inches.

3.03 OUTLET RISERS

Outlet risers shall be Orenco Systems®, Inc. Model Ultra-Rib, KOR FLO or engineer-approved equal. The material shall be PVC as per ASTM D-1784 and tested in accordance with AASHTO M304M-89. The risers shall be constructed of non-corrosive material and designed-to-be buried in soil. Risers shall have a minimum stiffness of 10 psi, when tested according to ASTM D2412. Risers shall be capable of withstanding a truck wheel load (54 square inches) of 2,500 pounds for 60 minutes with a maximum vertical deflection of 1/2 an inch. Risers shall be at least 12 inches high, shall have a minimum nominal diameter of 24 inches for simplex pumping applications or 30 inches when used in a duplex pumping application and shall be factory-equipped with the following:

3.04 RISER-TO-TANK ATTACHMENT

If risers are not cast into the tank lids, then all attachment components shall be constructed of waterproof, non-corrosive materials, such as PVC, ABS, fiberglass, or stainless steel. Adhesives and sealants shall be waterproof, corrosion resistant and approved for the intended application. The riser-to-tank connection shall be watertight and structurally sound. The riser-to-tank connection shall be capable of withstanding a vertical uplift of 5000 pounds to prevent riser separation due to tank settlement, frost heave, or accidental vehicle traffic over the tank. Risers shall be attached to tanks with one of the following attachment systems, or approved equal:

a. Orenco Systems®, Inc. Model PRTA24-2 (24" diameter riser) tank adapter cast into tank lid and a two-component methacrylate structural adhesive for the riser connection.

b. Orenco Systems®, Inc. Model RRFTA30 (30" diameter riser) tank adapter bolted down to the tank lid using Orenco's bolt down kit, Model RRFTA30BDKIT (stainless steel concrete anchor bolts and butyl sealant tape), and a two-component methacrylate structural adhesive for the riser connection.

3.05 LIDS

One lid shall be furnished with each access riser. Lids shall be Orenco Systems®, Inc. DuraFiber Model FLD24G, or FLD30G or **ENGINEER**-approved equal, as appropriate, fiberglass with green non-skid finish, and provided with stainless steel bolts. **MANUFACTURER** shall provide evidence that lids have been used successfully in continuous field service for a minimum of five years to demonstrate long-term integrity and suitability for the application. Lids shall be waterproof, corrosion resistant and UV resistant. Lids shall be flat, with no noticeable upward dome; a crown or dome of no more than 1/8" is allowable. Lids shall not allow water to pond on them. Lids shall have a green non-skid finish. Self-lubricating plastics, such as polyethylene, shall not be considered non-skid without addition of a non-skid coating. Lids shall form a watertight seal with the top of riser. Lids shall be capable of withstanding a truck wheel load (81 square inches) of 2500 pounds for 60 minutes with a maximum vertical deflection of 3/4 of an inch. Lids shall be provided with tamper-resistant stainless steel fasteners and a tool for fastener removal. Tamper-resistant fasteners include recessed drives, such as hex, Torx, and square. Fasteners that can be removed with common screwdrivers, such as slotted and Phillips, or fasteners that can be removed with standard tools, such as pliers or crescent wrenches, are not considered tamper-resistant. To prevent a tripping hazard, fasteners shall not extend above the surface of the lid. Optional components may include the following:

a. Traffic bearing lid: The traffic bearing lid shall be a cast iron frame and cover, part number 6024, 3060, 4036, as manufactured by Sather Manufacturing Co., Inc., or approved equal, which will fit over a standard lid. The cover shall have the word SEWER cast into it.

3.06 RISER INSTALLATION

Riser installation shall be accomplished according to the **MANUFACTURER'S** instructions. For cold weather areas, risers shall be backfilled with 3/8" pea gravel or other similar granular material to prevent frost heave.

PART 4 SEPTIC TANK EFFLUENT PUMPING ASSEMBLIES (SINGLE FAMILY RESIDENCES)

The Collection System On-Lot Package shall be certified to have been manufactured by Orenco Systems®, Inc., Sutherlin, Oregon. Orenco shall provide a unique Certificate of Origin with each Collection System On-Lot Package that lists all products in the Collection System On-Lot Package. Orenco warrants that any Products that comprise a Collection System On-Lot Package that are sold under an Orenco Certificate of Origin, will be free from defects in materials and workmanship for a period of five (5) years, with the exception of the pump which will be for a period of ten (10) years from the date of installation of the equipment, in accordance with, and subject to, the terms and conditions in effect at the time of sale.

Pump package systems shall be manufactured by Orenco Systems®, Inc. High-Head Pumping Assemblies or **ENGINEER**-approved equal, composed of:

4.01. RISERS AND LIDS
See PART 3.

4.02 PUMP VAULT
Orenco Systems®, Inc. Model PVU Series, Universal Biotube® Pump Vault or **ENGINEER**-approved equal, installed in conformance with the **ENGINEER'S** plans. The filter shall have a minimum effective screen area of no less than 14.5 square feet. The Biotube pump vault shall consist of a 12-inch diameter polyethylene vault with eight (8) 2-inch diameter holes evenly spaced around the perimeter, located appropriately to allow for maximum sludge and scum accumulation before requiring pumping (approximately 70% of minimum liquid level). Housed inside the polyethylene vault shall be the Biotube assembly consisting of 1/8-inch mesh polypropylene tubes. Attached to the vault is a flow inducer to accept one or two high-head effluent pumps.

4.03 DISCHARGE HOSE AND VALVE ASSEMBLY
For most single-family residences, Orenco Systems®, Inc. Model HV100BFCASQPRX or **ENGINEER**-approved equal. Discharge assembly shall be 1-inch diameter and include 150 psi PVC ball valve, anti-siphon valve, flow controller, high pressure flex hose with working pressure rating of 250 psi, and Schedule 40 PVC pipe with cam coupler adapter for quick disconnect.

4.04 FLOAT SWITCH ASSEMBLY
Float switch shall be mercury-free Orenco Systems®, Inc. Model MFPB with two mechanical switch floats mounted on a PVC stem attached to the filter cartridge. The floats must be adjustable and must be removable without removing the pump vault. The high level alarm and on/off function shall be preset as shown in the **ENGINEER'S** plans. Each float lead shall be secured with a nylon strain relief bushing at the splice box. The on/off float shall be rated for a minimum of 5.0A @ 120 VAC.

4.05 HIGH-HEAD EFFLUENT PUMP
All pumps shall comply with general requirements set forth in section I (above). Residential pumps shall be an Orenco Systems®, Inc. Model PF100511CV, 1/2 hp, 115 VAC, single phase, 60 Hz, two-wire motor, with 10 foot long extra heavy duty (SOOW) heavy duty electrical cord with ground. Pump shall include an internal check valve and shall be capable of delivering 18 GPM at a pressure of 14 ft, 10 GPM at 171 ft, and 0 GPM at 250 ft. When used in conjunction with a flow controller, the pump shall be capable of providing 5 gpm against a head of 190 feet.

4.06 ELECTRICAL SPLICE BOX
Orenco Systems®, Inc., Model SB series internal splice box or **ENGINEER**-approved equal, UL approved for wet locations, equipped with three (3) electrical cord grips and a 1-inch outlet fitting. Also included shall be UL listed waterproof wire nuts. The use of a UL-approved conduit seal kit accessible above ground shall be required to prevent the passage of gases, vapors, or flames through the conduit to the control panel. An additional UL classified sealant shall be added to the splice box

coupling to prevent condensation accumulation in the splice box. The following UL approved sealants shall be used:

a. UL classified moisture-cure polyurethane quick drying foam or **ENGINEER**-approved equal with an R-5 rating for each inch of foam.

b. UL classified silicone sealant or **ENGINEER**-approved equal consiting of a neutral cure silicone, non-acetic, non-corrosive silicone able to withstand temperatures to 450° F.

4.07 CONTROLS AND ALARMS

Controls and alarms shall be listed per UL 508. Panels shall be repairable in the field without the use of soldering irons or substantial disassembly. For most single family home applications, an Orenco Systems®, Inc. Model S1 Series or **ENGINEER**-approved equal control panel meeting the following:

Standard Components

a. Motor-Start Contactor: 120 VAC, 1hp, 16 FLA, 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).

b. Toggle Switch: Single-pole, double-throw HOA switch. 20 amps, 1 hp.

c. Controls Circuit Breaker: 10 amps, OFF/ON switch. Single-pole 120 VAC. DIN rail mounting with thermal magnetic tripping characteristics.

d. Pump Circuit Breaker: 20 amps, OFF/ON switch. Single-pole 120 VAC. DIN rail mounting with thermal magnetic tripping characteristics.

e. Audio Alarm: 95 dB at 24", warble-tone sound.

f. Visual Alarm: 7/8" diameter red lens, "Push-to-silence." NEMA 4, 1-watt bulb, 120 VAC

g. Panel Enclosure: Measures 11.5" high x 9.3" wide x 5.4" deep. NEMA 4X rated. Constructed of UV-resistant fiberglass; hinges and latch are stainless steel.

h. S1 Panel Ratings: 120 VAC, 1 hp, 14 amps, single phase, 60 Hz.

4.08 INSTALLATION

All pumping system components shall be installed in accordance with the **MANUFACTURER'S** recommendations, the **ENGINEER'S** plans, and all state and local regulations.

4.09 LOCATION

The pump control panel shall be mounted on a post or exterior wall nearest the tank and pump. If mounting to an exterior wall, try to select a garage or outbuilding where the sound of the motor contactor engaging will not be noticed. If a garage or outbuilding wall isn't available, installation should include use of sound-deadening insulation. (Post and panel mounting assemblies are acceptable.) The control panel shall be located within 50 feet and in sight of the pump motor or shall be provided with a lockable disconnect switch. The panel, when possible, should be mounted in the shade and protected from the weather. The panel should be located at a convenient height (usually about five feet above the ground) and where it will be accessible for maintenance.

PART 5 SEPTIC TANK EFFLUENT PUMPING ASSEMBLIES (COMMERCIAL CONNECTIONS)

The Collection System On-Lot Package shall be certified to have been manufactured by Orenco Systems®, Inc., Sutherlin, Oregon. Orenco shall provide a unique Certificate of Origin with each Collection System On-Lot Package that lists all products in the Collection System On-Lot Package. Orenco warrants that any Products that comprise a Collection System On-Lot Package that are sold under an Orenco Certificate of Origin, will be free from defects in materials and workmanship for a period of five (5) years from the date

of installation of the equipment, in accordance with, and subject to, the terms and conditions in effect at the time of sale.

Systems shall be Orenco Systems®, Inc. High-Head Pumping Assemblies or **ENGINEER**-approved equal, composed of:

5.01 TANK

See PART 2 above. Tank volumes and configurations serving commercial connections shall follow the most current edition of Orenco's AdvanTex Design Criteria, NDA-ATX-1, Table A. Recommended Minimum HRTs, Primary Tankage and Configurations.

5.02 RISERS AND LIDS

See PART 3 above.

5.03 PUMP VAULT

Orenco Systems®, Inc. Model PVU Series, Universal Biotube® Pump Vault or **ENGINEER**-approved equal, installed in conformance with the **ENGINEER'S** plans. The filter shall have a minimum effective screen area of no less than 14.5 square feet. The Biotube pump vault shall consist of a 12-inch diameter polyethylene vault with eight (8) 2-inch diameter holes evenly spaced around the perimeter, located appropriately to allow for maximum sludge and scum accumulation before requiring pumping (approximately 70% of minimum liquid level). Housed inside the polyethylene vault shall be the Biotube assembly consisting of 1/8-inch mesh polypropylene tubes. Attached to the vault is a flow inducer to accept one or two high-head effluent pumps. (Note: Commercial and multiple-user tanks may require a larger or multiple Biotube Pump Vaults, the sizes of which must be individually determined and spelled out in the specifications.)

5.04 DISCHARGE HOSE AND VALVE ASSEMBLIES

Orenco Systems®, Inc. Model HV125BCASQPRX or **ENGINEER**-approved equal, 1-1/4-inch diameter, 150 psi PVC ball valve, 150 psi PVC check valve, high pressure flex hose with working pressure rating of 250 psi, and Schedule 40 PVC pipe with cam coupler adapter for quick disconnect.

5.05 FLOAT SWITCH ASSEMBLY

Float switch shall be mercury free Orenco Systems®, Inc. Model MF3P with three switch floats mounted on a PVC stem attached to the filter cartridge. The floats must be adjustable and must be removable without removing the pump vault. The high/lag, pump on, pumps off and low-level alarms shall be preset as shown in the **ENGINEER'S** plans. Each float lead shall be secured with a nylon strain relief bushing at the splice box. The floats shall be UL or CSA listed.

5.05 COMMERCIAL HIGH-HEAD EFFLUENT PUMPS

All pumps shall comply with general requirements set forth in PART 1.10 (above). All commercial applications shall use Duplex (2) pumping systems for redundancy. Pumps shall be Orenco Systems®, Inc. Model PF Series High Head pump, 1.0 Hp, 230 VAC, single phase, 60 Hz, two-wire motor, with 10 foot long extra heavy duty (SOOW) heavy duty electrical cord with ground. The pumps shall be capable of delivering 20 GPM at a pressure of 150 ft, 0 GPM at 255 ft, and 30 GPM at 39 ft.

Pump models and capabilities will vary based upon application and will vay by site.

5.06 ELECTRICAL SPLICE BOXES

Orenco Systems®, Inc. Model SBEX series external splice boxes or **ENGINEER**-approved equal, UL approved for wet locations, equipped with up to four (4) electrical cord grips and two 3/4-inch outlet fittings. Also included shall be UL listed waterproof butt splice connectors. The use of a UL-approved conduit seal kit accessible above ground shall be required to prevent the passage of gases, vapors, or flames through the conduit to the control panel. An additional UL classified sealant shall

be added to the splice box coupling to prevent condensation accumalation in the splice box. The following UL approved sealants shall be used:

a. UL classified moisture-cure polyurethane quick drying foam or **ENGINEER**-approved equal with an R-5 rating for each inch of foam.

b. UL classified silicone sealant or **ENGINEER**-approved equal consisting of a neutral cure silicone, non-acetic, non-corrosive silicone able to withstand temperatures to 450° F.

5.07 CONTROLS AND ALARMS

Control panel shall be Orenco Systems®, Inc. MVP DAX Series. Control panel shall be a duplex control panel. Controls and alarms shall be listed per UL 508. Panels shall be repairable in the field without the use of soldering irons or substantial disassembly. Panel shall be Orenco Systems, Inc. Model MVP Series control panel meeting the following:

Standard Components

a. Programmable Logic Unit: 120/240 VAC programmable logic unit with built-in LCD screen and programming keys. Provides control functions and timing for panel operation.

b. Motor-Start Contactor: 120 VAC 16 FLA, 1 hp, 60 Hz; 2.5 million cycles at FLA (10 million at 50% FLA). 240 VAC 16 FLA, 3 hp, 60 Hz; 2.5 million cycles at FLA (10 million at 50% FLA).

c. Toggle Switch: Single-pole, double-throw HOA switch. 20 amps, 1 hp.

d. Controls Circuit Breaker: 10 amps, OFF/ON switch. Single-pole 120 VAC. DIN rail mounting with thermal magnetic tripping characteristics.

e. Pump Circuit Breaker: 20 amps, OFF/ON switch. Single-pole 120 VAC, double-pole 240 VAC. DIN rail mounting with thermal magnetic tripping characteristics.

f. Audio Alarm: 95 dB at 24", warble-tone sound.

g. Visual Alarm: 7/8" diameter red lens, "Push-to-silence." NEMA 4, 1-watt bulb, 120 VAC

h. Panel Enclosure: NEMA 4X rated, constructed of UV-resistant fiberglass or NEMA 4 rated, constructed of steel; hinges and latch are stainless steel. Conduit couplings provided.

i. MVP: Panel Ratings: 120 VAC, 1 hp, 16 amps, single phase, 60 Hz.; 240 VAC, 3 hp, 16amps, single phase, 60 Hz.

5.07 INSTALLATION

All pumping system components shall be installed in accordance with the **MANUFACTURER'S** recommendations, the **ENGINEER'S** plans, and all state and local regulations.

5.08 LOCATION

The **CONTRACTOR** shall locate the pump control panel on a post or exterior wall nearest the tank and pump. If mounting to an exterior wall, try to select a garage or outbuilding where the sound of the motor contactor engaging will not be noticed. If a garage or outbuilding wall isn't available, installation should include use of sound-deadening insulation. (Post and panel mounting assemblies are acceptable.) The control panel shall be located within 50 feet and in sight of the pump motor or shall be provided with a lockable disconnect switch. The panel, when possible, should be mounted in the shade and protected from the weather. The panel should be located at a convenient height (usually about five feet above the ground) and where it will be accessible for maintenance.

5.09 SERVICE CONNECTION

Orenco Systems®, Inc. Model SC100 (1"), SC125 (1.25"), SC150 (1.5"), or SC200 (2") or **ENGINEER**-approved equal. Service connection will include a swing check valve factory connected to a ball valve. All components will be PVC Schedule 40 and rated for 150psi.

a. Service connection shall be enclosed in PVC access riser as manufactured by Orenco Systems®, Inc. or **ENGINEER**-approved equal. Risers shall extend to two inches above the ground surface to allow for settlement and shall have a minimum nominal diameter of 8-inches.

b. One lid shall be furnished with each access riser. Lids shall be Orenco Systems®, Inc. Model FL8G or **ENGINEER**-approved equal, fiberglass with green non-skid finish.

5.10 SERVICE LINE TESTING

An air compressor may be used to bring the line to its test pressure; the test is a success if the pressure holds for 60 seconds or more. Any leakage will require the line to be repaired and retested.. When the service line can be filled with water from the tank test, particularly if the service line is short and doesn't require a large volume to fill it, a small hand pump with pressure guage can be employed for the pressure test.

PART 6 TOOLS FOR SEPTAGE MEASUREMENT

6.01 SCUM MEASURING UTILITY GUAGE (SMUG)

CONTRACTOR shall provide a minimum of one scum measuring utility gauge. The gauge shall consist of a minimum 3/8" diameter stainless steel rod with an incremental scale for measuring scum levels. The rod shall be bent at a 90-degree angle at the base to aid in identifying the scum "by feeling." The gauge shall be Orenco Systems®, Inc. Model SMUG or **ENGINEER**-approved equal.

6.02 SLUDGE MEASURING DEVICE

CONTRACTOR shall provide a minimum of one **ENGINEER**-approved sludge-measuring device.

PART 7 FORCEMAIN COMPONENTS & TESTING

7.01 COMBINATION AUTOMATIC AIR/VACUUM RELEASE VALVE

A.R.I Model D-021 or **ENGINEER**-approved equal. Valve base shall be made of reinforced nylon and include a Buna N rubber base O-ring seal. Body shall be constructed of reinforced nylon housing a foamed polypropylene float and stainless steel stem. Valve will also include a polypropylene elbow to expel air horizontally. Valve shall be corrosion resistant and operable with a minimum line pressure of 3 psig.

a. Piping shall be Orenco Systems®, Inc. Model ARA or **ENGINEER**-approved equal. Piping shall be constructed of Schedule 40 PVC and include a 2-inch diameter PVC isolation valve, a 3/4-inch diameter PVC ball valve for bypass, and a pressure guage connection. All components shall be rated for 150psi working pressure.

b. Air release assembly shall be enclosed in ribbed PVC access riser as manufactured by Orenco Systems®, Inc. or **ENGINEER**-approved equal. The material shall be PVC as per ASTM D-1784 and tested in accordance with AASHTO M304M-89. Risers shall extend to two inches above the ground surface to allow for settlement and shall have a minimum nominal diameter of 30.

c. Orenco Systems®, Inc. Model FLD30G or **ENGINEER**-approved equal, fiberglass with green non-skid finish, and provided with stainless steel bolts, and wrench. The riser and lid combination shall be sealed for watertightness and able to support a 2500 lb. wheel load. (Note: This is not to imply that PVC risers are intended for traffic areas.)

7.02 MANUAL VALVES

Orenco Systems®, Inc. Model ARA or **ENGINEER**-approved equal as listed above. Valves will include the following piping:

a. Piping shall be constructed of Schedule 40 PVC and include a 2-inch diameter PVC isolation valve, a 3/4-inch diameter PVC ball valve for bypass, and a pressure guage connection. All components shall be rated for 150 psi working pressure and allow the installation of a combination air/vacuum release valve.

b. Air release assembly shall be enclosed in ribbed PVC access riser as manufactured by Orenco Systems®, Inc. or **ENGINEER**-approved equal. The material shall be PVC as per ASTM D-1784 and tested in accordance with AASHTO M304M-89. Risers shall extend to two inches above the ground surface to allow for settlement and shall have a minimum nominal diameter of 30.

c. Orenco Systems®, Inc. Model FL30G or **ENGINEER**-approved equal, fiberglass with green non-skid finish, and provided with stainless steel bolts, and wrench. The riser and lid combination shall be sealed for watertightness and able to support a 2500 lb. wheel load. (Note: This is not to imply that PVC risers are intended for traffic areas.)

7.03 FORCEMAIN TESTING

A. The **CONTRACTOR** shall adhere rigorously to all hydrostatic testing procedures and requirements. Allowable AWWA leakages should be the maximum, not to be exceeded. Zero leakage should be the goal.

Hydrostatic Test Procedure

1. Fill the line with water to expel air.
2. Pressurize to the desired pressure at the lowest point.
3. Hold for two hours to ± 5 PSI of test pressure.
4. Accurately record time, pressure readings, and amount of leakage.
5. For further details, refer to AWWA C 600 Section 4.

Allowable Loss Gal/Hr/1000 ft. of Line

Test Pressure	3 in.	4 in.	6 in.	8 in.	10 in.	12 in.
150 psi	0.28	0.37	0.55	0.74	0.92	1.10
125 psi	0.25	0.34	0.50	0.67	0.84	1.01
100 psi	0.23	0.30	0.45	0.60	0.75	0.90

$$L = \frac{S\,D\,\sqrt{(P)}}{133200}$$

Where:

L = Allowable leakage for push-on or mechanical joints, GPH. *

S = Length of pipe tested, feet.

D = Nominal pipe diameter, inches.

P = Average test pressure, PSI, at lowest location on test section.

*Add 0078 gal/hr/in of nominal valve size for each metal-seated gate valve pumped against.

B. Portions of the line that are critical or suspect should be left exposed throughout the hydrostatic test to allow visual inspection. Leaks detected visually should be repaired

regardless of test results. The use of dye during initial filling and testing of a mainline section makes isolating leaks much easier especially in areas having high ground water.

C. Check valve failure in service lines is difficult to diagnose and may misrepresent mainline integrity. Therefore, service line connections should remain closed until mainline testing has been completed. Accurate records must be kept to assure all service line connections have been opened after the mainline system has been approved.

D. Testing long segments of line should be avoided whenever possible. A lengthy segment of line may pass the leakage test, yet still have an isolated leak that is excessive and which could prove to be a problem later. Testing shorter segments of line reduces this possibility and more readily isolates any leaks. The most common recommendation is to limit the test length to 12,000/D, where D is the diameter in inches and the length of the segment is in feet.

E Because air escapes from pipelines more rapidly than does liquid, it is important that all air is purged from a section of line prior to hydrostatic testing. Failure to do so may give misleading test results, possibly causing the section of line to appear to fail the test.

PART 8 SUPPORT, TRAINING, TESTING, AND OVERSIGHT

8.01 PRECONSTRUCTION CONFERENCE

Before any work at the site is started, a conference attended by the **OWNER**, **CONTRACTOR**, **ENGINEER,** and **MANUFACTURERS (or their** agents) and others as appropriate will be held to establish a working understanding among the parties as to the work involved for installing each STEP unit. At this conference, the **OWNER**, **CONTRACTOR**, **ENGINEER**, and **MANUFACTURER** shall designate, in writing, a specific individual to act as **INSPECTOR** for the installation of each STEP unit. Any cost or fees associated with the services of the **INSPECTOR** or the **ENGINEER** during construction will be the responsibility of the **OWNER.**

8.02 INSTALLATION AND FIELD TESTING TRAINING

A. The **MANUFACTURER** shall provide the services of a trained representative to instruct the installing **CONTRACTOR'S** crew and **INSPECTOR** regarding the proper installation and field testing of each STEP unit per the **MANUFACTURER'S** recommendations and requirements. The **MANUFACTURER** shall have a trained representative provide installation and field testing training services for a minimum of one (1) visit of a minimum of one (1) eight-hour day at the beginning of construction, unless the contracotr is already familiar with installing Manufacturer's STEP systems.

B. As part of the **MANUFACTURER's** installation training and to help ensure that subsequent installations are installed in accordance with **MANUFACTURER's** installation instructions, the **MANUFACTURER** or an approved representative, shall inspect and submit an inspection checklist report for the first (complete) installation. Subsequent installations shall not commence until the first install is inspected by the **MANUFACTURER**, **INSPECTOR**, and accepted by the **ENGINEER**.

8.03 QUALITY CONTROL

A. To ensure quality control, the **INSPECTOR** shall inspect and certify that an initial installation of each STEP unit is in compliance with the **MANUFACTURER'S** recommendations and requirements, using the "Orenco Sewer Inspection Checklist" online form that can be found here: http://forms.orenco.com/cn/a3spb/orencosewerinspectio

B. Upon completion of the inspection, the **INSPECTOR**, in coordination with the **ENGINEER**, shall perform or direct the **CONTRACTOR** to perform any required adjustments to the equipment and place into operation under the supervision of the **ENGINEER**. All equipment

and materials required to perform the testing shall be the responsibility of the **CONTRACTOR.** The completed inspection checklist shall be signed by the **INSPECTOR** and copies emailed to the **ENGINEER** and **MANUFACTURER** within one (1) week of each corresponding STEP unit being installed and prior to System Commissioning.

8.04 SYSTEM COMMISSIONING

A. The **MANUFACTURER** shall provide the services of a trained representative for training the **OWNER'S** service provider, and, when directed, randomly inspecting STEP installation's throughout the project. The inspection will include items covered in "Orenco Sewer Inspection Checklist" as well as the effluent package, wiring, and control panel placement. Upon system commissioning, the **MANUFACTURER'S** trained representative shall provide the **ENGINEER** a written report of findings. The **ENGINEER** should then perform or direct the **CONTRACTOR** to perform any required adjustments to the equipment and place into operation. All equipment and materials required to perform additional testing shall be the responsibility of the **CONTRACTOR.**

B. The **MANUFACTURER** shall provide the services of a trained representative for a minimum of one (1) visit of a minimum of one (1) eight-hour day for the purpose of system commissioning.

PART 9 OPERATION AND MAINTENANCE

9.01 OPERATION AND MAINTENANCE MANUAL

The **MANUFACTURER** shall provide five (5) operation and maintenance manuals to be sent to the **OWNER.**

9.02 RECOMMENDED SPARE PARTS

One spare pump, six (6) spare floats, check valve, anti-siphon valve, controls, and various other necessary components for every 50 pump systems (to be purchased by the OWNER).

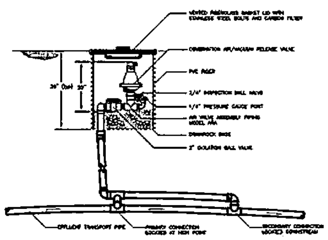
9.03 RECOMMENDED OPERATION AND MAINTENANCE TOOLS

A. BIOTUBE CARTRIDGE CLEANING CRADLE

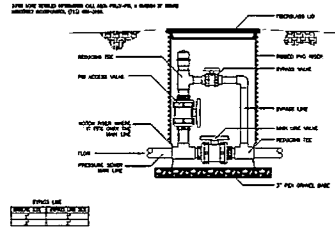
Cradle shall be Orenco Systems®, Inc. Model OM-BIOTUBE CRADEL or **ENGNEER**-approved equal for housing the Biotube Biotube pump vault filter cartridges for cleaning and maintenance.

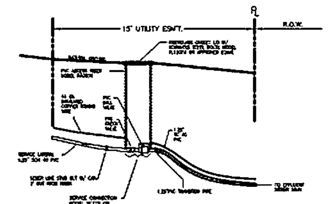
B. BIOTUBE CARTRIDGE CLEANING BRUSH

Brush shall be Orenco Systems®, Inc. Model OM-BIOTUBE BRUSH or **ENGINEER**-approved equal for cleaning Biotube pump vault filter cartridges.



COMBINATION AIR / VACUUM RELEASE DETAIL
SCALE: NTS

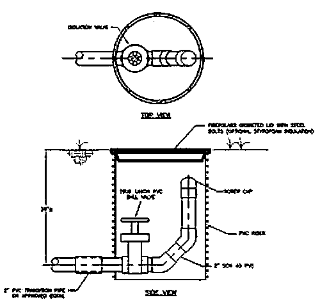




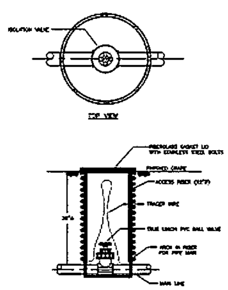
NOTES:
ALL SERVICE LINE CONNECTIONS SHALL BE SOLVENT WELDED IF HDPE SDR9 IS USED IN PLACE OF PVC, THE ONLY ACCEPTABLE SOLVENTS AND CEMENTS ARE THOSE THAT ARE RECOMMENDED BY THE PIPE MANUFACTURER. ALL SERVICE LATERALS FROM THE EFFLUENT SEWER MAIN TO THE PROPERTY LINE SHALL BE PRESSURE TESTED PRIOR TO ANY BACKFILLING.

SEE TYPICAL SUBDIVISION UTILITY ASSIGNMENT FOR THE LOCATION OF OTHER UTILITIES (SHEET 15).

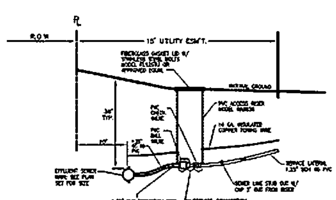
SERVICE CONNECTION W/ LATERAL DETAIL – LEFT



EFFLUENT CLEAN-OUT W/ISOLATION VALVE DETAIL
SCALE: NTS



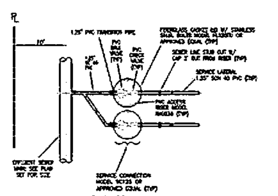
ISOLATION VALVE DETAIL
SCALE: NTS



NOTES:
ALL SERVICE LINE CONNECTIONS SHALL BE SOLVENT WELDED IF HDPE SDR9 IS USED IN PLACE OF PVC, THE ONLY ACCEPTABLE SOLVENTS AND CEMENTS ARE THOSE THAT ARE RECOMMENDED BY THE PIPE MANUFACTURER. ALL SERVICE LATERALS FROM THE EFFLUENT SEWER MAIN TO THE PROPERTY LINE SHALL BE PRESSURE TESTED PRIOR TO ANY BACKFILLING.

SEE TYPICAL SUBDIVISION UTILITY ASSIGNMENT FOR THE LOCATION OF OTHER UTILITIES (SHEET 15).

ELEVATION VIEW



PLAN VIEW

DUAL SERVICE CONNECTION W/ LATERAL DETAIL
SCALE: NTS

M&S ENGINEERING

DATE:
DRAWN:
DESIGN:
REVISIONS:

SHEET:

Comal Concrete Products, Inc.

4222 FM 482 NEW BRAUNFELS, TX 78132

EMAIL:comalconcrete@comalconcrete.com

830-608-1699 SA Metro: 830-606-4732 Fax: 830-608-1396

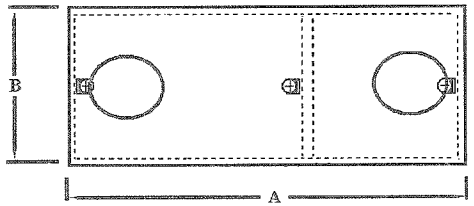
1500 GALLON

SEPTIC TANK

NOTE: DRAWING NOT TO SCALE

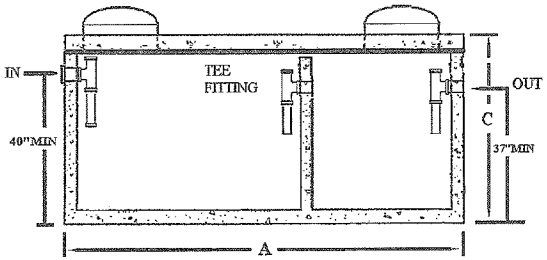
PLAN VIEW TOP

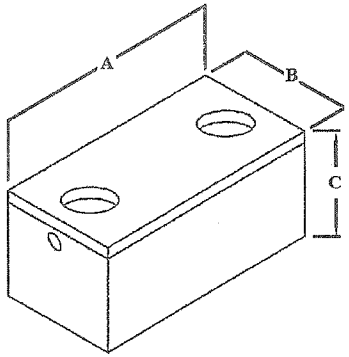
2 - 20" ACCESS PORTS



GALLON CAP	DIM. A	DIM. B	DIM. C
1500	148	80	50

SECTION:ELEVATION





SEPTIC TANK

DESIGN CONFORMS TO: ASTM C 1227

CONCRETE:

4500 PSI CONFORMING TO ASTM C 150

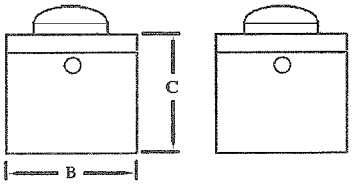
STEEL REINFORCEMENT:

GRADE 60 CONFORMING TO ASTM A 615

BEDDING SPECIFICATION:

6" TO 8" DEPTH OF PEA GRAVEL BED

RECOMMENDED BY MANUFACTURER



Comal Concrete Products, Inc.

4222 FM 482 NEW BRAUNFELS, TX 78132

EMAIL:comalconcrete@comalconcrete.com

830-608-1699 SA Metro: 830-606-4732 Fax: 830-608-1396

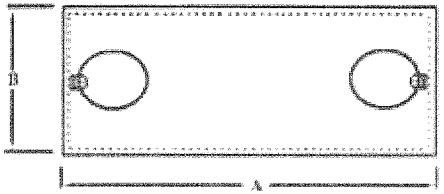
500 GALLON TO 2000 GALLON

SEPTIC TANKS

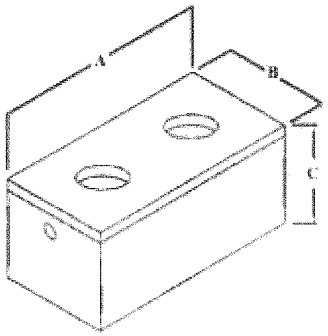
NON TRAFFIC

PLAN VIEW TOP

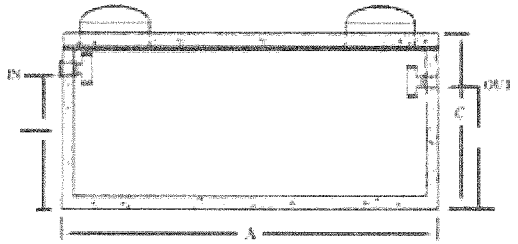
2 - 20" ACCESS PORTS



NOTE: DRAWING NOT TO SCALE



SECTION/ELEVATION



SEPTIC TANK

DESIGN CONFORMS TO: ASTM C 1227

CONCRETE:

4500 PSI CONFORMING TO ASTM C 150

STEEL REINFORCEMENT:

GRADE 60 CONFORMING TO ASTM A 615

BEDDING SPECIFICATION:

6" TO 8" DEPTH OF PEA GRAVEL BED

RECOMMENDED BY MANUFACTURER

GALLON CAP	DIM. A	DIM. B	DIM. C	FLOW -IN	FLOW -OUT	COMPARTMENTS
500	68	68	54	45	42	SINGLE
750	100	65	52	43	40	SINGLE
1000	103	79	52	43	40	SINGLE
1250	129	80	52	43	40	SINGLE
1500	151	83	50	40	37	SINGLE
2000	176	74	60	50	47	SINGLE

REVISED 6/2010 K.B.
APPROVED _____

AdvanTex®

AX-MAX General Specifications

AX-MAX EQUIPMENT SPECIFICATIONS

PART 1 - GENERAL

1.01 DEFINITIONS

A. Wherever used in these specifications and printed with initial bold capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

8. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the work to be performed.
9. *Bidder* – The individual or entity who submits a Bid directly to the Owner.
10. *Contractor* – The individual or entity with whom Owner has entered into the agreement.
11. *Engineer* – The individual or entity named as such in the agreement.
12. *Inspector* - The specific individual designated by the Owner, Engineer, Contractor, and Manufacture to ensure quality control by inspecting and certifying that the installation of the AX-MAX treatment system is in compliance with the Manufactures recommendations and requirements.
13. *Manufacture* – A supplier, fabricator, distributor, material man, or vendor having a direct contract with Contractor or Owner to furnish materials or equipment to be incorporated in the work by contractor.
14. *Owner* – The individual or entity with whom Contractor has entered into the agreement and for whom the work is to be performed.
15. *Operator* – The individual or entity with whom the owner has entered into an agreement and for whom operation and maintenance shall be performed.

1.02 GENERAL DESCRIPTION

The **MANUFACTURER** shall furnish a complete advanced treatment package(s), consisting of a pump, discharge assembly, ball valve, check valve, splice box, treatment system, and controls.

1.03 SUBMITTALS

The **MANUFACTURER** shall furnish six (6) sets of shop drawings and technical data sheets. The submittals shall clearly specify the materials of construction, equipment compatibility, along with drawings for each unique package being supplied.

1.04 OR-EQUAL EVALUATIONS

A. Throughout the equipment specifications you will find the term "or approved equal." For this project, this term "approved equal" shall mean equal in the judgment of the **ENGINEER**. Should the **CONTRACTOR** seek approval of a product other than the brand or brands named in the specifications, it shall furnish written evidence that such product conforms in all respects to the specified requirements, and that it has been used successfully elsewhere under similar conditions. It will not be the responsibility of the **MANUFACTURER** specified within these specifications to provide research, documentation, or data supporting the difference between the "or equal" and the specified product. This will be the sole responsibility of the **CONTRACTOR** seeking the approval.

B. Where the specified requirements involve conformance to recognized codes or standards, the **BIDDER** shall furnish evidence of such conformance in the form of test or inspection reports, prepared by a recognized agency, and bearing an authorized signature. Manufacturer's standard data and catalog cut sheets will not be considered sufficient in themselves, and the engineer will not be responsible for seeking further data from the manufacturer, or for otherwise researching the product. Failure to provide complete data will be cause for rejection

of the product. The submission shall include any impacts that could be expected from the alternative product and shall also indicate any product that would require a license or royalty, the actual fees, and a note that these fees would be handled by the **BIDDER**. The **BIDDER** shall provide submissions; meeting the above parameters no less than TWO WEEKS prior to **BID** opening for review by the **ENGINEER** for **CONTRACTORS** seeking approval of "or equal" products or systems shall provide, at minimum, the following.

C. Product/System submittals, including, but not limited to;

1. The number of years the **MANUFACTURER** has been in business of manufacturing relevant products/systems
    a. Size of company, including
        1) Number of employees related to relevant products/systems
        2) Number of engineers on staff related to relevant products/systems
    b. Product specifications and a detailed description of how each product or component is "equal" to the specified product, system, or component. A side-by-side comparison is required.
        1) Equipment/system warranty along with exclusions
        2) Performance claims, including, but not limited to;
            a) Treatment design
                - Surface area
                - Maintenance frequency
            b) Pump motor description
                - Manufacturer and origin
                - Length of service
                - Number of units in operation
                - Life-cycle cost (repair and replacement frequency)
                - Warranty
            c) Pump liquid end description
                - Manufacturer and origin
                - Length of service
                - Number of units in operation
                - Life-cycle cost (repair and replacement frequency and cost). Note liquid ends must be remove-able and repairable and cleanable.
                - Warranty
            d) Corrosion resistance
            e) Pump Lead description
                - Lead must be SOOW, extra heavy duty cord (600V) CSA approved.
            f) Control panel components
                - Manufacturer and origin
                - Length of service

- Number of units in operation
- Warranty
- Enclosure description

c. Evidence of successfully obtaining approval for a system with similar permit requirements with the regulating authority

d. Summary of product/system track record and history, including, but not limited to;

1) Number of similarly sized systems

2) Detailed summary of, at minimum, ten (10) similarly sized systems, at least five (5) years old, including, but not limited to;

a) Project name, location, and application

b) Years in operation

c) Current average daily flows and design flows

d) Operator name and contact information

2. **BIDDER** shall specify and furnish documentation related to manufacturer (or representative) support services, including, but not limited to;

a. Installation training program and support material

b. Installation oversight program and support material

c. Operator training program and support material

d. Startup services program and support material

1.05 EXPERIENCE CLAUSE

The equipment furnished shall be manufactured and supplied by a company experienced in the design and manufacture of advanced treatment systems. **MANUFACTURERS** shall have a minimum ten (10) years experience in the design and manufacturer of advanced treatment systems of similar size and equipment specified. **MANUFACTURERS** shall have at minimum of twenty-five (25) successful installations of advanced treatment systems.

1.06 MANUFACTURER

The **MANUFACTURER** shall be Orenco Systems®, Inc. or approved equal. The **MANUFACTURER** shall furnish a complete factory built advanced treatment system. The **MANUFACTURER** shall supply detailed installation and O&M instructions. and evidence of an adequate service provider network shall be submitted to the **ENGINEER.** The **MANUFACTURER** shall also submit evidence that the local supplier has spare parts, equipment repair ability, and experienced service personnel. The **MANUFACTURER** shall also provide the following support personnel:

- Professional engineer or personnel under the direct supervision of a professional engineer dedicated to supporting the project through design, construction, and O&M.
- Asset Management Department dedicated to assisting operators with operational and maintenance activities.

1.07 WARRANTY

The advanced treatment system **MANUFACTURER** shall provide a three (3) year warranty for the entire treatment system, including, but not limited to the pump, pump vault, hose and valve assembly, control panel, and splice box. Warranty term shall ensue after **OWNER'S** acceptance and system startup procedures are complete. The **MANUFACTURER** shall submit detailed exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition. The warranty shall be documented in product literature.

1.08 SERVICABILITY

The advanced treatment system components shall be completely serviceable, with easy access to the pump(s), treatment system, and floats. The pump shall be designed for removal without removing the floats.

1.09 PUMPS

The pump must be approved for use in the treatment unit as described in these specifications. Pump shall be 3/4 to 2.0 hp, 230 VAC, single phase, 60 Hz, two-wire motor, with 30 foot long extra heavy duty (SOOW) electrical cord with ground. The pumps must be submersible High-Head Effluent pumps. Pumps shall be UL and CSA listed for use with effluent. The pumps must have a minimum 24-hour run dry capability without water lubrication. The pumps shall have a 1/8-inch bypass orifice to ensure flow circulation for motor cooling and to prevent air bind. The pump shall have a floating impeller design to protect against up thrust and increase pump life. The pumps liquid ends must be repairable (by replacing impellers and/or diffusers) for better long-term cost of ownership. The motor must be rated for continuous use and frequent cycling, at least 100 cycles per day. The motor cable must be suitable for Class 1, Division 1 and 2 applications. The pumps shall be lightweight for easy removal and maintenance. The pump intake screen must be 1/8-inch mesh polypropylene. The pump shall have internal thermal overload protection and internal lightning protection. All pumps shall undergo 3-point (Dead head, Design Flow, and Design Flow + 30%) wet testing at the factory to confirm performance.

If three phase power is available, then the pumps shall be 3/4 to 2.0 hp, 230 VAC, three phase, 60 Hz, with 30 foot long extra heavy duty (SOOW) electrical cord with ground. Pumps shall be in accordance with the specifications listed above.

PART 2 - PRODUCTS

2.01 PUMPS / OPERATING CONDITIONS

Pump model will vary based upon treatment system configuration and the power available to the site.

PF300512 – Pre-Anoxic Return (Rnox) Pump

Pump shall comply with general requirements set forth in section I (above). Orenco Systems®, Inc., Model PF300512 series or engineer-approved equal 1/2Hp, 230 VAC, single phase, 60 Hz, two-wire motor, with 10 - 30 foot long extra heavy duty (SO) electrical cord with ground. Pump shall be UL and CSA listed as an effluent pump.

PF500712 – Optional Flow Equalization Pumps or Discharge Pumps

All pumps shall comply with general requirements set forth in section I (above). Orenco Systems®, Inc., Model PF5007 series or engineer-approved equal 3/4Hp, 230 VAC, single phase, 60 Hz, two-wire motor, with 10 - 30 foot long extra heavy duty (SO) electrical cord with ground. Pump shall be UL and CSA listed as an effluent pump.

PF501012 – Optional Flow Equalization Pumps or Discharge Pumps

All pumps shall comply with general requirements set forth in section I (above). Orenco Systems®, Inc., Model PF5010 series or engineer-approved equal 1Hp, 230 VAC, single phase, 60 Hz, two-wire motor, with 10 - 30 foot long extra heavy duty (SO) electrical cord with ground. Pump shall be UL and CSA listed as an effluent pump.

PF751012 – Duplex Recirculation Pumps

All pumps shall comply with general requirements set forth in section I (above). Orenco Systems®, Inc., Model PF7510 series or engineer-approved equal 1Hp, 230 VAC, single phase,

60 Hz, two-wire motor, with 10- 30 foot long extra heavy duty (SO) electrical cord with ground. Pump shall be UL and CSA listed as an effluent pump.

Or

PF1452012 – Simplex Recirculation Pumps

All pumps shall comply with general requirements set forth in section I (above). Orenco Systems®, Inc., Model PF1452012 series or engineer-approved equal 2Hp, 230 VAC, single phase, 60 Hz, two-wire motor, with 10 - 30 foot long extra heavy duty (SO) electrical cord with ground. Pump shall be UL and CSA listed as an effluent pump.

2.02 AX-MAX ADVANTEX® TREATMENT SYSTEM

A. The treatment system shall be an Orenco Systems®, Inc. AdvanTex® AX-MAX facility. The facility shall be a complete, fully plumbed wastewater treatment system for receiving and processing septic tank effluent. The unit(s) shall be a modular packed bed media filter that incorporates the recirculation tank, media, lateral piping, pumps, ventilation plumbing, etc. The vessel housing the equipment shall be constructed of 4-inch insulated walls. The lateral piping network that recirculates water from the recirculation tank shall be mounted atop hanging textile media. The media shall be a hanging textile media having a surface area of greater than 2,000 sq.ft/cu.ft. The treatment unit should have a hydraulic design capacity of 25 gpd/sf based upon everyday Average Daily Flow and 50 gpd/sf based upon a Maximum Daily Flow (occurring once in a 7 day period).

B. Plant configuration and number of units will vary based upon daily flows, anticipated organic and nitrogen loading rates and expected discharge permit limits. Please consult with Orenco Systems, Inc. for a proposed configuration and sizing.

2.03 AX MAX VENTILATION SYSTEM

INDIVIDUAL UNIT FANS

An Orenco Systems®, Inc. ventilation system shall be provided in the AX-MAX Series Treatment Facility or approved equal. The fan shall be UL recognized, 0.8 Hp, 115/230VAC, 1.4A/0.7A, 3400 RPM, and provide up to 245 CFM at 0" H_2O. The exhaust from the ventilation fan shall be forced through an enclosure with an adequate amount of activated carbon to remove any odors for a period of over one (1) year.

2.04 SPLICE BOX CONDUIT SEALS AND SEALANTS

As part of the treatment package, all AX-Max units will include re-installed splice boxes and UL listed waterproof butt splice connectors. The use of a UL-approved conduit seal kit accessible above ground shall be required to prevent the passage of gases, vapors, or flames through the conduit to the control panel. An additional UL classified sealant shall be added to the splice box coupling to prevent condensation accumulation in the splice box. The following UL approved sealants shall be used:

a. UL classified moisture-cure polyurethane quick drying foam or **ENGINEER**-approved equal with an R-5 rating for each inch of foam.

b. UL classified silicone sealant or **ENGINEER**-approved equal consisting of a neutral cure silicone, non-acetic, non-corrosive silicone able to withstand temperatures to 450° F.

2.05 CONTROLS

A. Controls and alarms shall be listed per UL 508. Panels shall be repairable in the field without the use of soldering irons or substantial disassembly.

B. An InGateway 601 series cellular modem, model IG601 shall be installed. Panel is required to allow real-time connectivity with the telemetry control panel and alarm communication. Phone dialers shall not be considered as an equivalent.

C. Panel shall be Orenco Systems®, Inc. TCOM™ control panel or engineer-approved equal, meeting the following:

1. Data Collection and Utilization: Logs data for system conditions and events such as daily flows, pump run time, pump cycles, and alarm conditions. Logs shall store data for at least a year.
2. Downloadable Logs: Download logs into a *.dif or ASCII format for simple conversion to common spreadsheet or word processor programs.
3. Multi-Level Password Security: Only qualified personnel can remotely access site.
4. Program Logic Rules: Simple "If … then" declarations.
5. Rules can be written based on several operands, including the following:
6. Input/output status
7. Point status
8. Date: mm/dd/yy format
9. Time of day: 24 hour clock
10. Timers
11. Historical data (allows for control optimization or detection of trends)
12. Schedule functions to control digital "Points" based on date or day of week/time.
13. Automatic daylight savings time adjustment.
14. Automatic call-out to pagers during alarm conditions when panel detects trends that could lead to system failure.

D. In addition, the unit shall have the capability of real-time direct connection to the panel via laptop serial port, to allow the operator real-time access to detailed logged data and the ability to change point values.

1. Standard Components
    a. Motor-Start Contactor: 17 FLA, 1-2 hp, 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA for 230VAC.
    b. HOA 3- Way Toggle Switch: Single-pole switch, Hands (manual) Off, Auto ON. 20 amps, 1 hp.
    c. Controls Circuit Breaker: 10 amps, OFF/ON switch. Single-pole 120 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
    d. Pump Circuit Breaker: 20 amps, OFF/ON switch. Single-pole for 120 VAC or double-pole for 230 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
    e. Audio Alarm: 80 dB at 24", warble-tone sound.
    f. 120VAC Ground Fault Interrupter (GFI)
    g. Current Sensor: 120 VAC with adjustable high & low alarm set points.
    h. Visual Alarm: 7/8" diameter red lens, "push-to-silence." NEMA 4, 1-watt bulb, 115 VAC.
    i. Panel Enclosure: NEMA 4, constructed of painted steel; hinges and latch are stainless steel. Conduit couplings provided.

j. Remote Telemetry Unit: ATRTU-Net; self powered 24 VDC at 10 mA max, 8 digital inputs, 8 analog inputs expandable to 16 with expansion board. On-board modem (9600 baud), Ethernet port (10 base T, RJ45jack) and Modbus port (R5422/485 terminals).

k. Touch Screen Display: interface module with 5.7 color touch screen, mounted in Panel Door.

l. Flow Meter – Siemens, electromagnetic flow meter model MAG 3100, with 5000/6000 series transmitter. In addition to logging daily flows, flow meter shall log flows on an hourly basis.

a. Pump Run Light: 7/8" green lens. NEMA 4, 1-watt bulb, 120 VAC.

b. Surge Arrestor: AG2401 120/230V, three 18" leads, rated for a maximum of 32,000amps, UL/CSA listed.

c. 3- Way (main, auto, off) manual transfer/disconnect switch

d. Effluent Alarm: 95db at 24", warble-tone sound.

2.06 CONTROL BUILDING

The control building shall be an Orenco Systems®, Inc. Fiberglass Shelter or engineered approved equal to house controls and chemical feeders. The shelter shall be a complete seamless, molded, one-piece enclosure constructed of an insulated foam-core wall monolithically poured. Wall thickness shall be no less then 4-inches thick with a minimum insulation value of R12. Shelter shall be capable of withstanding 160mph. The roof shall be capable of handling a 100psf live load. Manufacture will provide a 10-year limited warranty on workmanship.

2.07 INSTALLATION

All treatment, pumping system, and electrical components shall be installed in accordance with the **MANUFACTURE'S** recommendations, the engineer's plans, and all state and local regulations.

2.08 LOCATION

The pump control panel shall be mounted within a building nearest the tank and pump. The panel, when possible, should be mounted in the shade and protected from the weather. The panel should be located at a convenient height (usually about five feet above the ground) and where it will be accessible for maintenance.

PART 3 - EXECUTION

3.01 PRECONSTRUCTION CONFERENCE

Before any work at the site is started, a conference attended by the **OWNER**, **CONTRACTOR**, **ENGINEER, MANUFACTURE, OPERATOR** and others as appropriate will be held to establish a working understanding among the parties as to the work involved for installing each component of the treatment system. At this conference, the **OWNER**, **CONTRACTOR**, **ENGINEER**, and **MANUFACTURE** shall designate, in writing, a specific individual to act as **INSPECTOR** for the installation of the treatment system. Any cost or fees associated with the services of the **INSPECTOR** or the **ENGINEER** during construction will be the responsibility of the **OWNER.**

3.02 INSTALLATION AND FILED TESTING TRAINING

The **MANUFACTURER** shall provide the services of a trained representative to instruct the installing **CONTRACTOR'S** crew and **INSPECTOR** regarding the proper installation and field testing of each component per the **MANUFACTURE'S** recommendations and requirements. The **MANUFACTURER** shall have a trained representative provide installation and field testing training services for a minimum of one (1) visit of a minimum of one (1) eight-hour day at the beginning of construction.

3.03 QUALITY CONTROL

A. To ensure quality control, the **INSPECTOR** shall inspect and certify that an initial installation of the AdvanTex® system is in compliance with the **MANUFACTURE'S** recommendations and requirements.

B. Upon completion of the inspection, the **INSPECTOR**, in coordination with the **ENGINEER**, shall perform or direct the **CONTRACTOR** to perform any required adjustments to the equipment and place into operation under the supervision of the **ENGINEER**. All equipment and materials required to perform the testing shall be the responsibility of the **CONTRACTOR.** A letter of completion shall be signed by the **INSPECTOR** and copies faxed, emailed, or mailed to the **ENGINEER** and **MANUFACTURE** within one (1) week of the AdvanTex® system being installed and prior to System Commissioning.

C. The **MANUFACTURER** shall provide the services of a trained representative for a minimum of one (1) visit of a minimum of one (1) eight-hour day for the purpose of quality control during construction.

3.04 SYSTEM COMMISSIONING

A. The **MANUFACTURER** shall provide the services of a trained representative for training the **OWNER'S** service provider, and inspecting the AdvanTex® installation. The inspection will include items covered from the installation training. Upon system commissioning, the **MANUFACTURER'S** trained representative shall provide the **ENGINEER** a written report of findings. The **ENGINEER** should then perform or direct the **CONTRACTOR** to perform any required adjustments to the equipment and place into operation. All equipment and materials required to perform additional testing shall be the responsibility of the **CONTRACTOR.** The **MANUFACTURER** shall submit to the **ENGINEER** and **OWNER**, a detailed start-up checklist, according to the manufacturers inspection and startup procedures.

B. The **MANUFACTURER** shall provide the services of a trained representative for a minimum of one (1) visit of a minimum of one (1) eight-hour day for the purpose of system commissioning.

PART 4 – OPERATION AND MAINTENANCE

4.01 OPERATION AND MAINTENANCE MANUALS

The **MANUFACTURER** shall provide five (5) operation and maintenance manuals, four (4) to be sent to the **OWNER**, and one (1) sent to the **ENGINEER.**

4.02 SPARE PARTS

The **MANUFACTURER** shall provide a spare nozzles, spare pump, and spare control panel parts.

4.03 OPERATION AND MAINTENANCE TOOLS

A. AX LATERAL BRUSH CLEANING KIT

MANUFACTURER shall provide a minimum of one (1) AX Lateral Brush Cleaning Kit. This kit shall include 90-inch lateral cleaning brush used to clean 1-1/4" diameter laterals and shall be Orenco Systems®, Inc., OM-AX-LAT BRUSH CLEANING KIT or **ENGINEER**- approved equal.

B. AX SHEET CLEANING WAND

MANUFACTURER shall provide a minimum of one AX sheet-cleaning wand. Wand shall be Orenco Systems®, Inc. model OM-AX-CLEANING WAND or **ENGINEER**-approved equal. Cleaning wand shall have the ability to connect to a standard garden hose, and fit in between AX sheets to spray off debris.

C. FIELD TEST KIT

MANUFACTURER shall provide a field test kit to monitor the following parameters:

a. pH
b. Alkalinity
c. Ammonia (NH_3-N)
d. Nitrate/Nitrite (NO_3-N / NO_2-N)
e. Dissolved Oxygen (DO)
f. Chlorides
g. Turbidity
h. Temperature

The field test kit shall include:

a. pH test strips (0-14 pH)
b. Alkalinity test strips (0-240 ppm)
c. Ammonia (NH3-N) test strips (0-6 ppm)
d. Nitrate/Nitrite (NO_3-N / NO_2-N) test strips (0-50 ppm)
e. Dissolved Oxygen (DO) kit (1-12 ppm)
f. Chloride titrators (30-600 ppm & 300-6000 ppm)
g. Turbidity kit (0-200 NTUs)
h. Thermometer (0-240° F)

Changing the Way the World Does Wastewater®

APPENDIX A

e) AX-MAX INSTALLATION CHECKLIST

SYSTEM OWNER:_____ **DATE:** _____

SITE ADDRESS: _____

_____ **SYSTEM PROVIDER:** _____

CONTRACTOR: _____ **INSPECTOR:**_____

AS-BUILT SITE DIAGRAM

Please draw an as-built sketch of the site including approximate location of buildings, property boundaries, trees, fences, existing septic systems, existing wells, new septic tank, recirculation tanks, pump basins, AdvanTex® system, sewer piping, drainfield, etc. Include dimensions.

YES	*NO*	*PRE-INSTALLATION*	*DATE/INITIAL:*
_____	_____	Tank and AX-MAX location approved per engineer	
_____	_____	Panel location approved per engineer	
_____	_____	Electrical supply (# circuits/disconnect)	
_____	_____	AX-MAX equipment package reviewed and approved	
_____	_____	Contractor has reviewed AX-MAX Installation Manual (NIM-ATX-AX-3)	

YES	NO	TANK INSTALL (per Manufacture)	DATE/INITIAL:
_____	_____	Tank Warranty	
_____	_____	Date manufacture specified	
_____	_____	Factory leak test documentation	
_____	_____	Inlet connection approved	
_____	_____	Certificate of Origin	
_____	_____	Inlet tee installed	
_____	_____	Riser-to-Tank connections approved	
_____	_____	Tank is level and properly bedded	
_____	_____	Tank passes leak test/water tight test (tank filled 2" above tank/riser connection)	

YES	NO	ACCESS RISERS	DATE/INITIAL:
_____	_____	Access risers installed per manufacture's instructions	
_____	_____	Splice Box location acceptable and installed per manufacture's instructions	
_____	_____	Discharge grommet holes installed properly and oriented per engineer's plans (if applicable)	

YES	NO	SITE PREP-INGROUND INSTALLATION	DATE/INITIAL:
_____	_____	Verify elevations and orientations per engineer's plans can be achieved	
_____	_____	If gravity from septic tank to AX-MAX, ensure 1/8-inch slope between vessels	
_____	_____	Outline and mark excavation site, excavate to depth shown on plans	
_____	_____	Bottom of excavation is free of debris, rocks, or sharp objects	
_____	_____	Proper bedding material laid and at least 4-inch thick by 7-1/2-feet wide and encompasses the length of the AX-MAX	
_____	_____	Bedding material leveled and compacted	

YES	NO	SET AX-MAX UNIT	DATE/INITIAL:
_____	_____	Installer has reviewed offloading instructions	
_____	_____	AX-MAX lid is above grade per engineer's plans	
_____	_____	AX-MAX units have proper spacing per engineer's plans	

YES	NO	ANTIBUOYANCY MEASURES	DATE/INITIAL:

_____	_____	Manufacture supplied anti-buoyancy flanges attached
_____	_____	Concrete forms constructed per manufacture's instructions
_____	_____	Rebar placed per manufacture's instructions
_____	_____	Concrete poured into forms and set prior to backfilling

YES	NO	PARTIAL BACKFILL/WATER TEST	DATE/INITIAL:
_____	_____	Proper backfill used and free of debris, rocks, or sharp objects	
_____	_____	AX-MAX backfilled in 12-inch lifts and compacted with mechanical compactor	
_____	_____	AX-MAX watertight tested per manufacture's instructions	

YES	NO	PUMPS/PLUMBING/VENTILATION	DATE/INITIAL:
_____	_____	All pumps and connections identified	
_____	_____	All pumps installed and connected to discharge assemblies, packing material removed	
_____	_____	All fittings, transport and plumbing lines installed and sized per engineer's plans	
_____	_____	Any exposed pipe painted with UV resistant paint	

YES	NO	CONTROL PANEL	DATE/INITIAL:
_____	_____	Incoming power to panel installed	
_____	_____	Phone line or high speed internet to the modem is installed	
_____	_____	Wiring from pumps and floats installed per manufacture's schematic	
_____	_____	Conduit seal installed before control panel for all conduits	
_____	_____	Control panel installed under awning or in control building	
_____	_____	Control panel documentation and schematics left in control panel	

YES	NO	BACKFILL INSTALLATION	DATE/INITIAL:
_____	_____	Backfill complete using 12-inch lifts and mechanically compacted	
_____	_____	Backfill brought to final grade per engineer's plans	

YES	NO	PREPARE FOR OPERATION	DATE/INITIAL:
_____	_____	AX-MAX filled half way for pump tests	
_____	_____	Nozzles are facing up and lateral flush valves are open	
_____	_____	Pumps turned on and laterals flushed of all debris	
_____	_____	Nozzles pointed down and lateral flush valves closed after flushing	

_____	_____	
_____	_____	Manifold pressures adjusted to 3-3.5 psi
_____	_____	All nozzles have a uniform spray and reach edge of splash guards
_____	_____	Floats checked for proper operation by simulating a raising and lowering of the liquid level
_____	_____	Fan is operational and there is air flow at the inlet and exhaust

YES	***NO***	***PREPARE FOR START UP***	***DATE/INITIAL:***
_____	_____	All plumbing connections have been completed and tested	
_____	_____	All electrical connections have been completed and tested	
_____	_____	All tanks have successfully been tested for watertightness	
_____	_____	Phone or high speed internet line has been connected and is operational	
_____	_____	Floats work as intended by simulating a rising and lowering of the liquid level	
_____	_____	There is enough water in all tanks to perform pump and float operations	
_____	_____	All exposed PVC is either protected by UV paint or insulation	

Inspector: _____ ***Date:*** _____

END OF SECTION

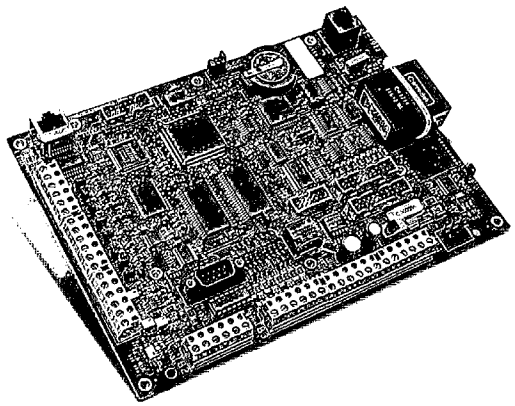
Technical Data Sheet

Orenco® TCOM Remote Telemetry Board

Applications

Orenco's line of affordable TCOM remote telemetry units give facility managers, operators, and maintenance providers the ability to remotely monitor and control the performance of mechanical equipment in real time. Ideal for:

- Wastewater Collection and Treatment
- Water Systems
- Environmental Monitoring
- Industrial Processes



Orenco® TeleComm™ (TCOM) ATRTU-NET remote telemetry board

Features/Unique Specifications

To specify this panel for your installation, require the following:

- Automatic call-out to e-mail capable devices during alarm conditions or when panel detects trends that could lead to system failure
- Ability to maintain logs for system conditions and events, such as Motor Run Time, Motor Cycles, and Alarm Conditions
- Downloadable logs into a *.dif or ASCII format for simple conversion to common spreadsheet or word processor programs
- No proprietary computer software needed for remote monitoring and control. VT100 protocol allows remote access and control from any computer modem (Mac or PC) with a simple communications program (e.g. Windows® HyperTerminal).
- Bluetooth® adapter available.
- Multi-level password security to ensure that only qualified personnel can remotely access site
- Simple interface using status, reference, and control parameters (Points). Points are viewable/editable by the operator. The following "point" types are supported:
  - Digital: on or off condition
  - Analog: numeric range (± 20,000,000)
  - Date: mm/dd/yy format
  - Time: 24 hour clock
  - Label: Text (7 character max)
- Program logic (rules) consists of simple conditional "If... Then" declarations. Rules can be written based on several operands, including the following:
  - Input / Output status
  - Point status
  - Date: mm/dd/yy format
  - Time of day: 24 hour clock
  - Timers
  - Historical data (allows for control optimization or detection of trends)
- Schedule Functions to control digital "Points" based on date or day of week / time
- Automatic daylight savings time adjustment
- Optional graphical interface software to view system status and permit interactive system control
- Ability to upload new programming remotely
- Ability to upload firmware updates remotely

TCOM Remote Telemetry Board (continued)

Model: ATRTU-NET

Hardware Specifications

Physical Size

- 5.75" x 8.0"

Terminations

- Removable terminal blocks with screw compression terminals
- Accepts 16 to 22 AWG solid or stranded wires

Digital Input Features

- Eight inputs
- Discrete or pulse (25 pulse/sec maximum)
- Self-powered: 24 VDC at 10 mA maximum
- Yellow LED input indicators
- Optically isolated
- Expandable to 16 inputs with expansion board

Analog Input Features

- Eight inputs
- Expandable to 16 inputs with expansion board
- 0-5 VDC input signal, or 4-20 mA input with jumper)
- Linear or 10k ohm thermistor scaling
- 12-bit analog-to-digital resolution

Digital Output Features

- Eight outputs
- Expandable to 16 outputs with expansion board

Analog Output Features

- Two outputs
- 4-20 mA output signal
- 10-bit digital-to-analog resolution

Communication Ports

- RS-232 port – 9 pin (Bluetooth adapter available)
- On-board modem: 33.6-k baud (RJ11 phone jack)
- Ethernet port (10 base T, RJ45 jack)
- Serial modbus port (RS422/485 terminals)

Sensor/External Relay Power Supply

- 5 VDC, 30 mA maximum
- 24 VDC, 350 mA maximum

Power Requirements

- 24 VDC, 1.2 A

Environment

- 32° F to 122° F (0° C to 50° C)
- 5% to 95% RH, non-condensing

Firmware Specifications

Safety Features

- Non-volatile memory backup of program
- Lithium battery backup of data and program settings (1-year storage without power)
- Hardware Watchdog Timer to restart system in the event of a program corruption
- Battery backup to allow continued monitoring and alarm functions during power outage (optional)

Logs

- Activity log (a minimum of 2048 defined digital events)
- Alarm log (up to 240 board-level events)
- Custom designed user logs for recording flow, level, alarms, etc. (up to 32 individual logs, with a total of 65,472 logged data points)
- Maintenance log (up to 64 entries of 60 characters)

Control Parameters (Points)

- 672 available control parameters

Program Logic (Rules)

- 800 available rules

Schedules

- 64 available events (time and day or date-based) events

Alarm Callout Capability (Mailboxes)

- 16 destinations (mailboxes) available for alarm event notifications
- E-mail capable (POP3/SMTP e-mail server required)

Networking Protocols

- Ethernet
  a. Modbus TCP-capable (permits peer-to-peer communications, up to 16 peers)
  b. HTTP Web server-capable
  c. TELNET text terminal compatible
- Serial modbus (permits our controller to act as master or slave)
  a. As "master," modbus permits connection to off-the-shelf, non-proprietary devices that support modbus protocols. Can control and monitor up to 32 clients.
  b. As "slave," modbus permits connection to and communication with modbus servers.