each TSFT shall hold a minimum of 125 gallons of water per linear foot of length for a minimum total volume of 2,400 gallons. The TSFT support system shall be designed to withstand both the static and dynamic loads imposed on them Under normal operation and installation conditions.
- C. Performance Criteria: TSFTs shall be designed to clean up to 2-inches of sediment and debris covering the entire floor of the tank in each flushing lane with a single tip of the tank.

### 2.2 MANUFACTURERS

- A. Manufacturer: Provide product of one of the following:
  1. Gabriel Novac & Associates, Inc.
  2. Grande Water Management Systems, Inc.
  3. Veolia.
  4. Or equal.

### 2.3 EQUIPMENT

- A. The TSFTs shall be fabricated entirely of 316L stainless steel. The minimum plate thickness shall be 1/8-inch. Provide weep holes at the bottom to allow for draining of any excess water remaining after flushing is complete.

- B. Bearings: The bearings shall consist of permanently lubricated tapered spherical double roller bearings with locking sleeve in a split housing equipped with an end cap and double lip seal or equivalent. The bearings shall be factory installed and tested and shall be lubricated with waterproof grease. The bearing housing material shall be 316 stainless steel.
- C. Supports: The supports shall be fabricated from same material as the TSFTs and be anchored to the top of the support walls using embedded threaded rod type anchors. The rod type anchors shall be type 316 stainless steel and be installed into the concrete support structure using a chemical anchoring system approved by the TSFT equipment manufacturer.
- D. TSFT Filling System:
  - 1. Each TSFT shall have a dedicated 2-inch diameter fill line connected to a master fill manifold which will be located in the Utility Building. The master fill manifold will be connected to the potable water source which will be protected by a reduced pressure backflow preventor. The master fill manifold will consist of a main piping header which feeds the series of fill lines, one for each TSFT, piped in parallel to each other and each having a solenoid controlled ball valve where the fill pipe meets the main piping header. Each solenoid controlled ball valve will be controlled through the control panel to open and let water flow to that particular TSFT when it is time for that particular flushway to be flushed. Each solenoid controlled ball valve will in turn will receive a signal from the control panel to close once the FSTF has tipped and triggered the associated proximity switch to indicate that that particular flushway has flushed.

## 2.4 ACCESSORIES

- A. Non-contact Position Switches: shall be waterproof proximity switches. These switches shall be mounted directly to the wall support so that they can be adjusted or replaced from below without the need to remove the automatic tipping buckets. Proximity switches shall be:
  - 1. Wired through an intrinsically safe relay in order to meet both waterproof and explosion proof condition.
    - a. Do not wire switches directly to a power source to avoid damage.
  - 2. Suitable for submergence, meeting IP68 requirements.
  - 3. Contact Rating: Suitable for low current, low voltage duty.
  - 4. Proximity switches shall be installed on shock proof mounts incorporated into the wall support.
  - 5. Arrange such that proximity switch contact closes for approximately one (1) second when the automatic tipping bucket is tipped under normal (non-submerged) operating conditions.
  - 6. Manufacturer: Provide product of one of the following:
    - a. PEPPERL+FUCHS, model NJ15-30GK-N.
    - b. Or equal.

## 2.5 FABRICATION AND MANUFACTURE

- A. TSFTs shall be fabricated using continuous TIG or MIG welding.

## 2.6 CONTROLS

- A. The flushing system shall be controlled by the Main Tank PLC Control Panel to be located in the Utility Building. See Section 40 67 17, Process Control Panels and Enclosures, and Drawings for details.
- B. The control panel will be designed so that the flushing operation can be carried out locally by an operator using the push buttons located on the local PLC control panel OIT when the system is in the “LOCAL” mode by pushing a “FLUSH TSFT-X” button or the complete flushing sequence may be initiated by pushing the appropriate button. In the “REMOTE” mode the system will wait for remote signals to control the flushing operation.
  - 1. The PLC will also be programmed to monitor the tank level instruments to determine when the tank has been placed in use, requires dewatering and flushing, and to control the automated slide gates allowing flow into or out of the storage tank as well as individual cells.
- C. The basic flushing sequence is described below:
  - 1. The PLC shall be used to control the flushing sequence after the storage tank and outlet sump have been emptied.
  - 2. All flushways in the affected cells shall be flushed after each use.
    - a. Level instruments in each cell will be used to determine if a cell was active during the preceding event. If the level reading indicated that there was water in the cell during the preceding event then the cell will be considered “affected”
  - 3. When the tank has been emptied, the TSFT farthest from the outlet in the affected cells will be filled with flush water by sending a signal to open the electrically operated ball valve corresponding to that TSFT. When the TSFT is full and tips, it activates its respective proximity switch. The proximity switch signal is used to close the first solenoid valve.
  - 4. After a preset time delay and upon the level measurement reaching a certain level in the outlet sump (empty) to insure that it is drained and can adequately accommodate the flush water and settled solids from the next flush, the valve to fill the next farthest affected cell shall be energized. This process is repeated in order from farthest to nearest from the outlet until all TSFTs in the affected cells have operated.
  - 5. After the last tipping bucket is operated and the Tank sump is drained the system shall return to stand-by mode and waits for the next signal.
  - 6. The PLC will also have an internal adjustable timer that will be used to determine if a malfunction occurs during the flushing sequence. The timer will be set so that the flush water supply valve operation can be monitored.



## 2.7 SOURCE QUALITY CONTROL

- A. Tests:
  - 1. Each TSFT shall be factory assembled, balanced and tested. The ENGINEER shall have access and ample notice (minimum of two weeks) to witness these procedures at their discretion.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Verification of Conditions:
  - 1. CONTRACTOR and its applicator shall examine the areas and conditions under which the TSFT Work is to be performed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the TSFT Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

### 3.2 INSTALLATION

- A. Install equipment in accordance with the manufacturer's recommendations.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and adjust the equipment to assure that the system operates to the OWNER'S satisfaction.
- B. Field Tests:
  - 1. After CONTRACTOR and ENGINEER have mutually agreed that the equipment installation is complete CONTRACTOR and a qualified field service representative of the manufacturer shall conduct a running test and a torque test in the presence of ENGINEER to demonstrate that the mechanism and its controls will function correctly and that it is structurally sound.
  - 2. Running Tests:
    - a. All TSFTs together with their controls shall be field tested. Tests shall demonstrate to ENGINEER that each part and all parts together function in the manner intended. All necessary testing equipment, materials and manpower shall be provided by CONTRACTOR.
  - 3. In the event that the CONTRACTOR is unable to demonstrate that equipment meets the requirements of the tests, CONTRACTOR shall adjust, modify and retest the equipment as often as necessary in order to meet the specified requirements.

- C. Manufacturer's Services:
  - 1. Manufacturer's Services: Furnish services of a qualified factory-trained serviceman for installation supervision, start-up and test services and operation and maintenance personnel training services.
  - 2. Serviceman shall make not less than two visits to the Site. The first visit shall be for a period of not less than two 8-hour days to assist in the installation of the equipment. The second visit shall be for a period of not less than two 8-hour days to check the completed installation, to perform the field tests, and to instruct plant operators in the proper care, operation and maintenance of the equipment.
    - a. Serviceman shall revisit the Site as often as necessary until installation is acceptable.
  - 3. All costs including expenses for travel, lodging, meals and incidentals and cost of travel time, for visits to Site shall be included in the Contract Price.

### 3.4 SYSTEM STARTUP

- A. Comply with applicable requirements of Section 01 75 11, Checkout and Startup Procedures, and the following:
  - 1. Manufacturer's representative shall inspect the installation prior to start-up of the equipment and certify that the installation is proper and equipment is ready for start-up.

### 3.5 ADJUSTING

- A. Make all necessary adjustments to equipment to provide complete and satisfactory operation upon completion of the installation.

### 3.6 CLOSEOUT ACTIVITIES

- A. Training: Provide training for OWNER's personnel in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel, and the following:
  - 1. After equipment is fully operational, and before OWNER will assume responsibility for the operation of the equipment, the Manufacturer's representative shall instruct the OWNER's operation and maintenance personnel in the proper care, maintenance and operation of the equipment.
    - a. Training shall occur prior to the start of the Demonstration Period.
  - 2. All instruction courses may be video-taped by OWNER at OWNER's expense.
- B. Demonstration Period:
  - 1. In order to achieve substantial completion, all process equipment and associated systems including but not limited to TSFTs, TSFT fill system, TSFT control and monitoring system including: TSFT proximity switches, OLS level sensors and transmitters, automated slide gates and PLC control panel, shall be run in automatic mode for a period of not less than 30 days to demonstrate that the system is functioning properly and has achieved reliable operation.

2. All process equipment and associated equipment shall be placed into service in automatic mode throughout thirty (30) day demonstration period. Process equipment and associated equipment shall run continuously during intervals determined by the automatic control scheme without significant interruption throughout the thirty (30) day demonstration period.
3. Any significant interruption in the operation of the systems as determined by the ENGINEER will require the demonstration period, then in progress, to be stopped and started over from the beginning after corrections are made. Significant interruption may include any of the following events:
  - a. Failure of any critical equipment unit, system, or subsystem.
  - b. Failure of noncritical unit, system, or subsystem that is not satisfactorily corrected within forty-eight (48) hours after failure.
4. The automatic system controls, for both operation and maintenance, must function properly throughout the demonstration test period.
5. Following successful completion of the Demonstration Period there will be a final inspection of the equipment by the CONTRACTOR and ENGINEER.

++ END OF SECTION ++

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