
Part 1 General

1.1 SUMMARY

- .1 This section includes performance requirements, construction features, materials, fabrication, quality assurance, inspection and testing for the Leachate Storage Tank (TK-1), Secondary Containment Tank (TK-2) and associated foundations.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM B695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
 - .2 ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- .2 American Water Works Association (AWWA)
 - .1 AWWA D103, Factory-Coated Bolted Steel Tanks for Water Storage
- .3 International Organization for Standardization (ISO)
 - .1 ISO 28706, Vitreous and Porcelain Enamels - Determination of Resistance to Chemical Corrosion
 - .2 ISO 28765 Class 2, Vitreous and Porcelain Enamels - Design of Bolted Steel Tanks for the Storage or Treatment of Water or Municipal or Industrial Effluents and Sludges
- .4 Society for Protective Coatings (SSPC)
 - .1 SSPC SP-10, Joint Surface Preparation Standard: Near-White Metal Blast Cleaning

1.3 SCOPE OF WORK

- .1 Furnish and erect a steel bolted landfill leachate tank, including the concrete foundation, aboveground piping, pipe supports, outside ladder with safety cage, and other appurtenances as shown on the Contract drawings in accordance with AWWA D103 specifications.
- .2 All required labour, materials, equipment and construction services shall be included.

1.4 QUALIFICATIONS OF TANK SUPPLIER

- .1 The tank manufacturer shall have specialized in the design and fabrication of factory coated steel bolted tanks for at least ten years prior. The manufacturer shall have an active ISO-9001 registration. All engineering design, fabrication and coating shall be done in-house.
- .2 The tank installer shall be certified by the tank manufacturer to be qualified to do the Work.
- .3 The tank supplier shall provide a reference list of five tanks presently used in landfill leachate service of equal or greater size than that described herein.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Shop drawings to detail and indicate following as applicable to project requirements.
 - .1 Tank dimensions, capacity, and materials of construction.
 - .2 Size, material and location of all nozzles, manways and tank appurtenances.
 - .3 Size, materials and locations of railings, ladders, ladder cages, platforms and walkways.
 - .4 Finishes.
 - .5 Holiday test records for all tank sheets.
 - .6 Glass thickness test records for all tank sheets.
 - .7 Fish scale test records.
 - .8 Hydrostatic test records.
 - .9 Insulation types, locations and RSI values.
 - .10 Piping, valves and fittings: type, materials, sizes, piping connection details.
 - .11 Anchors: description, material, size and locations.
 - .12 Foundation: provide complete details including reinforcing and concrete type, composition and strength.
 - .13 Complete set of structural calculations shall be provided for tank structures and foundations.
 - .14 Grounding and bonding: provide details of design, type, materials and locations.
 - .15 Corrosion protection: provide details of design, type, materials and locations.
 - .2 The bidder shall include the tank manufacturer's standard Operation and Maintenance Manual for incorporation into overall operation and maintenance manual.
 - .3 Approval of the tank supplier's shop drawings by the Contract Administrator shall be an approval relating only to their general conformity with the bidding drawings and specifications and shall not guarantee detail dimensions and quantities, which remains the bidder's responsibility.

Part 2 Products

2.1 TANK CAPACITY AND ELEVATION

- .1 See Contract drawings for tank capacity, elevation, appurtenances and other pertinent design requirements.

2.2 TANK DESIGN STANDARDS

- .1 Materials, design, fabrication and construction of the bolted steel tank shall conform to the AWWA D103, latest edition.
- .2 The tank coating system shall conform to Section 12.4 Glass Coatings of AWWA D103, latest edition.

- .3 Wind load shall be designed to the latest revision of National Building Code of Canada with an importance factor of post disaster, or AWWA D103, whichever is higher.
- .4 Seismic and snow loads shall be designed to the latest revision of National Building Code of Canada, with an importance factor of post disaster.

2.3 TANK FOUNDATION

- .1 The tank foundation design shall be provided by the tank supplier, based on the soil bearing capacity as detailed in the geotechnical report included in the Contract documents.
- .2 Concrete foundations shall be provided for the following:
 - .1 Leachate Storage Tank (TK-1)
 - .2 Secondary Containment Tank (TK-2) including embedded starter ring.

2.4 MATERIALS OF CONSTRUCTION

- .1 Bolts
 - .1 Heads on bolts used in tank lap joints (structure bolts) shall be completely encapsulated by high impact, UV resistant material.
 - .2 Structure bolts shall be zinc mechanically deposited in accordance with latest edition of ASTM B695, class 50, type 1.
 - .3 Structure bolts on the tank shell shall be installed such that the head portion is located inside the tank, and the washer and nut on the exterior.
- .2 Sealant
 - .1 Sealant shall be one component, moisture cured, polyurethane compound.
- .3 Cathodic Protection
 - .1 A passive cathodic protection system shall be designed and supplied by the tank manufacturer.

2.5 GLASS COATING

- .1 All structural sheet steel shall be glass coated in accordance with AWWA D103.
- .2 Sheets shall be media blasted on both sides to the equivalent of SSPC SP-10 (Near White Metal Blast Cleaning). After fabrication and prior to application of the coating, all sheets shall be thoroughly cleaned by washing and hot rinsing followed immediately by hot air drying.
- .3 A base coat of glass frit containing nickel oxide shall be applied to both sides of the sheet.
- .4 A second coat of milled cobalt blue glass shall be applied to both sides of the sheets.
- .5 A third coat of glass shall be applied to all interior shell and floor sheet surfaces which must be a titanium dioxide reinforced mixture, white glass.
- .6 The sheets shall be fired at a minimum temperature of 816°C.
- .7 Edge Coat: Sheet edges shall be rounded in profile per Porcelain Enameling Institute Technical Manual to enable the same glass coating to be applied to all four edges of the sheet and ensure full encapsulation of the sheet edges with a minimum thickness of 5 mils.
- .8 Frits shall be individually tested in accordance with the latest revision of ISO 28706.

- .9 Holiday Testing: A volt test is performed on every sheet. Any sheet registering a discontinuity on the interior surface or floor shall be rejected. Test results shall be submitted to the Contract Administrator.
- .10 Glass Thickness: Minimum glass thickness on the inside surface of the sheet shall be 10.0 mils. Glass thickness shall be measured using a calibrated magnetic induction type electronic dry film thickness gauge. Test results shall be submitted to the Contract Administrator.
- .11 Adherence: The coating shall be tested in accordance with ISO 28765 Class 2 or better. Any sheet that has poor adherence shall be rejected.
- .12 Fish Scale Testing: The coating shall be tested for fish scale by placing full size production sheets in an oven at 204°C for one hour. The sheets will then be examined for signs of fish scale. Any sheet exhibiting this characteristic will be rejected and the entire lot tested. Test results shall be submitted to the Contract Administrator.

2.6 TANK STRUCTURE

- .1 Steel Roof
 - .1 The roof shall be made of bolted steel panels assembled in a similar manner as the shell; utilizing the same sealant and hardware to assure a weather tight assembly.
 - .2 A free and unobstructed storage area is a requirement. Support columns to the floor are not acceptable.
- .2 Tank Bottom
 - .1 Concrete Bottom: Secondary Containment (TK-2)
 - .1 The bottom design is of reinforced concrete with an embedded steel base setting ring per the manufacturer's design and in accordance with latest edition of AWWA D103.
 - .2 A leveling plate assembly consisting of two anchor rods and a slotted plate shall be used to secure the base setting ring, prior to encasement in concrete. Installation of the base setting ring on concrete blocks or bricks, using shims for adjustment, is not permitted.
 - .3 Place one butyl rubber elastomer waterstop seal on the inside surface of the base setting ring below concrete floor line. Place one bentonite impregnated water seal below the butyl rubber seal. The materials shall be installed in accordance with tank manufacturer's instructions.
 - .2 Steel Bottom: Leachate Storage Tank (TK-1)
 - .1 The bolted steel floor sheets shall be coated with and constructed of the same material as the shell sheets. The floor sheets shall be placed over a 76 mm compacted sand base, or a non-extruding and resilient bituminous type filler meeting the requirements of ASTM D1751 shall be placed between the floor sheets and concrete surface.
 - .2 A plastic encapsulated nut shall be used to cover the bolt threads exposed on the inside of the floor.

2.7 APPURTENANCES

- .1 Pipe Connections
 - .1 Inlet, discharge, drain and other connections shall conform to the sizes and locations specified on the Contract drawings.
 - .1 The location of roof manway M2 is approximate and shall be verified by the contractor based on the supplied equipment and installation locations

- of the Pump Lifting Davit (H-1), Leachate Loadout Pump (P-1) and guiderail system.
- .2 External tank piping shall be in accordance with the requirements for Leachate Piping as indicated in Section 22 11 17 – Process Piping and Valves.
 - .3 Internal tank piping and supports shall be made of 316LSS.
- .2 Outside Tank Ladders and Platforms
- .1 Outside tank ladder and platforms, complying with the local Occupational Health and Safety Regulations, shall be furnished and installed as shown on the Contract drawings:
 - .1 A platform shall be provided near the roof elevation to facilitate access to the Pump Lifting Davit (H-1) to allow for removal of the leachate loadout pump (P-1) from roof manway M2. H-1 shall be supported by the tank/platform. Platform elevation shall be suitable to permit complete removal of P-1 from the tank given the hook height and reach of H-1 and overall height of P-1 assembly.
 - .2 A safety handrail shall be provided on the tank roof to enclose all roof nozzles.
 - .2 Ladders and platforms shall be fabricated of aluminum or galvanized steel.
 - .3 Ladders shall be equipped with a hinged lockable entry device at grade and a self-closing double-bar safety gate shall be provided at each ladder opening on elevated platforms.
- .3 Shell Manholes
- .1 One shell manhole shall be provided as shown on the Contract drawings in accordance with the latest revision of AWWA D103.
- .4 Roof Vent
- .1 A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum design rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.12 kPa. The overflow pipe shall not be considered to be a tank vent. The vent piping shall be in accordance with the requirements for Leachate Piping as indicated in Section 22 11 17 – Process Piping and Valves.
- .5 Roof Manway
- .1 The manufacturer shall provide roof manways as indicated on the drawing. They shall be equipped with a hinged cover and a hasp for locking.
 - .2 The opening shall have a curb at least 102 mm in height, and the cover shall have a downward overlap of at least 51 mm, or a gasketed weather-tight cover in lieu of the 102 mm curb and 51 mm overlap.
- .6 Liquid Level Indicator
- .1 A liquid level indicator with stainless steel float, number board and high visibility target shall be provided and installed as shown on the project drawings.
- .7 External Attachments
- .1 External attachments including grounding lugs, cable tray clips, pipe supports, and lifting davit (H-1) support shall be as shown on the Contract drawings, or per manufacturer's standard.
- .8 Internal Attachments

- .1 Internal attachments including grounding lugs, cable tray clips, etc. shall be as shown on the Contract drawings, or per manufacturer's standard.
- .2 Internal tank attachments and supports shall be made of 316LSS.
- .9 Identification Plate
 - .1 A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior shell at a location approximately 1.5 m from top of concrete elevation in a position of unobstructed view.
- .10 Tank Insulation
 - .1 The tank shell and steel roof shall have 102 mm thick rigid insulation (R20 value).
- .11 Cladding
 - .1 The tank shall be finished with 26 ga pre-painted metal cladding. Cobalt-blue color.

Part 3 Execution

3.1 PACKAGING

- .1 All sheets shall be protected from damage during shipment. Prior to packing, the sheets will be kept separated, or heavy paper / plastic foam sheets will be placed between each panel to eliminate sheet-to-sheet abrasion.
- .2 Individual stacks of panels (not applicable to panels shipped in racks) will be wrapped in heavy mil plastic and steel banded to special wood pallets built to maintain the roll-radius of the tank panels and minimize contact or movement of finished panels during shipment.

3.2 CONSTRUCTION

- .1 Field erection of the bolted steel tank shall be in accordance with the procedures outlined in the manufacturer's assembly manual and performed by an authorized installer of the tank manufacturer.
- .2 The correct manufacturer approved jacks and / or scaffolding specific to the tank type shall be used for assembly.
- .3 Particular care will be taken to protect the coated sheets from damage during field installation. Prior to assembly all surfaces shall be visually inspected and any damaged panels or components repaired or replaced. Any coating damage shall be repaired per manufacturer's recommendations.
- .4 No backfill shall be placed against the tank shell without prior written approval and instructions of the tank manufacturer.

3.3 COMMISSIONING

- .1 Hydrostatic Testing
 - .1 Following assembly and cleaning of the tank, the tank shall be tested for liquid tightness by filling tank to its overflow elevation. Any leaks shall be corrected in accordance with the manufacturer's recommendations.
 - .2 Water required for testing shall be furnished by The City at the completion of tank erection. Disposal of test water shall be the responsibility of The City.
- .2 Disinfection
 - .1 Tank does not require disinfection prior to operation.

3.4

WARRANTY

- .1 D22- Supplemental Conditions: Warranty.
- .2 The tank manufacturer shall offer a warranty of 36 months from the date of installation or 38 months from the date of shipment, whichever is earlier.

END OF SECTION

Part 1 General

1.1 SCOPE

- .1 This section covers submersible tank mixing systems intended for continuous use while submersed in the Leachate Storage Tank (TK-1). Each mixer shall have the ability to function continuously on a year-round basis, regardless of drain and fill cycles. Each mixer shall consist of a water-filled submersible motor, an impeller and a non-submersible control center that houses all control electronics.

1.2 REFERENCES

- .1 Canadian Electric Code (CEC)
- .2 Canadian Standards Association (CSA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pumps and include:
 - .1 Physical dimensions, weight, materials of construction, general specifications and accessories.
 - .2 Connections, and fittings, control assemblies and ancillaries, identifying factory and field assembled components and recommended installation.
 - .3 Installation and operation manuals.
 - .4 Wiring and control diagrams.
 - .5 List of equipment or tooling necessary for diagnostics, trouble-shooting, repair or general maintenance
 - .6 Warranty.

1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data.
 - .1 Include:
 - .1 Manufacturer's name, type, model year, capacity and serial number.
 - .2 General equipment specifications and data sheets.
 - .3 Details on operation, servicing and maintenance.
 - .4 Installation, start-up, operation, and maintenance instructions.
 - .5 Factory-recommended maintenance schedule.
 - .6 List of equipment or tooling necessary for diagnostics, trouble-shooting, repair or general maintenance.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 PROCESS CONDITIONS

- .1 Process fluid: landfill leachate waste water.
 - .1 Refer to the attached typical leachate composition.
 - .2 Maximum Temperature: 60°C (140°F)
- .2 Minimum Ambient Temperature: -40°C (-40°F)

2.2 LEACHATE TANK MIXER (M-1)

- .1 Performance
 - .1 Mixing system shall completely mix the tank according to the following minimum performance requirements.
 - .1 For tanks up to 375,000 usgal: All temperatures shall converge to within 0.5°C within 24 hours after mixer is installed and activated.
- .2 General
 - .1 Mixing system consists of a spiral-shaped nozzle mounted in a submersible stainless steel casing. System is lowered to the tank floor and creates a vortical flow pattern inside the tank. Devices with an externally mounted pump shall not be acceptable. Mixer operation shall be independent of tank drain and fill cycles to ensure constant mixing. Mixer shall weigh less than 40 pounds (18 kg) and be able to be hoisted, installed, and/or removed by on-site personnel without additional equipment needed, and so that there is no crush hazard or entanglement hazard present, and so that weight of mixer on tank floor does not cause damage to interior coating.
 - .2 Mixing system inlet shall be elevated at a minimum of 6 inches above tank floor to avoid disturbing accumulated tank sediment or entraining particles and causing accelerated wear of moving parts.
 - .3 Mixers using submersible pump with slit or “water sheet” or horizontal motor mounting designs are not acceptable.
 - .4 Power source for mixer shall be 240VAC single phase to allow unit to continue 24/7 operation.
- .3 Construction
 - .1 Components – wet-side:
 - .1 Equipment entering tank shall not adhere to, scratch or otherwise cause damage to internal tank coating or put undue stress on the materials of the tank construction. Equipment shall fit through a standard hatch of size 18” x 18” or larger.
 - .2 Each submersible mixer shall consist of the following components, regardless of the power source selected:
 - .1 Nozzle
 - .1 AISI Type 316 Stainless Steel.
 - .2 Electropolished to minimize surface corrosion.
 - .2 Nozzle housing
 - .1 AISI Type 316 Stainless Steel
 - .2 Brush finish to minimize surface corrosion

- .3 Buoyancy mechanism to keep nozzle pointing upright no matter the angle of the tank floor
- .4 Rubber foot pad to avoid scratching tank floor
- .5 Integrated power cable and lowering mechanism for simplicity
- .3 Motor
 - .1 Stainless Steel 304 body
 - .2 Leachate resistant rubber seals
 - .3 Fully submersible
- .2 Components – dry-side: Each 115VAC or 230VAC control center shall consist of the following components:
 - .1 Enclosure
 - .1 Lockable
 - .2 Weather Resistant
 - .3 Overall weight of control center not to exceed 50 lbs
 - .4 Green and Red LED Indicator lights show motor status
 - .5 Enclosure heater, if required based on minimum ambient temperature
 - .2 Motor Controller/VFD
 - .1 Rated to 1.0 HP
 - .2 Operating temperature range -40 to 129 °F (-40 to 54°C)
 - .3 Manual speed control
 - .4 Thermal shut-off protection built-in
 - .5 Current overload protection built-in
 - .6 SCADA outputs included:
 - .1 Digital Output signal indicating motor running
 - .2 Digital Output signal indicating fault
 - .3 Digital Input/output signal allowing remote motor on/off
 - .4 RS-485 or Dry Contact connections
 - .3 GFCI-protection
 - .1 115/230VAC, single-phase, with a 300mA trip level GFCI included inside control center
- .4 Controls
 - .1 Each unit shall be equipped with all necessary controls, inter-wired, to provide the following minimum functions:
 - .1 On/Off switch to control power to mixer.
 - .2 Automatic low water level shutoff.
 - .3 Any other controls shown on drawings.
- .5 Acceptable Product: PAX Water Technologies Models PWM100 and PCC105

Part 3 Execution

3.1 INSTALLATION

- .1 All equipment shall be installed in accordance with manufacturer's written instructions and the Contract documents.
- .2 Installation shall be performed by factory-trained personnel or crew having experience with installation procedures and operation and maintenance requirements for the type of equipment installed under these specifications.
- .3 Mixer must be able to be installed through Leachate Storage Tank (TK-1) roof manway M. Mixer must be able to be installed without draining tank or taking tank out of service. Wet-side of Mixer shall weigh less than 40 pounds (18 kg) and dry-side shall weigh less than 50 pounds (22 kg). Both wet-side and dry-side shall be able to be hoisted, installed, and/or removed by on-site personnel without additional equipment needed, and so that there is no crush hazard or entanglement hazard present, and so that weight of mixer on tank floor does not cause damage to interior coating.
- .4 Tank penetration is recommended to be above tank water line, typically through the hatch side-wall.
 - .1 Fitting will prevent moisture intrusion into tank and ideally be horizontally oriented.
 - .2 Fitting shall be 1 inch diameter fitting to allow cable to pass through.
 - .3 Strain relief for power cable shall be part of the contractor-supplied fitting for tanks more than 30 feet in depth.
- .5 Installation of the in-tank (wet-side) components may be performed in any of the following ways:
 - .1 Installation below a hatch opening in a full tank utilizing the Mixer power cord.
 - .2 Installation by personnel with confined space training while the tank is drained and empty.
 - .3 Installation by tank manufacturer personnel during tank manufacture.
- .6 Installation of the outside-of-tank (dry-side) components shall be performed in accordance with manufacturer's written instructions.

3.2 TRAINING

- .1 Provide training on all aspects of operation, maintenance and of the complete system.

3.3 WARRANTY

- .1 D22- Supplemental Conditions: Warranty.
- .2 The Product shall include be warrantied for three (3) years on all supplied components to be substantially free from defects in material and workmanship.

END OF SECTION