

# Lake Bennett Community

## Onsite Wastewater Management System

### Operation and Maintenance Manual

Version 1.



## Project Details

<b>PROJECT TITLE:</b>	Lake Bennett Community Onsite Wastewater Management Upgrade
<b>PROJECT LOCATION:</b>	841 Chinner Road, Lake Bennett, Northern Territory
<b>ONSITE WASTEWATER MANAGEMENT SYSTEM OVERVIEW:</b>	<p>AdvanTex® wastewater treatment system supplied by Orenco Systems® Inc (Orenco) with a peak hydraulic design of 37,800 L/day.</p> <p>Septic Treatment and Effluent Pumping (STEP) tank, to replace the existing Sewer Pump Station 2 (SPS2).</p> <p>Effluent Disposal Land Application Area (LAA) utilising subsurface 'dripline irrigation' providing a total area of 9,425 m<sup>2</sup>.</p>
<b>PEAK DESIGN:</b>	37,800 L/day
<b>WMS DESCRIPTION:</b>	<p>The Treatment Plants consists of:</p> <ul style="list-style-type: none"> <li>(1) 22kL STEP Tank (SPS2 replacement)</li> <li>(1) 22kL Primary Tank 1</li> <li>(1) 22kL Primary Tank 2</li> <li>(1) 22kL Anoxic Tank</li> <li>(2) 15kL Recirculation Tanks</li> <li>(4) AX100 treatment units with active ventilation</li> <li>(1) 15kL Discharge Tank</li> <li>(1) Orenco Telemetry Control Panel</li> <li>(1) UV disinfection unit</li> <li>(1) Microfiltration unit</li> <li>(1) Chlorine dosing system</li> <li>(4) 27kL Recycled Water Storage Tanks</li> <li>(2) Land Application Areas (LAA) utilising subsurface 'dripline irrigation' providing a total area of 7,620 m<sup>2</sup>.</li> </ul>
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## Important Safety Message

The document provides procedures for operation and maintenance of the Lake Bennett onsite Wastewater Management System, and details of the components that has been installed.

This document should be read and fully understood by the asset, their onsite representative (if a different person), and all maintenance personal.

All personnel involved in the operation and maintenance must be provided with appropriate training by ENVR Solutions Pty Ltd.

All plumbing maintenance personal must have appropriate qualifications, and all electrical work is to be performed by a qualified electrician. It will be the responsibility of the asset to ensure the supplied maintenance program is adhered to and their maintenance contractors have the appropriate qualifications.

Before commencing any work that may be hazardous, care should be taken to establish a safe procedure. Where more than one employee is engaged in the same job, all employees shall understand the procedures to be followed to prevent endangerment to self or other personnel on the job.

Any person monitoring, inspecting, or maintaining the systems should have:

- PPE (Personal Protection Equipment): Appropriate footwear, eye protection, gloves, masks, and clothing, etc.
- Risk management procedures to prevent injury from falling, lifting etc.
- Suitable soap and disinfectant and wash facilities are supplied for general hygiene.
- Suitable First Aid Kit so any cuts or abrasions can be cleaned with antiseptic and covered with a dressing.

Never enter a confined space (outlet structure, manhole, tank etc.) without proper training and equipment. A confined space should never be entered without at least one additional person present

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# 1. Onsite Wastewater Management System Overview

This Operation and Maintenance (O&M) Manual is provided by ENVR Solutions Pty Ltd (ENVR) for the Lake Bennett Community (LBC) Onsite Wastewater Management System (OWMS).

The OWMS sustainably treats wastewater flows that significantly over holiday periods throughout the year to a Class A quality into the following three distinct systems:

1. A Wastewater Treatment Plant (WWTP) designed with a peak loading of 38,800 L/day
2. Two Land Application Areas (LAA) utilising subsurface 'dripline' irrigation, and
3. Four Recycled Water Storage (RWS) Tanks with a total storage volume of 108,000 L to supply Class A recycled water provide recycled water safe for reuse in a future community nursery and 'greening' program.

The WWTP consists of an 'AdvanTex®' treatment system manufactured by Orenco Systems® Inc (Orenco) and designed by ENVR. The AdvanTex® treatment process is an 'attached growth' multi pass, advanced secondary treatment method specifically designed and engineered for treatment of wastewater into high-quality recycled water. Utilising naturally occurring microorganisms found within anerobic, anoxic and aerobic environments, the AdvanTex® treatment process provides extremely efficient wastewater treatment including nitrogen reduction and is perfectly suited to operate in remote locations that experience fluctuating and seasonal wastewater generation.

The LaLBC AdvanTex® system features four (4) AdvanTex® AX100 Textile Filters combined with upstream primary treatment tanks and downstream RWS tanks. An anoxic treatment tank with alkalinity dosing has is also incorporated into the design to provide effective treatment of nitrogen.

Before discharge, the treated effluent undergoes microfiltration and a two-step disinfection process to achieve Class A recycled water standards. This water is deemed suitable for irrigation within two designated subsurface irrigation zones or may alternatively be utilised in a community nursery propagation program.

Operation, control, and monitoring are managed using an Orenco TCOM Control Panel, a telemetry system that connects via a 4G network. This panel oversees all floats, valves, sensors, and pumping equipment, enabling operators to monitor and control the system in real time and remotely collect essential operational data and event records. Additionally, its communication features notify system operators if an alarm is triggered.

Overall, the ENVR designed and delivered OWMS is a proven technology that is demonstrably capable of treating wastewater that significantly fluctuates over the course of the year to a very high quality.

## 2. Treatment, Process and Component Overview

The LBC OWMS is an advanced secondary treatment solution, employing a multi-barrier methodology to safeguard public and environmental health. The system ensures complete containment of wastewater throughout each phase of the treatment process in an environmentally responsible manner, making it particularly appropriate for the Lake Bennett site.

### 2.1 Primary Treatment

Primary treatment of the raw wastewater is performed by utilising the existing septic tanks currently servicing the site and installing a further 66,000L of primary treatment into the WWTP separated across the following tanks:

- Primary Tank 1 (P-1): 22,000 L
- Primary Tank 2 (P-2): 22,000 L
- Pre-anoxic Tank (AT-1): 22,000 L

All tanks have been installed below ground level and are equipped with waterproof lids and risers. They are designed to capture and process more than two-thirds of gross solids, grease, and oils, resulting in effluent that is primarily clarified, treated, and finely screened. Owing to the increased tank capacity, de-sludging pump-out intervals are expected to be necessary approximately every 6 to 8 years.

### 2.2 Advanced Secondary Treatment

Following primary treatment, the primary clarified effluent is directed to the downstream advanced secondary treatment system, specifically the AdvanTex® AX100. This advanced secondary treatment is accomplished using four (4) AdvanTex® AX100 textile filters, which are supplied from dual 15,000L interconnected concrete recirculation tanks. The AX100 units utilize highly efficient 'attached growth' biological treatment, making them particularly suitable for sites with variable or seasonal wastewater flows. Central to their performance is a lightweight textile media filter that promotes optimal conditions for extensive microbial populations, which effectively oxidize organic contaminants in the wastewater.

Because the textile filter media is suspended above the water within each unit, there is no need for costly aerators or high-energy blowers. This design ensures that the treatment process remains energy-efficient regardless of fluctuations in influent flow, as passive treatment processes continue during both peak and minimal flow periods. Effluent circulation and discharge are managed by low-horsepower pumps operating intermittently, resulting in significantly reduced energy requirements compared to conventional activated-sludge systems. Additionally, this treatment process does not generate sludge, thereby eliminating the need for routine sludge withdrawal, handling, and disposal.

From the Recirculation Tanks, blended wastewater is distributed over the AdvanTex® textile and percolates down through the sheets where it is filtered, cleaned, and nitrified by the naturally occurring

organisms' populating the on the large surface-area. After treatment, a portion of the filtrate is returned to the pre-anoxic tank for denitrification while, a separate portion is discharged to the Disc tank via a passive recirculation ball valve.



**Image 1. An AX100 Textile Filter**

### **2.3 Disinfection and Microfiltration**

Disinfection of the final treated effluent is performed by a UV disinfection system and chlorine dosing system which is located in the Control Room. After disinfection, the treated effluent will be pumped to the Wet Weather Storage Tanks. Prior to being pumped through the disinfection systems, treated effluent will pass through a microfilter to polish remaining suspended solids in the effluent stream.

### **2.4 Wet Weather Storage**

After treatment, effluent will be stored in a series of four (4) x 27,000L Recycled Water Storage tanks which will provide 108,000 L (2.7 days) of storage on a peak flow of 38,800 L/day.

### **2.5 Monitoring and Control**

The monitoring and control of the AdvanTex® system is accomplished using an Orenco T-Com Control Panel that automatically controls pump function and system operation, whilst enabling remote supervision of the operational aspects of the treatment process. This system provides real-time monitoring and remote alarm diagnostics without having to be permanently onsite and will automatically send messages via email in the event of an alarm being generated.

The control panels, UV disinfection system, and chlorine dosing system are housed in a climate-controlled control room. This robust design safeguards essential control and disinfection functions from

environmental factors, helping to maintain the long-term sustainability of the entire onsite wastewater treatment and disposal system.

## 2.6 Subsurface Irrigation

Treated effluent is reused as a watering resource and irrigated via subsurface driplines installed across the LAA areas:

- Irrigation Area 1
  - Total area = 6,234 m<sup>2</sup>
  - Operates as one singular area
- Irrigation Area 2
  - Total area = 1,386 m<sup>2</sup>
  - Separated into 4 subareas control vi individual solenoid valves
- Total area = 7,620 m<sup>2</sup>.

Subsurface dripline irrigation is an excellent way to evenly distribute water throughout a soil profile eliminating the risk of over-saturation and run off. In addition to soil percolation, the use of 'trickle' irrigation within the soil maximises the potential for evapotranspiration from vegetation planted with the garden beds. Furthermore, beneficial residual nutrients remaining in the effluent are made available to plant root-mass within the rhizosphere of the soil profile, which further maximises vegetation growth responses. All these factors will prevent run-off and potential contamination of adjacent aquatic habitats. This approach will ensure the environmental values of the site are protected and that compliance with all environmental protection legislation is upheld.

**Table 5. Summary of STEP Tank, OSWTP and LAA Components and Suppliers**

Component	Role/Function	Equipment Description	Supplier
STEP Tank (SPS2 Replacement)	<p>The old SPS2 infrastructure has been decommissioned and replaced with a new 22kL STEP Tank with internal epoxy coating to prevent Hydrogen Sulphide (H<sub>2</sub>S) attack, and an anti-flotation concrete ring-beam will be poured around the base of the tank to prevent tank movement from seasonal groundwater movement.</p> <p>The tank has been fitted with an Orenco Biovault Pump Package with Effluent Filter which prevents the pump from ever clogging with rags, wipes or other debris that has found its way into the collection network. Only 'primary clarified effluent is discharged from this tank, and solids will remain in the underground tank for passive, natural treatment and only need to be pumped every 6 to 8 years</p>	1 x 22,000 L concrete tank with internal epoxy coating to prevent H <sub>2</sub> S attack	Taylex and Fastcall Plumbing NT
		<p>2 x Fibreglass lids and extended risers.</p> <p>1 x venting lid with activated carbon odour suppression kit</p> <p>1 x tank shield anti-access grate</p> <p>1 x MVP Control Panel</p> <p>1 x Biovault pumping package with 2 x discharge pumps and effluent filter</p>	Orenco
Primary Tank 1 (PT-1)	<p>The primary treatment stage is designed to receive raw wastewater; segregate settleable and floatable solids (sludge and scum); accumulate, consolidate, and store solids; digest organic matter; and discharge primary-treated effluent. Can typically achieve BOD removal of &gt;50% and TSS removal of &gt;90% when using an Effluent Filter.</p>	1 x 22,000 L concrete tank with internal epoxy coating to prevent H <sub>2</sub> S attack	Taylex and Fastcall Plumbing NT
		<p>2 x Fibreglass lids and risers</p> <p>1 x venting lid with activated carbon odour suppression kit</p> <p>1 x tank shield anti-access grate</p>	Orenco
Primary Tank 2 (PT-2)		1 x 22,000 L concrete tank	Taylex and Fastcall Plumbing NT

	Primary Tank 2 will provide equalization and stability by leveling out peaks in flow and allow consistent loading of the AdvanTex® AX100 filters. Primary Tank 2 also provides primary treatment as described above and is fitted with a Biotube Effluent Filter.	2 x Fibreglass lids and risers 1 x Biotube Effluent Filter, 12" 1 x tank shield anti-access grate	Orengo
		1 x 50 mm HR MultiJet Water Meter Male Thread with Pulse Reed Output (10 litre Pulse)	Thinkwater NT
Anoxic Tank (AT-1)	This process consists of recirculating a portion of the recirc-blend (or filtrate) from the AdvanTex® secondary treatment system to an anoxic zone within in a separate pre-anoxic tank. The anoxic treatment stage provides a denitrification process to reduce overall Total Nitrogen concentrations. During the denitrification process, BOD is consumed during the conversion of NO <sub>3</sub> to N <sub>2</sub> gas by facultative heterotrophic bacteria. The N <sub>2</sub> gas is then returned to the atmosphere. Alkalinity in the form of Sodium Bicarbonate is dosed into this tank.	1 x 22,000 L concrete tank	Taylex and Fastcall Plumbing NT
		2 x Fibreglass lids and risers 1 x Biovault pumping package with 2 x discharge pumps	Orengo
AdvanTex® Treatment -	In the secondary treatment process, AdvanTex® AX100 units filter and clean effluent from the primary treatment stage and will typically achieve treatment levels of < 10mg/L BOD and TSS (30-day average or 30-day arithmetic mean), with total nitrogen (TN) reduction typically > 60% and nitrification averages of 95% (range 90-99%).  After primary and pre-anoxic treatment, effluent is transported to the recirculation tanks feeding the AX100 Filters where it is blended with AdvanTex® filtrate. The blended wastewater is distributed over the AdvanTex® textile media and percolates down through the media, where it is filtered, cleaned, and nitrified by the naturally occurring microorganisms populating the media. After treatment, a portion of the filtrate is returned to the recirculation tanks while another portion is transported to the discharge tank. Note that a portion of the recirc-blend (or filtrate) is also returned directly back to the pre-anoxic tank treatment stage to facilitate denitrification.	2 x 15,000 L concrete tanks	Taylex and Fastcall Plumbing NT
		4 x AX100 Textile Filters 1 x Ventilation Assembly 1 x Recirculating Ball Valve 1 x Recirculation Pumps 1 x Filtrate Return Pump 4 x Fibreglass lids and risers	Orengo
Alkalinity Dosing	The nitrification occurring in the AdvanTex® system is heavily influenced by the alkalinity required to buffer the process (7.14mg/L alkalinity per 1mg/L of ammonia N). For complete nitrification, pH levels of 7.5 to 8.5 are required and need to be buffered to always remain above a pH of 7, as nitrification effectively ceases at a pH of 5. The use of additional alkalinity to buffer the process is critical for all nitrogen removal for the	1 x Fiberglass Liquid Chem feed Unit (Orengo) 1 x Peristaltic alum feed pump (Orengo)	Orengo

	<p>OSWTP, and the alkalinity dosing system has been sized to provide a minimum targeted residual of 80mg/L, with a preferred residual target of 100mg/L.</p> <p>Sodium bicarbonate will be used to dose alkalinity into the pre-anoxic tank upstream of the AdvanTex® system. The Liquid Chem Feed Unit will feature an internal mixer to ensure adequate mixing of the chemical remains constant.</p>		
Disinfection	<p>Disinfection of the final treated effluent is performed by a UV disinfection system and chlorine dosing system which is located in the Control Room. After disinfection, the treated effluent will be pumped to the Wet Weather Storage Tanks.</p>	1 x Sanitron S5000C UV disinfection unit (Orengo)	Orengo
		1 x Chlorine Dosing System	Thinkwater NT
Final Filtration	<p>To consistently achieve a Total Suspended Solids (TSS) target of &lt;10mg/L, and to ensure treated effluent will exhibit the lowest turbidity required for optimum UV disinfection, a microfiltration unit will be installed upstream of the UV disinfection system.</p>	1 x HUR 90 HP Housing and HC/90-5 Filters microfiltration unit (Orengo)	Orengo
Control Panel	<p>The Control Panel is a telemetry-based panel connected into a remote network system. It controls all sensors, pumping, and dosing equipment for the WWTP, and provides real-time operator monitoring and control of system components, as well as remote data collection of key operational parameters and events. The panel's communication function provides notice to system operators in the event of an alarm. ENVR and Orengo can remotely 'log-in' to the panel, determine the cause of the alarm, and – often – address the situation without having to be physically present at the treatment facility.</p>	1 x UL Type 1, T-COM Control Panel	Orengo
Control Room	<p>The control panel, chemical dosing systems, flow meter, UV system and microfiltration unit is installed inside a secure and climate controlled customised 20ft container.</p> <p>The Control Room includes a potable water supply with backflow prevention, sample collection tap, security cameras and work bench.</p>	1 x 20ft shipping container repurposed as original MAC Water Treatment Plant	<p>LBBC supplied Container.</p> <p>Container fitted out by SCF Containers (Berrimah)</p>
Recycled Water Storage	<p>Storage of Recycled Water prior to irrigation is provided in 4 x 27,000 poly tanks for a total of 108,000L allowing 2.8 days storage on a peak flow of 38,800 L/day</p>	4 x 27,000 L poly tanks	Duratanks NT
Land Application Area	<p>Treated effluent is irrigated via subsurface driplines installed across two (2) designated irrigation areas. Treated effluent is evenly distributed between the areas by distribution valves which will ensure an even distribution of recycled effluent throughout the soil profile eliminating the risk of over-saturation of the soil.</p>	Subsurface driplines are Netafim Bioline 17 pressure compensating drip irrigation lines.	Thinkwater NT

	<p>In addition to soil percolation, the use of 'trickle' irrigation within the soil maximises the potential for evapotranspiration. Furthermore, beneficial residual nutrients remaining in the effluent will be made available to plant root-mass within the rhizosphere of the soil profile. All these factors will prevent run-off and potential contamination of adjacent aquatic habitats</p> <p>Treated effluent will be discharged via 2 x new subsurface dripline irrigation disposal areas providing a total area of 7,620 m<sup>2</sup> (3mm/day DLR = 22,860 L/day allowable discharge).</p>	<p>All pipelines and fittings associated with the irrigation zones to be distinctly and permanently coloured lilac.</p> <p>Prominent warning signs have been displayed in the vicinity of all irrigation zones with the works 'RECYCLED WATER BEING USED – AVOID CONTACT'.</p>	
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## 3. Operating Overview

### 3.1 Primary Tank 1

#### Description

Raw effluent enters a 22,000L primary tank where treatment occurs via settling and anaerobic digestion.

#### Operating Logic

None. Passive operation

### 3.2 Primary Tank 2

#### Description

Primary treated effluent gravity flows from PT-1 into PT-2, which is also a 22,000 L concrete tank. Further primary treatment of the effluent occurs in this tank before exiting via gravity through an effluent filter ensuring that all solids and debris greater than >3mm remain in the tank.

#### Operating Logic

None. Passive operation

### 3.3 Pre-Anoxic Tank

#### Description

Effluent gravity transfers from PT-2 into the 22,000L anoxic tank (AT-1) to undergo further primary treatment. Some treated effluent is pumped back from the AdvanTex Recirculation Tank creating an 'Anoxic' environment which produces denitrification biochemical processes.

Effluent is discharged from this tank to the downstream AdvanTex Recirculation tank via dual 'duty/standby' submersible pumps from float-controlled operation.

#### Operating Logic

Pre-anoxic – Controls the pumps (2), PF(50Hz)300534, 380V 3Ø, 1/2Hp (1.1Amps Each), in a duplex alternating, on demand mode.

- Pre-Anoxic Tank Float Operation
  - High Level Alarm/Lag Pump Enabled
  - Lead Pump On.
  - Pump(s) Off

- Redundant Off/Low Level Alarm.
- Pre-Anoxic Tank Settings
  - High Level Delay 5.00 Seconds
  - Lag Enable O/F
  - Minimum Run Time 30.00 Seconds
  - Pump High Amp Alarm 4.10 Amps
  - Pump Low Amp Alarm 0.50 Amps
  - Pump 1 Liters per Minute 113.56 LPM
  - Pump 2 Liters per Minute 113.56 LPM.

### 3.4 AdvanTex Recirculation Tank

Effluent is transferred from the Pre-Anoxic Tank to the 30,000 L Recirculation Tank (comprised of two 15,000 L units). Within this tank, four recirculation pumps move the effluent to the AX100 filters, after which it returns via gravity to the Recirculation Tank. Once the tank reaches a predetermined volume, discharge to the evapotranspiration tank is facilitated through the recirculating ball valve.

The recirc pumps timer settings can be adjusted manually or can use the following program. At the top of every hour, the panel program queries the amount of time in the previous 60 minutes that the Discharge Pulse flowmeter has recorded. The panel logic takes this value (Pd) and divides by LPM to get Liters, then is multiplied by the recirc-ratio value that has been inputted into the controls. The panel then runs the pump for the amount of time required for correct recirculation based on processed flow. This is repeated continuously.

The AdvanTex Recirculation tank also contains the Pre-Anoxic Return Pump, which pumps a small portion of filtrate back to the Pre-Anoxic Tank for denitrification.

Recirc – Controls the pumps (4), PF(50Hz)500734, 380V 3Ø, 3/4Hp (1.6Amps Each), in a dual duplex alternating, time dosed mode. Cycle 1: Pumps 1&2, Cycle 2: Pumps 3&4, Repeats.

- RT Float Operation
  - High Level Alarm
  - Override Timer On/Off
  - Redundant Off/Low Level Alarm (\*Timer Active).
- RT Adjustable Settings
  - RT Use Trend Data (activate) O/F
  - RT Ret Recirc Ratio 4:1.
  - RT Maximum Off Time 20.00 Minutes

- RT Minimum Off Time 0.50 Minutes
- RT Number of Days for Average 28.00 Days
- RT Estimated Average Daily Flow 16,000.00 LPD
- RT Estimated Peak Daily Flow 25,000.00 LPD.
  
- RT Manual Timer/Pump Settings
  - RT Manual Time Set (activate) O/F
  - RT Manual Off Time 9.50 Minutes
  - RT Manual Ovr Off Time 6.00 Minutes
  - RT On Time 1.00 Minutes
  - RT Ovr On Time 1.00 Minutes
  - RT High Level Delay 5.00 Seconds
  - RT Pumps High Amp Alarm 7.00 Amps
  - RT Pumps Low Amp Alarm 1.00 Amps
  - RT Pump 4 Liters per Minute 283.91 LPM
  - RT Pump 5 Liters per Minute 283.91 LPM.
  
- Recirc Tank Auto Timer Settings
  - UseTrend Data O/F
  - Ret Recirc Ratio 4:1
  - Maximum Off Time 20.00 Minutes
  - Minimum Off Time 0.50 Minutes
  - Number of Days for Average 28.00 Days
  - Estimated Average Daily Flow 12,000.00 LPD
  - Estimated Peak Daily Flow 37,800.00 LPD.
  
- Manual Timer/Pump Settings
  - High Level Delay 5.00 Seconds
  - Lag Enable O/F
  - Manual Time Set O/F
  - Off Time 13.80 Minutes
  - On Time 1.50 Minutes
  - Ovr Off Time 4.60 Minutes
  - Ovr On Time 1.50 Minutes
  - Pump High Amp Alarm 4.60 Amps
  - Pump Low Amp Alarm 0.60 Amps
  - Pump 1 Liters per Minute 189.27 LPM
  - Pump 2 Liters per Minute 189.27 LPM.

- Pump 3 Liters per Minute 189.27 LPM
- Pump 4 Liters per Minute 189.27 LPM.

Pre-anoxic Return – Controls the pump (1), PF(50Hz)300534, 380V 3Ø, 1/2Hp (1.1Amps), in a simplexing time dosed mode.

- Pre-Anoxic Return Settings
  - Manual Off Time 55.60 Minutes
  - Manual On Time 4.40 Minute
  - Use Flow % Timer O/F
  - Flow Multiplier 1.25
  - Minimum Dose Flow 10.00 L
  - Pump 1 Enable O/F
  - Pump High Amp Alarm 4.10 Amps
  - Pump Low Amp Alarm 0.50 Amps
  - Pump 1 Liters per Minute 113.56 LPM

### 3.5 Discharge Tank

The Discharge Tank is a 15,000L tank that receives treated effluent from the AdvanTex Recirculation Tank, and discharges tot the irrigation areas or RWS tanks.

The discharge pumps activates on a volume-demand program when the tank has reached a specific volume and discharge a small portion of treated effluent out of the tank and through the control room where it passes through the microfilter, UV system and chlorine dosing system prior to the irrigation area or RWS tanks.

Discharge – Controls the pumps (2), PF(50Hz)752034, 380V 3Ø, 2Hp (4Amps Each), in a duplex alternating, time dosed mode. Also controls (2) 24VAC Valves, (8VA Max Each), (2) Irrigation Field Valves.

Daily maximum discharge limit value in the programming (user adjustable, but default will be 28,600 litres). If the maximum discharge volume is reached between midnight and 11:59 pm, the N/O solenoid valve will close and the N/C solenoid valve will open until 11:59 pm. This is prevent any more water from being discharged to the drainfield and will divert the excess water to a large storage tank. At midnight, the daily discharge volume will reset, therefore allowing the solenoids to return to their normal states.

- Discharge Tank Float Operation
  - High Level Alarm
  - Pump On
  - Pump Off
  - Redundant Off/Low Level Alarm.

- Discharge Tank Settings
- High Level Delay 5.00 Seconds
- Lag Enable O/F
- Off Time 30.00 Minutes
- On Time 15.00 Minutes
- Ovr Off Time 10.00 Minutes
- Ovr On Time 15.00 Minutes
- Pump High Amp Alarm 7.00 Amps
- Pump Low Amp Alarm 1.00 Amps
- Pump 1 Liters per Minute 283.90 LPM
- Pump 2 Liters per Minute 283.90 LPM.

### 3.6 Additional Controls

The TCOM Control Panel also features::

- Controls Surge Arrestor Fault Input (Logs Data, Alert Notification)
- (1) Valve Transformer Fault Input (Logs Data, Alert Notification)
- (1) AX Fan, On/Off (220V 1Ø, 0.9Amps), Enable/Disable Point
- (1) AX Fan Current Sensor Fault Input (Logs Data, Alert Notification)
- (2) S2400C UV Unit, On/Off (220V 1Ø, 0.64Amps Each), Independent Enable/Disable Points
- (2) S2400C UV Unit Current Sensor Fault Input (Logs Data, Independent Alert Notification)
  - **A UV Fault Does Not Disable Any Pump.**
- (1) Liquid Chem Feeder, On/off (1) Peri Pump (220V, 0.193Amps), (1) Mixer (220V, 4.7Amps)
  - Program Options
    - **Flow Pace:**
      - Operation

*\*System must have pre-anoxic return program. **Peristaltic Pump** activation is tied directly to pre-anoxic pump activation. When pre-anoxic pump is activated, peristaltic pump is activated. When pre-anoxic pump is deactivated, peristaltic pump is deactivated. Peristaltic pump feed rate is manually adjusted on the peristaltic pump. (Adjustment is based on flow rate calculation done by operator). Mixer is activated prior to peristaltic pump activation. User inputs (in minutes) pre-run time for mixer (3 min. factory default). Mixer continues activation until peristaltic pump is deactivated.*

- Program Inputs
  - Mixer Pre-run Time: (x)min. *(Factory default is 3.)*
  - Peristaltic Pump Activate- ON/OFF *(Factory default is ON.)*
  - Mixer Activate- ON/OFF *(Factory default is ON.)*

- Timer:

- Operation

Programmable ON and OFF times (in min). Factory default 1min ON, 59min OFF.

**Peristaltic pump** activates for programmed ON cycle, deactivates at end of ON cycle and for duration of OFF cycle. Timer is activated when LCFA RO float is up. Timer deactivates if LCFA RO float is down. Peristaltic pump feed rate is manually adjusted on the peristaltic pump. (Timer setting and pump feed rate is calculated by operator based on flows.) Mixer is activated prior to peristaltic pump activation. User input (in minutes) pre-run time for mixer (3 min. factory default). Mixer continues activation until peristaltic pump is deactivated. \*Note: Pre-run time for mixer cannot exceed programmed OFF time for this configuration.

- Program Inputs

- ON Time: (x)min. *(Factory default is 1.)*
- OFF Time: (x)min. *(Factory default is 59.)*
- Mixer Pre-run Time: (x)min. *(Factory default is 3.)*
- Peristaltic Pump Activate- ON/OFF *(Factory default is ON.)*
- Mixer Activate- ON/OFF *(Factory default is ON.)*
- RO float has to be in the "up" position for the peri pump to activate after RO Delay

## 4. Maintenance Guidelines

### 4.1 Occupation Health and Safety

The following are general safety requirements for all personnel operating or performing maintenance and/or repair duties on the LBC OWMS. It is a requirement of all personnel to ensure the following safe work practices are adhered to.

### 4.2 Personal Protective Equipment

Personal protective equipment (PPE) is clothing, equipment or substances designed to be worn by someone to protect them from risks of injury or illness.

PPE can include but is not limited to:

- Hearing protective devices, such as earmuffs and ear plugs.
- Respirators
- Eye and face protection, such as goggles
- Safety helmets and sun hats
- Gloves and safety boots
- Clothing, such as high visibility vests or life jackets.

### 4.3 Hazards

Be aware that workplace hazards are not always obvious. Some examples of workplace hazards to look for include:

- Work environment (such as slippery floor surfaces, open tanks, and trip hazards)
- Energy (such as electricity, motor induced heat and UV light)
- Substances (such as chlorine chemicals and effluent).

### 4.4 Safety

- Caution should be taken when working around open tanks.
- All personnel involved in the operation and maintenance must be provided with appropriate training.
- All equipment on site must be operated in accordance with the supplier's manuals.
- Do not leave man-holes open for longer than necessary.
- To ensure that trip hazards are kept to a minimum, the WWTP enclosure must be kept orderly and cleaned regularly.

## 4.5 Confined Spaces

Under no circumstances should personnel enter a confined space without proper equipment or rescue personnel standing by. Confined spaces including tanks, manholes, dry wells, or any space that is below ground level or has inadequate ventilation, has the potential for containing deadly hydrogen sulphide gas.

## 4.6 Chlorine Storage

The storage of any chemicals such as chlorine is to be in appropriately bunded and signed areas and will be accompanied by relevant safety information and MSDS sheets.

## 4.7 First Aid

Take immediate action to wash thoroughly any cut, scratch, or abrasion of the skin as soon as possible. Apply antiseptic to the wound, cover with cotton wool, or gauze, and protect with a waterproof plaster.

If in contact with effluent DO NOT handle food, drink, or smoking materials without first washing your hands.

## 4.8 WWTP Operation

Only trained personal are authorised to operate the WWTP either via the Orenco TCOM Control Panel, or remotely via TCOM Viewer. If in doubt contact ENVR on 0402 524 033 or Tim Earl on 0417 892 281.

**IMPORTANT NOTE: Under no circumstances should any of the WWTP underground tanks be completely pumped out until empty!**

## 5. Maintenance Responsibilities

### 5.1 Site Caretaker

- Responsible for site upkeep within the WWTP enclosure including mowing, weeding, rubbish removal and general grounds keeping activities.
- Performs designated duties as detailed in Table 1
- Follows instructions from ENVR for incident response and fault rectification.
- Keeps records of all maintenance and incident events, fault repairs and equipment replacement.
- Keeps a general watch over the entire site and reports any issues back to the Remote Monitoring, Service and Support Provider and Apex Camp Manager.

### 5.2 Remote Monitoring, Support and Maintenance Provider

- Logs into T-COM viewer checks operational status and responds to any alarms.
- Remotely monitors all aspects of WWTP operation and assess and managers flow data.
- Is the contact between Orenco and WWTP operation for trouble shooting
- Is the contact between Orenco and Lake Bennett Body Corporate
- Coordinates, oversees, and performs all maintenance tasks as detailed in Table 1
- Performs training and ensures information is transferred between all parties.
- Coordinates and oversees incident management response and fault rectification.
- Performs influent and effluent sampling and delivers to a NATA accredited laboratory for analysis.
- Ensures compliance with all conditions of the operating licence.
- Maintains an information and record keeping management system including all flow data, sample results, incidents, complaints, and other relevant information.

### 5.3 Qualified Electrician

- Performs fault diagnostics, repair work and componentry replacement on all electrical equipment on an as needed basis.
- Is available after hours and weekends.

### 5.4 Qualified Plumber

- Carry's out pump replacement and any plumbing repair works on an as needed basis.
- Is available after hours and weekends.

## 6. Maintenance Duties

### 6.1 Land Application Area Maintenance

- Periodic mowing/slashing of irrigation areas should be performed as required.
- All irrigation areas should be always kept clear of weeds, and this can be done using careful application of herbicides (wick type) or mechanical means.
- Check for pooling or ponding of water caused from possible breakages dripline or pipework – repair as necessary.
- Twice yearly checks of soil pH and conductivity should be conducted to ensure the soil remains in good health.
- Deploy potable water irrigation during period of low occupancy of the Lake Bennett Community, and/or when turf is showing signs of heat stress or water deficiency.

#### Performance Indicators

- Turf is healthy and actively growing.
- All irrigation areas display an even coverage of turf with no lines or die-off
- Weeds are not present.
- Irrigation areas are mowed and tidy.

### 6.2 Schedule of Services

The following schedule of services is required:

- Monitir WWTP treatment performance via sampling of raw influent and treated effluent and deliver to NATA accredited laboratory.
- Service and maintain all equipment including AX100s, pumps, floats, and filters to Orenco's requirements.
- Maintain and clean all water quality monitoring equipment to manufacturers requirements.
- Maintain and clean all disinfection equipment to manufacturers requirements.
- Maintain turf in irrigation areas including watering, mowing, weeding and weeding of turf as required.
- Maintain overall site and landscaped gardens
- Monitor and assess build-up of sludge in all septic tanks and organise pump out de-sludge if required.
- Provide general upkeep of WWTP compound including rubbish and weed removal.

### 6.3 Service and Maintenance Program

The treatment plant maintenance, inspection and service program will be carried out as follows.

- Weekly inspection duties will be performed as part of a proactive and preventative maintenance and monitoring plan.
- This will coincide with a quarterly maintenance program which include influent and effluent sampling.
- Other maintenance duties will be performed at various times or as required.
- All duties involved in the maintenance program have been itemised in Table 1 below. All servicing visits, call outs, equipment replacements and incident should be recorded in the maintenance register.

**Table 1. Maintenance, Monitoring and Support Program**

Item	Task	Action	Frequency	Location
1	Remove weeds and/or rubbish from site	Site Caretaker	Daily	Onsite
2	General walk over of entire WWTP and irrigation areas to monitor for leaks, vandalism, issues, odours etc.	Site Caretaker	Daily	Onsite
3	Perform general mowing and groundskeeping of grassed areas around WWTP compound	Site Caretaker	Weekly (or as required)	Onsite
	Perform general mowing and groundskeeping of Irrigation Areas	Site Caretaker	Weekly (or as required)	Onsite
4	Log into T-COM panel to remotely monitor and assess operating efficiency, alarms, and flow diagnostics	ENVR	Daily	offsite
5	Download monthly operation log files captured and recorded via T-COM and manage into ENVR data system	ENVR	Monthly	Offsite
6	Analyse flow diagnostics of log files to monitor trends and disposal volumes	ENVR	Monthly	Offsite
7	Capture brief operating report of inflows, disposal, evapotranspiration, water quality results, faults/breakdowns and general maintenance events and submit to Lake Bennett Body Corporate	ENVR	Monthly	Offsite

8	Perform observational assessment of turf health in irrigation areas including checking for pests, diseases, and growth inhibitors	ENVR	Quarterly	Onsite
9	Check Biotube® Effluent Filters; Clean as Required (Primary Tank 2 and SPS2)	ENVR	Quarterly	Onsite
10	Perform visual inspection of liquid-levels in all tanks	ENVR	Quarterly	Onsite
11	Check Biotube® Pump Vault Filters; Clean as Required	ENVR	Quarterly	Onsite
12	Perform assessment of water flow through AX100s	ENVR	Quarterly	Onsite
13	Check Control Panel operational status (levels, alarms, pump status, flow status)	ENVR	Quarterly	Onsite
14	Flush AX100 laterals and manifolds	ENVR	Quarterly	Onsite
15	Assess spray radius of spin nozzles and clean and replace as required	ENVR	Quarterly	Onsite
16	Perform sludge accumulation assessment of Primary Tanks and SPS2 via measurement of sludge and scum levels. Organise de-sludge pump out if required	ENVR	Quarterly	Onsite
17	Inspect, test and clean all floats	ENVR	Quarterly	Onsite
18	Clean UV glass sleeves via using internal wiper mechanism	ENVR	Quarterly	Onsite
19	Remove and clean filter cartridge of microfilter unit	ENVR	Quarterly	Onsite
20	Inspect all irrigation areas for leaks and/or pooling. Repair as necessary.	ENVR	Quarterly	Onsite
21	Confirm and Record Pump Voltages and Amperages	ENVR	Quarterly	Onsite
22	Inspect and clean intakes of all submersible pumps	ENVR	Annually	Onsite
24	Replace UV lamps	ENVR	Annually	Onsite

25	Provide ongoing consulting, correspondence and reporting to NT Government on the client's behalf	ENVR	Ongoing	Offsite
26	Facilitation of a 24 hour/7-day, remote alarm response management service	ENVR	Ongoing	Onsite/Offsite
27	Provision of reports and monitoring results while maintaining appropriate records of works as required.	ENVR	Ongoing	Offsite

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## 7. Contingency Plans

### 7.1 Recycled Water Storage Limits Reached

#### Description

Recycled Water Storage Tanks at maximum volume capacity.

#### Causes

- Irrigation function not available due to prolonged wet weather, combined with high accommodation occupancy of the camp.

#### Controls

- Engage licenced pump out contractor to remove treated effluent from RWS tanks.

### 7.2 Declining Treatment Results

#### Description

Recycled water samples reveal a trending decline in water quality with regards to the following:

- E. coli
- Biological Oxygen Demand (BOD)
- Total Suspended Solids (TSS)
- Dissolved Oxygen (DO)
- Total Nitrogen (TN)
- Total Phosphorus (TP)

#### Cause

- E. coli: Failure of or inadequate disinfection process
- BOD: Not enough oxygen available to sustain oxidation of organic material and/or Oil and Grease entering recirculation tank and contaminating textile material
- TSS: Failure of microfiltration and/or overloading of AX100s
- DO: Inadequate supply of oxygen
- TN: Failure of the nitrification process (low pH, inadequate DO supply, inadequate BOD availability, low temperature, minimal retention)
- TP: Phosphorus load in wastewater inflow high.

## Controls

### E. coli

- Ensure ample supply of chlorine is always available onsite
- Confirm operation of chlorine doser
- Maintain chlorine dosing system per manufacturers requirements
- Confirm operation of UV disinfection system
- Clean UV glass sleeves using manual wiper
- Replace UV bulbs annually.

### BOD

- Ensure AdvanTex ventilation assemble is operational
- Review and adjust recirculation ratios
- Ensure all primary tank effluent filters are in place and functional
- Ensure the build-up of sludge and scum in the septic tanks is managed appropriately and there is no carryover into AdvanTex recirculation tank
- Ensure no FOG (fats, oil, and grease) is entering the AdvanTex recirculation tank by maintaining appropriate grease trap pump out frequency.

### TSS

- Ensure AdvanTex ventilation assemble is operational
- Review and adjust recirculation ratios
- Ensure all primary tank effluent filters are in place and functional
- Ensure the build-up of sludge and scum in the septic tanks is managed appropriately and there is no carryover into AdvanTex recirculation tank
- Ensure no FOG (fats, oil, and grease) is entering the AdvanTex recirculation tank by maintaining appropriate grease trap pup out frequency.
- Clean out microfiltration cartridge.

### DO

- Ensure AdvanTex ventilation assemble is operational
- Review and adjust recirculation ratios
- Ensure all primary tank effluent filters are in place and functional
- Ensure the build-up of sludge and scum in the septic tanks is managed appropriately and there is no carryover into AdvanTex recirculation tank
- Ensure no FOG (fats, oil, and grease) is entering the AdvanTex recirculation tank by maintaining appropriate grease trap pup out frequency.

TN

- Ensure AdvanTex ventilation assemble is operational
- Ensure filtrate return pump is functioning and returning water back to Pre-Anoxic Tank
- Review and adjust filtrate return ratios
- Increase alkalinity by dosing sodium bicarbonate via Liquid Chemical Feeder (contact ENVR Solutions for assistance)

TP

- Instigate a phosphorus reduction plan by informing users that phosphorus may be too high and to reduce the use of P containing detergents and products.

### 7.3 Cyclone Emergency

#### Description

Extremely destructive weather event.

#### Cause

Significant weather system associated with the wet season.

#### Controls

- Evacuate all guests and staff from the property
- Secure all tank and AX100 lids
- Remove any loose material from site
- Ensure RWS tanks are at minimum volume
- After stormfront has passed visit site to assess damage (if any)
- Check remote communications
- Engage pump out contractor to remove treated effluent from RWS tanks if required.

## 8.Plant and Equipment Register

Area	Component	Item	Quantity	Model	Serial	Manufacturer
Sewer Pump Station	SPS2	22,000 L Concrete Tank	1	Underground / Concrete Tank	NA	Taylex Tanks (Fastcall Plumbing)
		Biovault	1	Universal Biotube Pump Vault, 24" cartridge	PVU72-2425-L	Orenco
		Discharge Pump	2	Effluent Pump; 3/4Hp, 50gpm, 380-415V, 50Hz 1-phase	PF(50HZ)500712	Orenco
		Float Assembly	1	Float Assembly; Length (39")	MF4P-VC	Orenco
		MVP Control Panel	1	MVP Duplex Panel, 230V w/DM: AU/NZ Style	MVP- DAX2DM(AU/NZ)	Orenco
Primary Treatment	Primary Tank 1	22,000 L Concrete Tank	1	Underground / Concrete Tank	NA	Taylex Tanks (Fastcall Plumbing)
	Primary Tank 2	22,000 L Concrete Tank	1	NA	NA	Taylex Tanks (Fastcall Plumbing)
		Effluent Filter	1	Biotube Filter, 12"	FT1260-36	Orenco
	Pre-Anoxic Tank	22,000 L Concrete Tank	1	NA	NA	Taylex Tanks (Fastcall Plumbing)

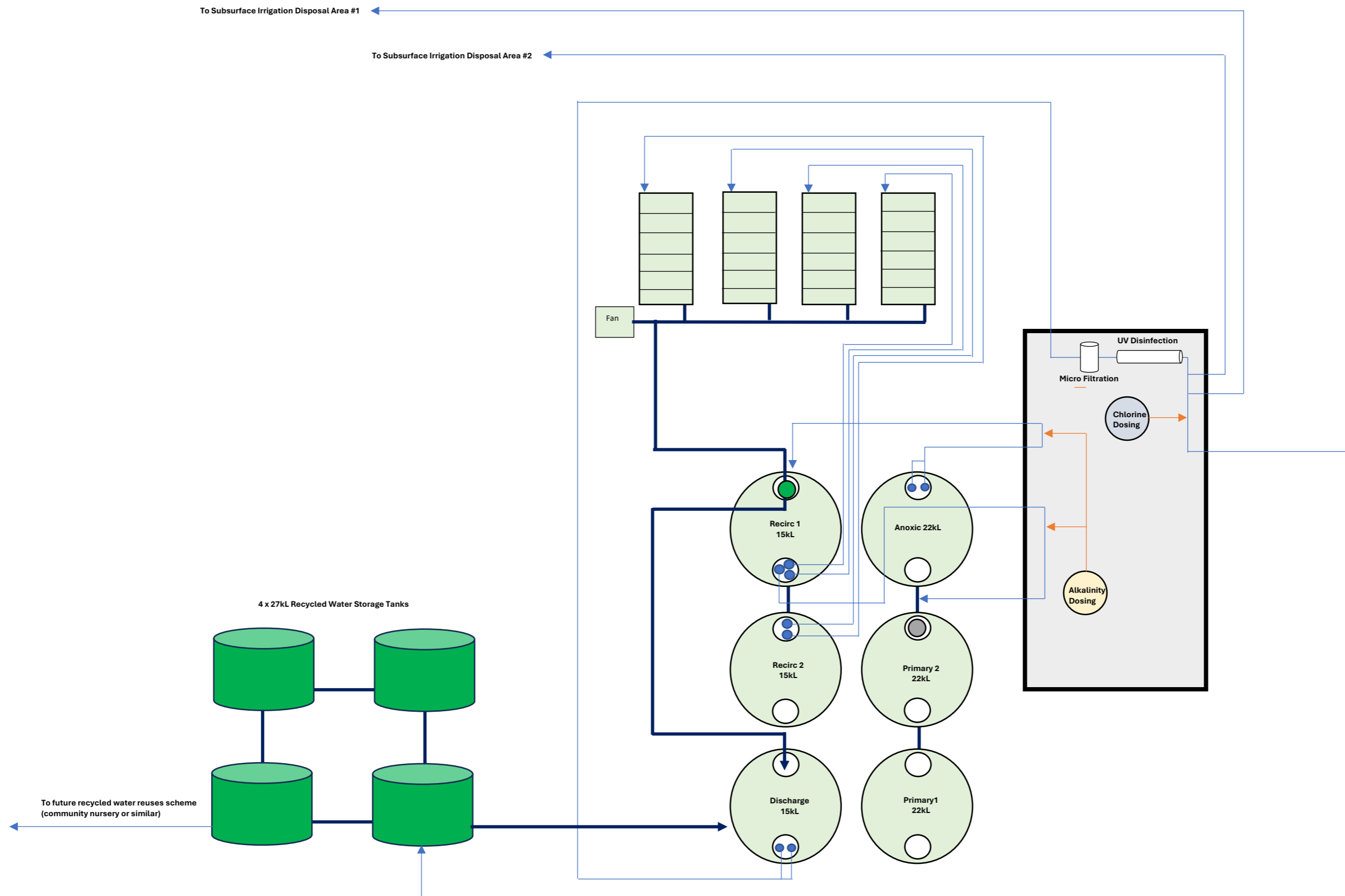
		Biovault	1	Universal Biotube Pump Vault, 24" cartridge	PVU84-2425-L	Orenco
		Discharge Pump	2	Effluent Pump; 1/2Hp, 30gpm, 380-415V, 50Hz 3-phase	PF(50HZ)300534	Orenco
		Float Assembly	1	Float Assembly; Length (39")	MF4P-39V	Orenco
AdvanTex System (secondary treatment)	Recirculation Tank	15,000 L Concrete Tank	2	Underground / Concrete Tank	NA	Taylex Tanks (Fastcall Plumbing)
		Recirculating Ball Valve	1	Float Ball Valve 4" - FRP	MM4-FRP	Orenco
		Flow Inducer Tower	1	Flow Inducer Tower - Recirc - Triplex 126"	FITR-T126	Orenco
		Flow Inducer Tower	1	Flow Inducer Tower - Recirc - Duplex 126"	FITR-T126	Orenco
		Recirc Pump	4	Effluent Pump; 3/4Hp, 50gpm, 380-415V, 50Hz, 3-phase	PF(50HZ)500734	Orenco
		Filtrate Return Pump	1	Effluent Pump; 1/2Hp, 30gpm, 380-415V, 50Hz, 3-phase	PF(50HZ)300534	Orenco
		Float Assembly	3	Float Assembly; 45" stem, Field Set	MF3P-45FS	Orenco

	Textile Filters	AX100	4	AdvanTex Filter Commercial, 100 Sqft.	AX100	Orengo
	Ventilation Assembly	Blower	1	AX Above Ground Vent Fan Assembly	AXVFACF	Orengo
Discharge	Discharge Tank	15,000 L Concrete Tank	2	Underground / Concrete Tank	NA	Taylex Tanks (Fastcall Plumbing)
		Flow Inducer Tower	1	Flow Inducer Tower - Recirc - Duplex 126"	FITR-T126	Orengo
		Discharge Pump	1	**SO Effluent Pump; 2Hp, 75gpm, 380-415V, 50Hz, 3-phase	PF(50HZ)500734	Orengo
		Float Assembly	1	Float Assembly; 39" stem, Pump Vault	MF4P-39V	Orengo
Recycled Water Storage	RWS Tanks	27,000 L Tank	4	Above ground / Polyethylene	NA	Duratanks NT
Tertiary Treatment	Microfiltration	Microfilter	1	Harmsco Microfilter housing and cartridge	HUR90 & HC/90-5	Orengo
	UV Disinfection	UV Disinfection	2	Sanitron	S5000 C	Orengo

	Chlorine Dosing	Chlorine Dosing System	1	Grundfos dosing Station	1 L02 P1 02 DDA 7.5-16 AR	TBC
Nitrogen Treatment	Alkalinity Dosing	Liquid Chemical Feeder	1	Fiberglass Liquid Chem Feed Units	LCF-C	
Control Room	Control Room	Repurposed MACWater Water Treatment Container	1	NA	NA	Supplied by Lake Bennett Community / Renovated by SCF
Control and Monitoring	Control Panel	TCOM-C Control Panel	1	TCOM-DAX/DDAX/S/DAX380 3Ø TSD XF LCFA (2)UV (2)CV fm (AUS/NZ)	Q#052925SK1	Orenco
	Flow Meter	50mm 'Paddle Wheel) Flow Meter	1	MT-EX Series Water Meter 50mm	MT-EX PH32MM	Thinkwater NT

## 9. Appendix 1 – WWTP Schematic

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## 10. Appendix 2 – Design Drawings

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# Lake Bennett Community Onsite Wastewater Management Upgrade

## Plan Cover Sheet

### Project Details

**Project Name:**

Lake Bennett Community Onsite Wastewater Management Upgrade

**Address:**

Lot Plan 2005/20, 841 Chinner Road, Lake Bennett, Northern Territory, Australia

**Client:**

Lake Bennett Community Body Corporate (LBBC)

ENVR Solutions Pty Ltd (ENVR) have been contracted by LBBC to deliver a major upgrade to the existing onsite wastewater management system/s servicing 64 x bungalows surrounding Lake Bennett.

ENVR's engagement extends across the following deliverables:

1. Design, install and commission to operation a new AdvanTex® advanced secondary treatment system, Onsite Wastewater Treatment Plant (OSWTP) supplied by Orenco Systems® Inc (Orenco) with a peak hydraulic design of 38,000 L/day.
2. Design, install and commission to operation a new Septic Treatment and Effluent Pumping (STEP) tank, to replace the existing Sewer Pump Station 2 (SPS2).
3. Design, install and commission to operation a new and Effluent Disposal Land Application Area (LAA) utilising subsurface 'dripline irrigation' providing a total area of 9,425 m<sup>2</sup>.

### Design Basis

**Flows**

Average daily flow: 12,000 litres

Peak daily flow: 37,800 litres

**Influent: (avg) / (max):**

BOD: 140 mg/L / 200 mg/L

TSS: 50 mg/L / 100 mg/L

TKN: 50 mg/L / 80 mg/L

**Discharge Targets:**

BOD: 30 mg/L (max)

TSS: 20 mg/L / (max)

TN: 60 mg/L (avg)

TP: 20 mg/L (avg)

E.coli: 10 CFU/100mL (max)

pH: 6 - 9

**Power Supply**

220-240 vac, 3-phase, 50-Hz

### OWMS Description

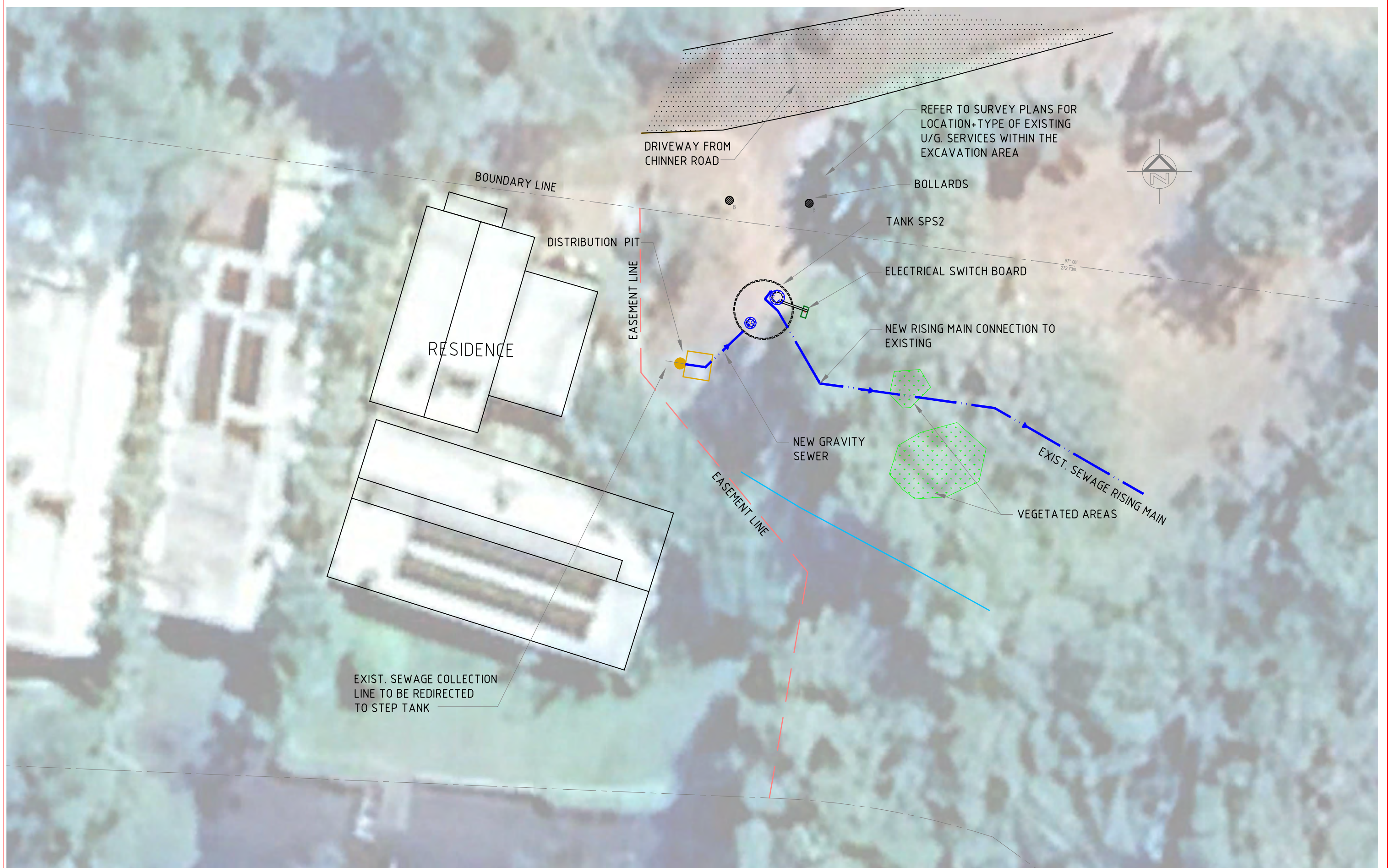
Collection Network	<p><u>Zone 1</u> gravity sewer draining to approximately 18kL septic tanks which discharge to sewer pump station 1 (SPS1).</p> <p><u>Zone 2</u> gravity sewer draining to sewer pump station 2 (SPS2), which is a 22kL Septic Treatment and Effluent Pumping (STEP) Tank.</p> <p><u>Zone 3</u> 2 x 4kL gravity drain to sewer pump station 3 (SPS3). SPS3 pumps via a submerged sewer rising main under the lake to SPS1.</p>
Primary Treatment	2 x 22,000L concrete primary tanks 1 x 22,000L concrete anoxic tank
Secondary Treatment	2 x 15,000L concrete recirc tanks 4 x AX100 textile filters 1 x ventilation assembly 1 x 15,000L concrete discharge tank
Control Room	Climate controlled 20ft container with custom internal fit out
Alkalinity Dosing	Sodium bicarbonate dosing
Disinfection	UV disinfection system Chlorine dosing
Final Filtration	Microfiltration system
Monitoring and Control	Customised T-COM Panel
Recycled Water Storage	4 x 27,000L poly storage tanks
Land Application Area	9,425m <sup>2</sup> subsurface dripline irrigation separated across to distinct disposal areas.

### Project Notes

- 1) This plan set is based upon the expected flows and waste strengths 10/07/2025 for the purpose of servicing the Lake Bennett Community Any changes in usage that would affect flows or waste strength requires a review by ENVR Solutions Pty Ltd
- 2) Once the OSWTP is placed into operation, the flows and waste strengths entering the OSWTP must be monitored. If flow or any of the influent waste strengths exceed those listed in the design basis displayed on the Plan Cover Sheet, measures should be taken to reduce these parameters to those listed on the plan set. Otherwise, additional treatment capacity and plant expansion will be necessary.
- 3) ENVR Solutions Pty Ltd assume incoming wastes will not contain high concentrations of toxic substances that may adversely affect the performance of the biological processes required for the system to operate. These typically include but are not limited to:
  - Chlorine (pool and spa overflow)
  - Waste Dairy Products
  - Quaternary Ammonium Compounds (disinfectants, cleaning products)
  - Formaldehyde (disinfectant, chemical toilet treatment)
  - Dichlorobenzene (urinal tablets, sanitises)
  - Petrochemicals (waste oil, diesel, turpentine etc)
  - Pharmaceuticals (drugs and or medicine)
- 4) In addition to the above, water softener brine discharge is strongly prohibited from being discharged into the AdvanTex system. Failure to adhere to this policy will void Orenco's warranty.

### Drawing List

Drawing Title
L.BENNETT- W.W.M. Upgrade iss.05-W.W.T.P. SL 004 iss.02
L.BENNETT- W.W.M. Upgrade iss.05-W.W.T.P. GA 003 iss.06
L.BENNETT- W.W.M. Upgrade iss.05-W.W.M. L OUT 005 iss.02
L.BENNETT- W.W.M. Upgrade iss.05-W.W.M. L OUT 002 iss.06
L.BENNETT- W.W.M. Upgrade iss.05-W.W.M. L OUT 001 iss.06
L.BENNETT- W.W.M. Upgrade iss.05-Irrigation Piping
L.BENNETT- W.W.M. Upgrade iss.05-Pressure Piping
L.BENNETT- W.W.M. Upgrade iss.05-Elec. conduits
L.BENNETT- W.W.M. Upgrade iss.05-CONTROL ROOM_SS-L-001iss.02
L.BENNETT- W.W.M. Upgrade iss.04-ANOXIC+PRIM TANKS1+2 SECT
L.BENNETT- W.W.M. Upgrade iss.04-DISCHARGE TANK+CONTROL ROOM SECT
L.BENNETT- W.W.M. Upgrade iss.04-RECIRC's+AX100's SECT
L.BENNETT- W.W.M. Upgrade iss.04-W.W.M. SITE LAYOUT.001
L.BENNETT- W.W.M. Upgrade iss.04-W.W.M. PLANT LAYOUT.002
L.BENNETT- W.W.M. Upgrade iss.04-SPS 2-STEP Tank Layout
L.BENNETT- W.W.M. Upgrade iss.04-SPS 2-STEP Tank Sect.



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 BRISBANE, AUSTRALIA.  
 PHONE: 0402 524 033  
 A.B.N: 946 583 81170

ISSUE	AMENDMENT	APPROV.	DATE
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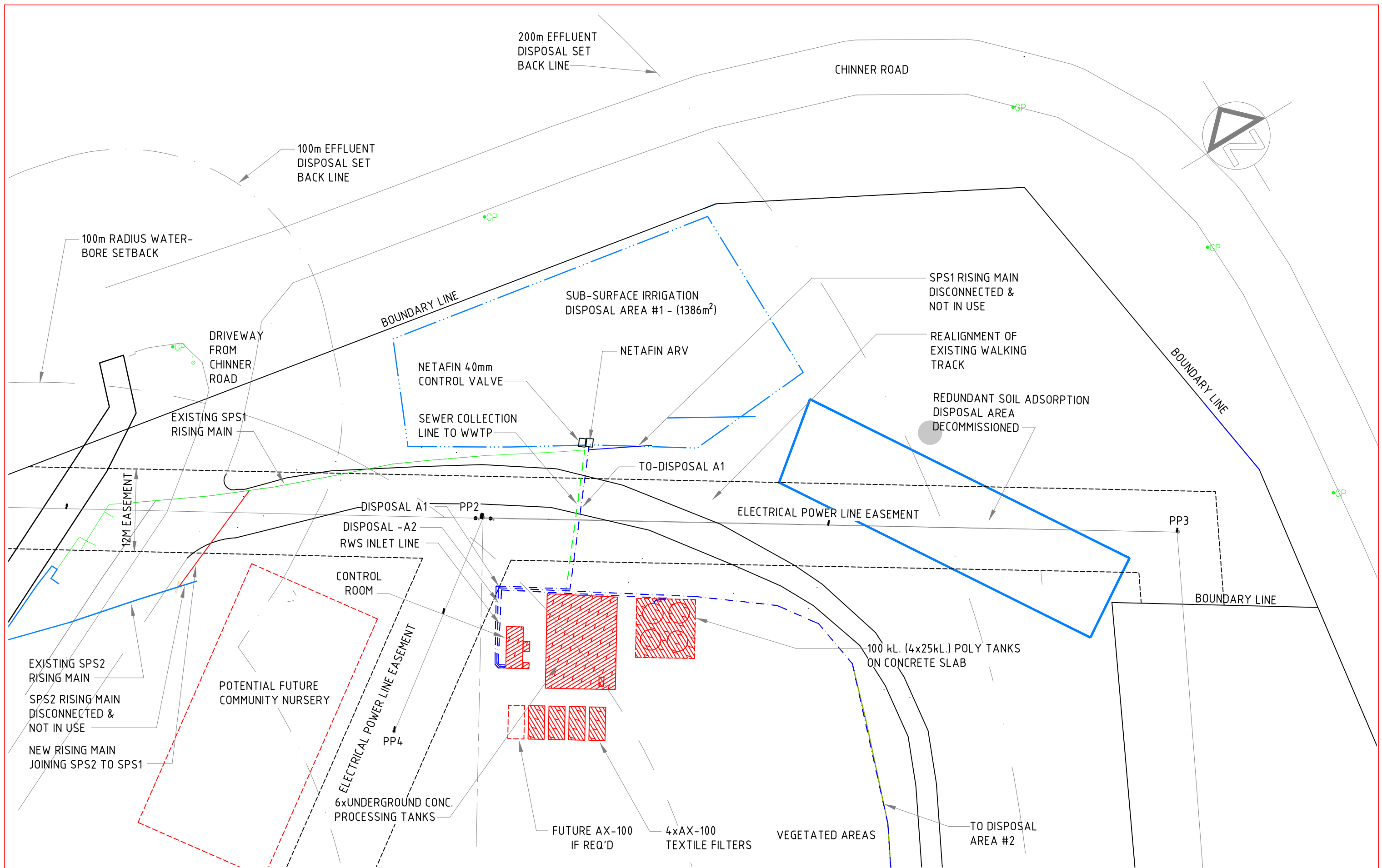
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SCALE: 1:200 @ A3  
 CHECKED: MMCK. DATE: 17.10.24.  
 CLIENT: PROPRIETORS OF UNIT PLAN 2005/200  
 841 CHINNER RD., LAKE BENNETT  
 PROJECT: LAKE BENNETT COMMUNITY WASTE WATER TREATMENT UPGRADE

DRAWN: TJT DATE: 16.10.24.  
 APPROVED: XXX DATE: 00.00.00.  
 DRAWING No:  
**LBC - LN/L - 001.**  
**A3** ISSUE: AC

DRG. TITLE:  
**LAYOUT**  
**S.T.E.P. TANK (SPS 2)**  
**GENERAL LAYOUT**



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 A.B.N: 946 583 81170

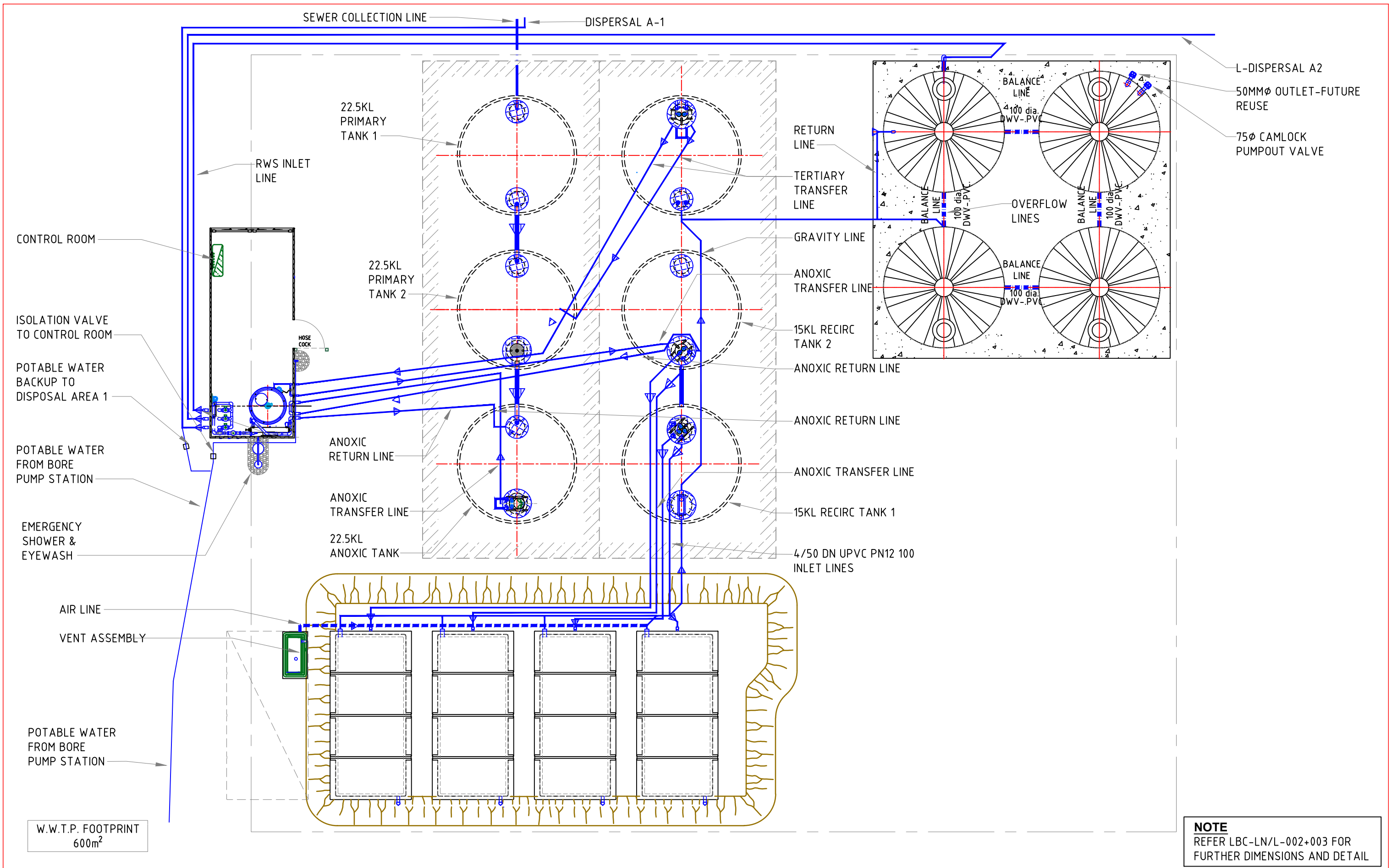
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SCALE: 1:500 @ A3	DRAWN: TJT	DATE: 09.04.25.
CHECKED: MMCK. DATE: 00.00.00	APPROVED: XXX	DATE: 00.00.00.
CLIENT: PROPRIETORS OF UNIT PLAN 2005/200 841 CHINNER RD., LAKE BENNETT		
PROJECT: LAKE BENNETT COMMUNITY ONSITE WASTE WATER MANAGEMENT UPGRADE	DRAWING No: <b>LBC - LN/L - 002</b>	
	<b>A3</b>	ISSUE: AC

DRG. TITLE: **ONSITE WASTE WATER MANAGEMENT PLANT LAYOUT PLAN**



W.W.T.P. FOOTPRINT  
600m<sup>2</sup>

**NOTE**  
REFER LBC-LN/L-002+003 FOR  
FURTHER DIMENSIONS AND DETAIL



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ARANA HILLS, QLD, 4054.  
BRISBANE, AUSTRALIA.  
PHONE: 0402 524 033  
A.B.N: 946 583 81170

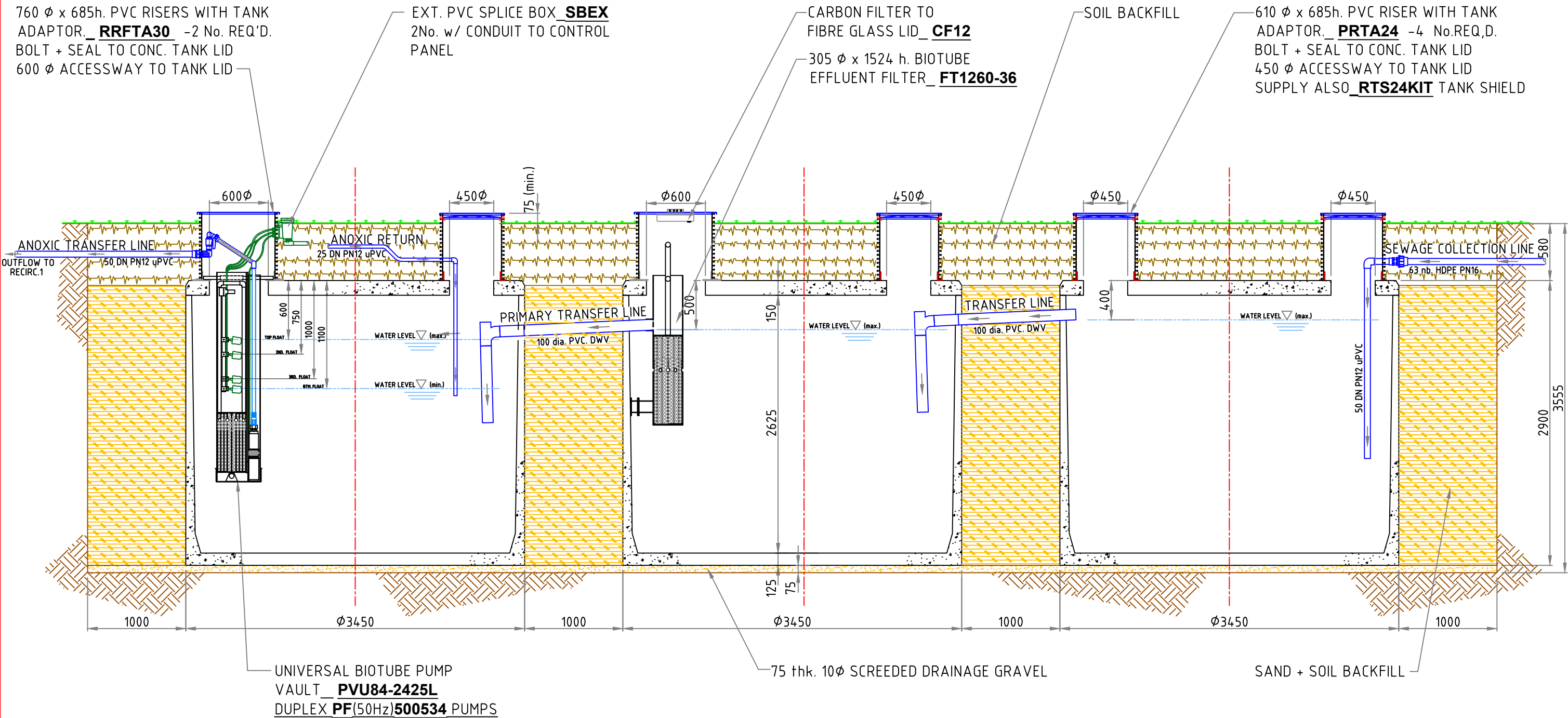
ISSUE	AMENDMENT	APPROV.	DATE
AC	AS CONSTRUCTED		13/02/26

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SCALE: 1:100 @ A3	DRAWN: TJT	DATE: 04.06.25.
CHECKED: MMck. DATE: 00.06.25.	APPROVED: MMck.	DATE: 00.06.25.
CLIENT: PROPRIETORS OF UNIT PLAN 2005/200 841 CHINNER RD., LAKE BENNETT		
PROJECT: LAKE BENNETT COMMUNITY ONSITE WASTE WATER MANAGEMENT UPGRADE	DRAWING No: LBC - LN/L - 004. A3	
		ISSUE: AC

DRG. TITLE:  
**W.W.T.P.  
AdvanTex SYSTEM  
SYSTEM LAYOUT**



**22,500 LT. CONC. ANOXIC TANK**

**22,500 LT. CONC. PRIMARY TANK 2**

**22,500 LT. CONC. PRIMARY TANK 1**

**NOTE.**  
 1. PIPEWORK POSITIONS ARE A GENERAL SCHEMATIC REPRESENTATION OF LOCATION. EXACT LOCATIONS ARE TO BE SITE VERIFIED  
 2. 'ORENCO' TO VERIFY ALL COMPONENTS AND LAYOUT INCLUDING PUMPS AND VESSELS

'TAYLEX TANKS'  
 CONCRETE UNDERGROUND TANK  
 22,500 LITRE  
 TRAFFICABLE-2.0 TONNE POINT LOAD



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 PHONE: 0402 524 033  
 A.B.N: 946 583 81170

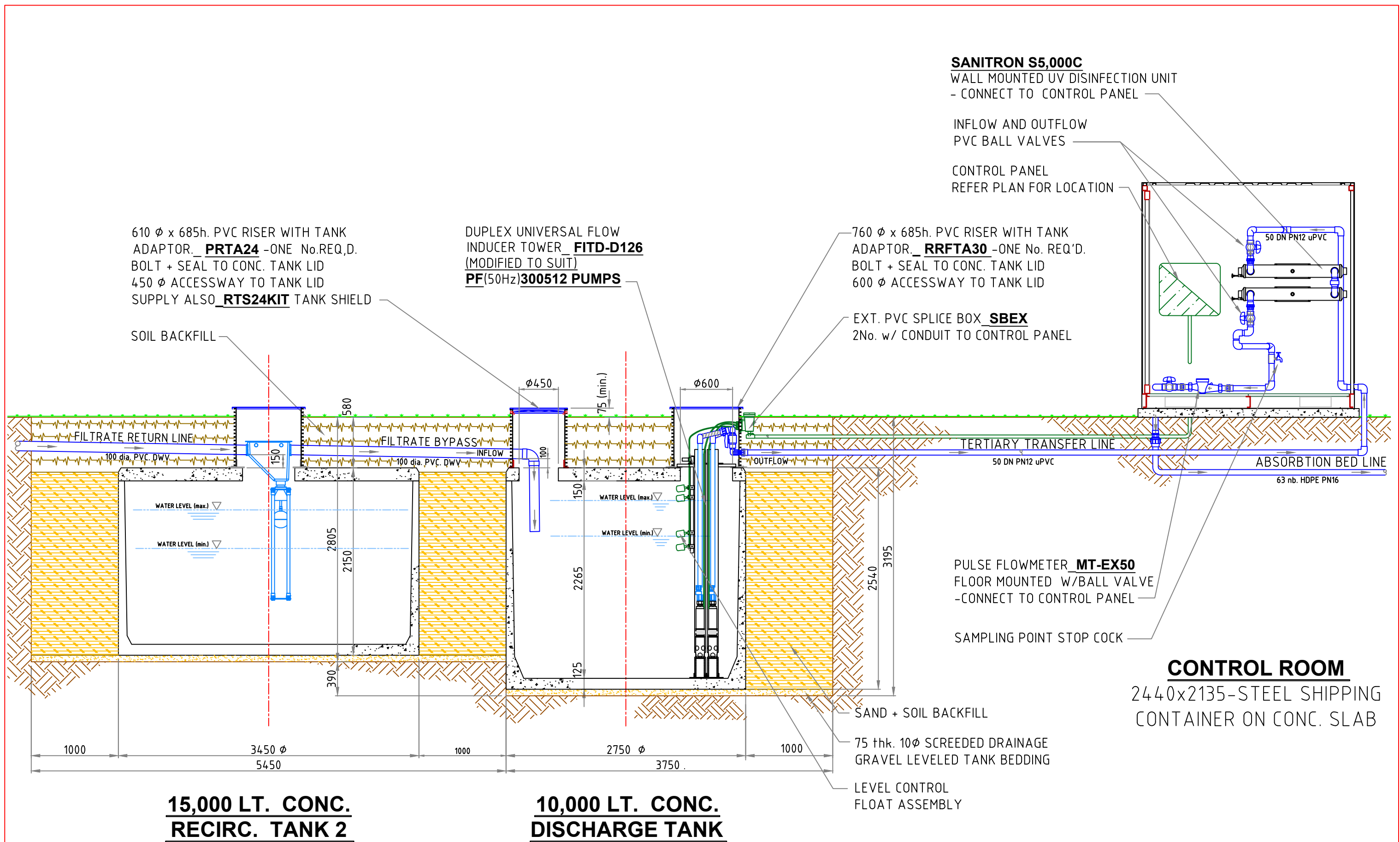
ISSUE	AMENDMENT	APPROV.	DATE
01	PRELIMINARY ISSUE	MMCK.	20/12/24

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SCALE: 1:40 @ A3  
 CHECKED: MMCK. DATE: 00.12.24.  
 CLIENT: PROPRIETORS OF 841 CHINNER RD., LAKE BENNETT  
 PROJECT: LAKE BENNETT COMMUNITY WASTE WATER TREATMENT UPGRADE

DRAWN: Tjt DATE: 11.12.24.  
 APPROVED: XXX DATE: 00.00.00.  
 UNIT PLAN 2005/200  
 DRAWING No: LBC - TN/A - 002.  
 A3 ISSUE: 01

**W.W.T.P.**  
**ANOXIC+PRIMARY TANKS**  
**SECTIONAL VIEW**



**15,000 LT. CONC.  
RECIRC. TANK 2**

**10,000 LT. CONC.  
DISCHARGE TANK**



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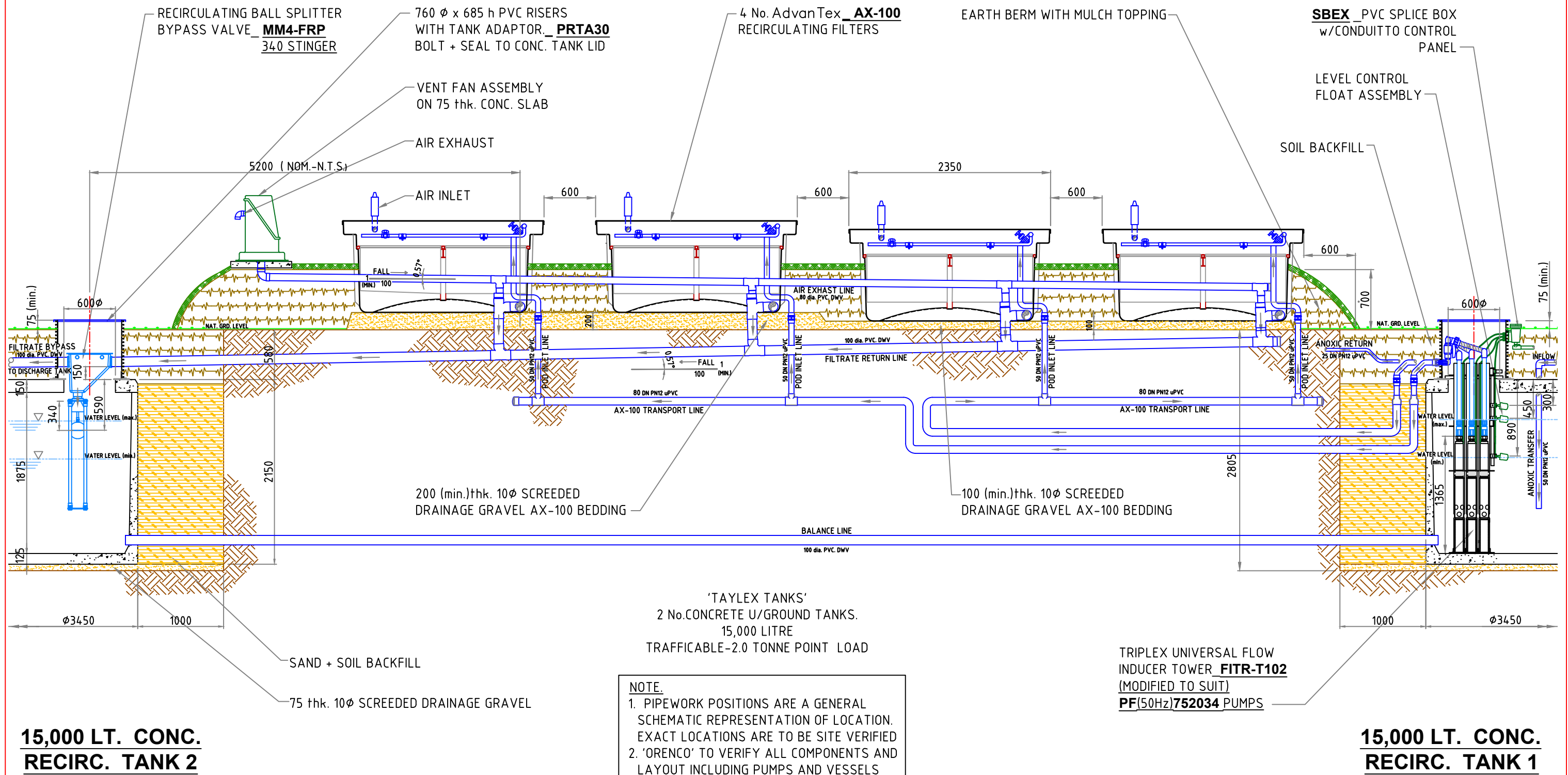
ISSUE	AMENDMENT	APPROV.	DATE
01	PRELIMINARY ISSUE	MMcK.	20/12/24

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SCALE: 1:40 @ A3  
CHECKED: MMcK. DATE: 00.12.24.  
CLIENT: PROPRIETORS OF 841 CHINNER RD., LAKE BENNETT  
PROJECT: LAKE BENNETT COMMUNITY WASTE WATER TREATMENT UPGRADE

DRAWN: Tjt DATE: 19.12.24.  
APPROVED: XXX DATE: 00.00.00.  
UNIT PLAN 2005/200 RD., LAKE BENNETT  
DRAWING No: LBC - TN/A - 003.  
A3 ISSUE: 01

DRG. TITLE:  
**W.W.T.P.  
DISCHARGE TANK  
SECTIONAL VIEW**



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ISSUE	AMENDMENT	APPROV.	DATE
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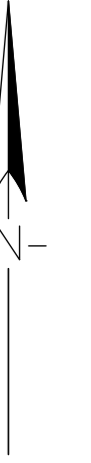
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CHECKED: MMcK. DATE: 00.12.24.  
CLIENT: PROPRIETORS OF 841 CHINNER RD., LAKE BENNETT

PROJECT: LAKE BENNETT COMMUNITY WASTE WATER TREATMENT UPGRADE

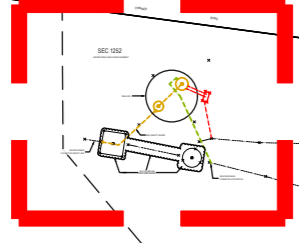
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APPROVED: XXX DATE: 00.00.00.  
UNIT PLAN 2005/200 RD., LAKE BENNETT

DRAWING No: **LBC - TN/A - 001.**  
A3  
ISSUE: 01

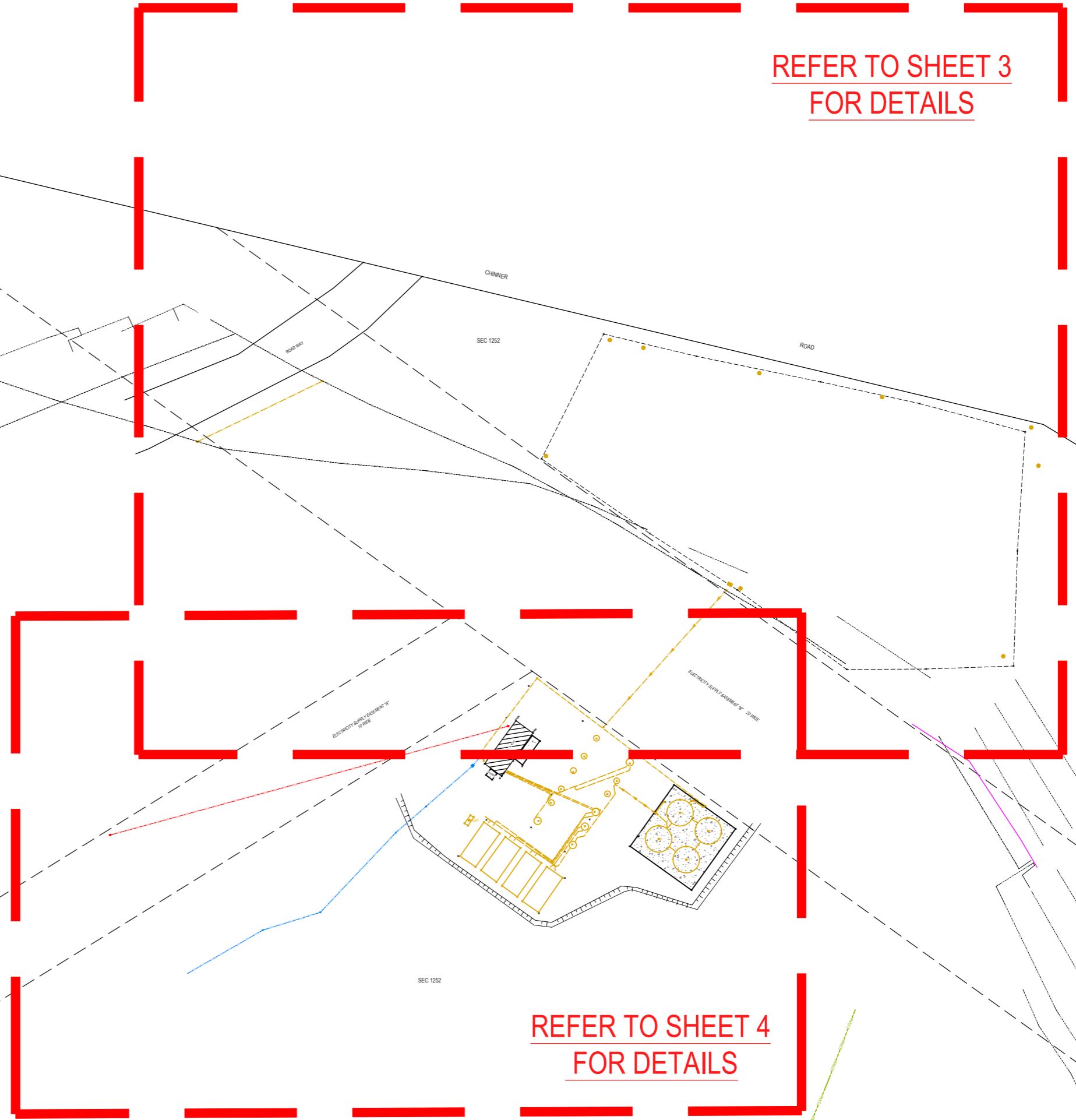
DRG. TITLE: **W.W.T.P. RECIRC. TANKS + AX-100's SECTIONAL VIEW**



REFER TO SHEET 2  
FOR DETAILS

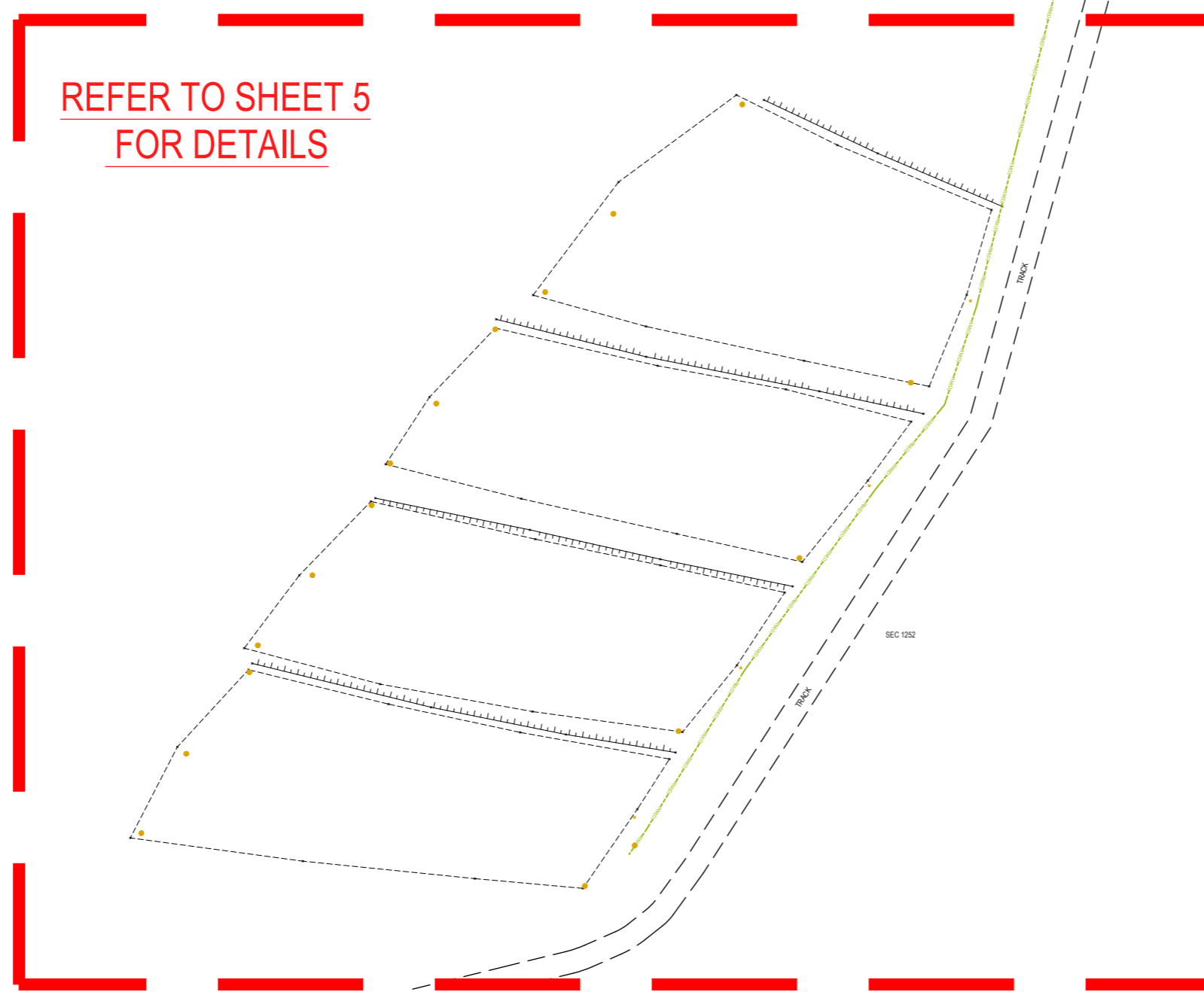


REFER TO SHEET 3  
FOR DETAILS



REFER TO SHEET 4  
FOR DETAILS

REFER TO SHEET 5  
FOR DETAILS



**NOTE**

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**UNDERGROUND SERVICES**

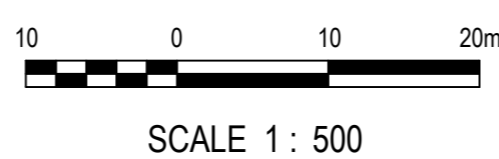
LOCATION OF UNDERGROUND SERVICES HAS NOT BEEN SURVEYED. SERVICE HAS BEEN INFERRED FROM LOCATION OF VISIBLE SITE FEATURES AND FROM INFORMATION PROVIDED BY CLIENT

CLASSIFICATION	METHOD
QUALITY LEVEL A	DIRECT MEASUREMENT TO TOP OF UTILITY/ENCASEMENT
QUALITY LEVEL B	GPR OR RADIO DETECTION WAND
QUALITY LEVEL C	INFERRED FROM LOCATION OF VISIBLE SITE FEATURES
QUALITY LEVEL D	FROM DBYD INFORMATION

LEGEND	
<b>ELECTRICITY</b>	
	CABLES UNDERGROUND (QUALITY LEVEL D)
	CABLES UNDERGROUND-EXISTING (QUALITY LEVEL B)
	PIT
<b>PROPERTY</b>	
	BOUNDARY
<b>SEWERAGE</b>	
	PIPE UNDERGROUND (QUALITY LEVEL D)
	PIPE UNDERGROUND (QUALITY LEVEL C)
	PIPE UNDERGROUND - EXISTING (QUALITY LEVEL C)
	RISING MAIN UNDERGROUND (QUALITY LEVEL D)
	RISING MAIN UNDERGROUND - EXISTING (QUALITY LEVEL B)
	(AX100) FOOTPRINT
	RISER
	VENT
	PIT
	TANK ABOVE GROUND
<b>STRUCTURE</b>	
	CONCRETE BUILDING
<b>TOPOGRAPHY</b>	
	BOTTOM OF EMBANKMENT
	TOP OF EMBANKMENT
	NATURAL SURFACE SPOT LEVEL
<b>WATER SUPPLY</b>	
	PIPE BELOW GROUND (QUALITY LEVEL D)
	PIT

**eja**  
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**SURVEY & PLANNING CONSULTANTS**  
10 HARVEY STREET  
DARWIN NT 0801  
PH. (08) 8981 2494  
FAX. (08) 8981 5205  
darwin@eja.com.au  
www.eja.com.au



HORIZONTAL DATUM  
MGA 94 - ZONE 52

VERTICAL DATUM  
AHD

SURVEYOR  
NC

DRAFTER  
LC

DATE OF SURVEY

DATE DRAWN  
18/12/2025

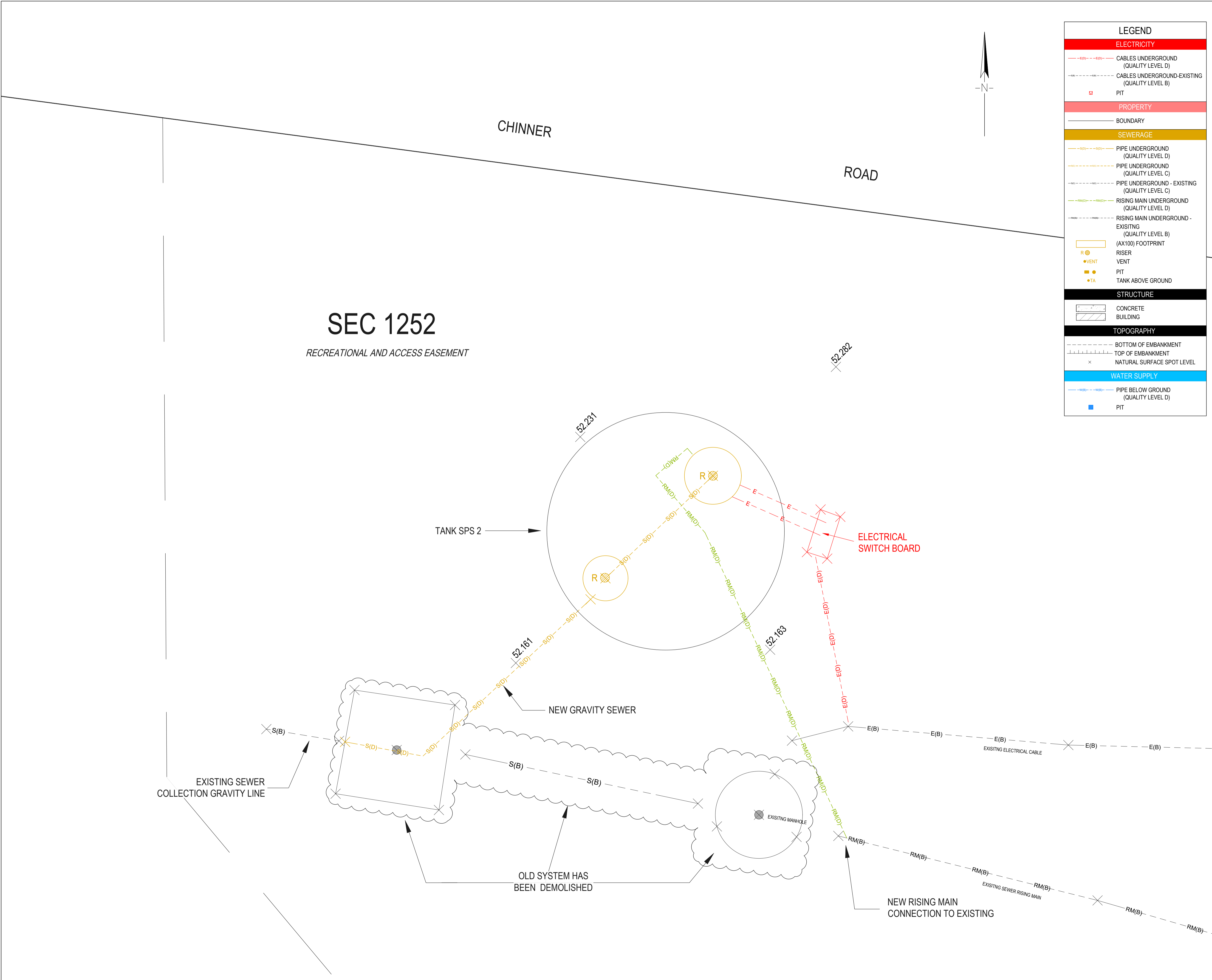
CLIENT  
ENVR SOLUTIONS PTY LTD

**ENVR SOLUTIONS**  
SUSTAINABLE  
wastewater management  
SOLUTIONS

SECTION 1252, HUNDRED OF HOWARD  
LAKE BENNETT WASTE WATER TREATMENT PLAN  
AS CONSTRUCTED

SHEET 1 OF 1      DRAWING 13489-08-R01      REV 01

FILE PATH: X:\D\13489\12\_Drafting\13489-08-R01



LEGEND	
<b>ELECTRICITY</b>	
---	CABLES UNDERGROUND (QUALITY LEVEL D)
---	CABLES UNDERGROUND-EXISTING (QUALITY LEVEL B)
⊗	PIT
<b>PROPERTY</b>	
---	BOUNDARY
<b>SEWERAGE</b>	
---	PIPE UNDERGROUND (QUALITY LEVEL D)
---	PIPE UNDERGROUND (QUALITY LEVEL C)
---	PIPE UNDERGROUND - EXISTING (QUALITY LEVEL C)
---	RISING MAIN UNDERGROUND (QUALITY LEVEL D)
---	RISING MAIN UNDERGROUND - EXISTING (QUALITY LEVEL B)
○	(AX100) FOOTPRINT
○	RISER
●	VENT
⊗	PIT
●	TANK ABOVE GROUND
<b>STRUCTURE</b>	
▒	CONCRETE BUILDING
<b>TOPOGRAPHY</b>	
---	BOTTOM OF EMBANKMENT
---	TOP OF EMBANKMENT
x	NATURAL SURFACE SPOT LEVEL
<b>WATER SUPPLY</b>	
---	PIPE BELOW GROUND (QUALITY LEVEL D)
■	PIT

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 UNDERGROUND SERVICES  
 LOCATION OF UNDERGROUND SERVICES HAS NOT BEEN SURVEYED. SERVICE HAS BEEN INFERRED FROM LOCATION OF VISIBLE SITE FEATURES AND FROM INFORMATION PROVIDED BY CLIENT

CLASSIFICATION	METHOD
QUALITY LEVEL A	DIRECT MEASUREMENT TO TOP OF UTILITY/ENCASEMENT
QUALITY LEVEL B	GPR OR RADIO DETECTION WAND
QUALITY LEVEL C	INFERRED FROM LOCATION OF VISIBLE SITE FEATURES
QUALITY LEVEL D	FROM DBYD INFORMATION

No.	REVISION DETAILS	CHK	DATE
01	ADDITIONAL INFORMATION ON SHEET 2	NC	26/02/2026
00	PREPARED FOR INFORMATION	NC	18/12/2025



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 darwin@eja.com.au

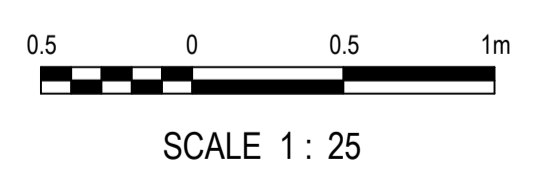
CLIENT  
 ENVR SOLUTIONS PTY LTD



SURVEYOR: NC  
 DATE OF SURVEY: 16/12/2025

DRAFTER: LC  
 DATE DRAWN: 18/12/2025

HORIZONTAL DATUM: MGA 94 - ZONE 52  
 VERTICAL DATUM: AHD

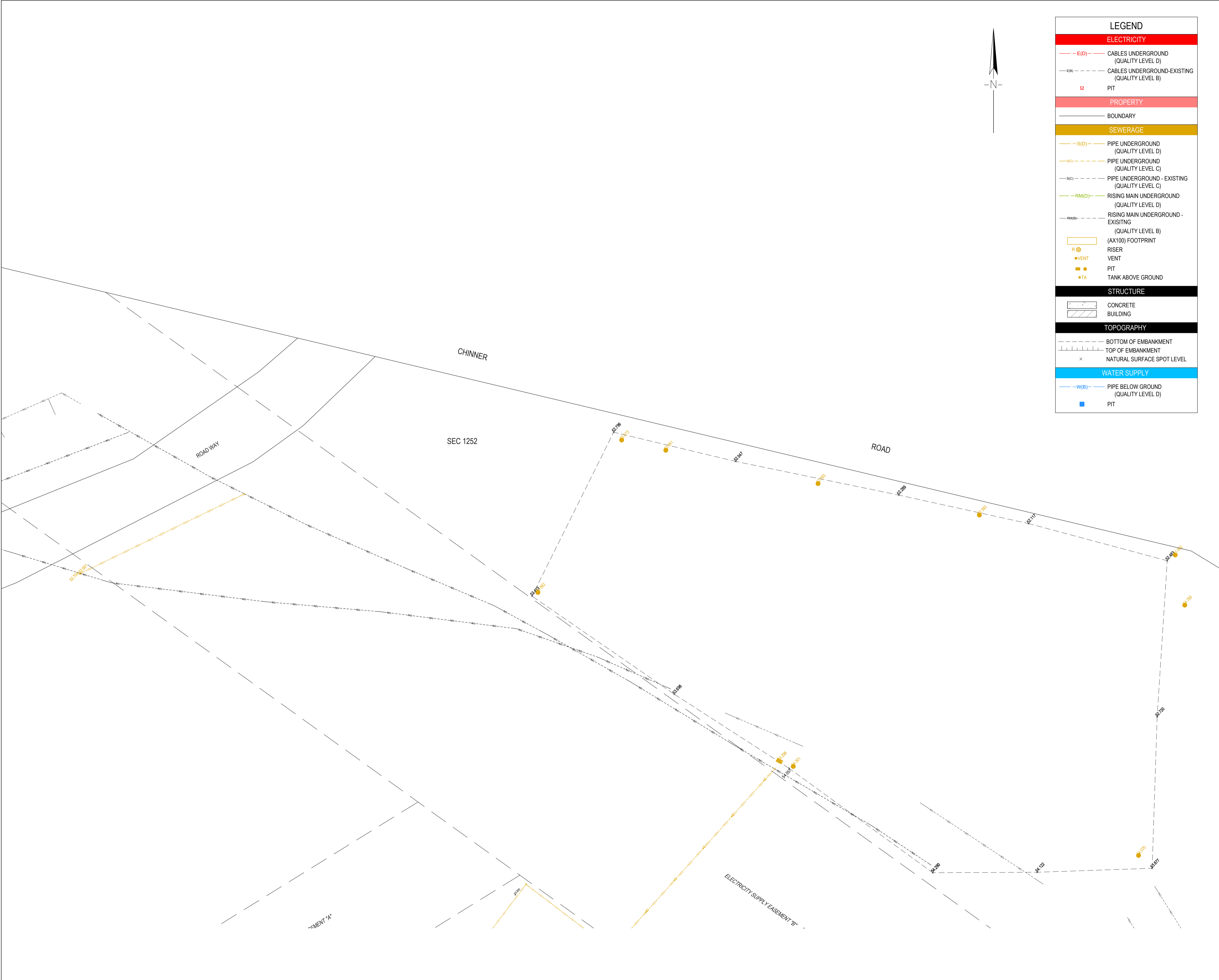


SECTION 1252, HUNDRED OF HOWARD LAKE BENNETT WASTE WATER TREATMENT PLAN AS CONSTRUCTED

SHEET	DRAWING	REV
2 OF 5	13489-08-R01	00

ISO A1 594mm x 841mm

FILE PATH: X:\13489\12\_Drafting\13489-08-R01



**LEGEND**

**ELECTRICITY**

- E(D)- CABLES UNDERGROUND (QUALITY LEVEL D)
- E(B)- CABLES UNDERGROUND-EXISTING (QUALITY LEVEL B)
- PIT

**PROPERTY**

- BOUNDARY

**SEWERAGE**

- S(D)- PIPE UNDERGROUND (QUALITY LEVEL D)
- S(C)- PIPE UNDERGROUND (QUALITY LEVEL C)
- S(B)- PIPE UNDERGROUND - EXISTING (QUALITY LEVEL C)
- RM(D)- RISING MAIN UNDERGROUND (QUALITY LEVEL D)
- RMB- RISING MAIN UNDERGROUND - EXISTING (QUALITY LEVEL B)

**STRUCTURE**

- (AX100) FOOTPRINT
- R RISER
- V VENT
- P PIT
- TA TANK ABOVE GROUND

**STRUCTURE**

- ▨ CONCRETE BUILDING

**TOPOGRAPHY**

- - - - - BOTTOM OF EMBANKMENT
- - - - - TOP OF EMBANKMENT
- x NATURAL SURFACE SPOT LEVEL

**WATER SUPPLY**

- W(B)- PIPE BELOW GROUND (QUALITY LEVEL D)
- PIT

**NOTE**

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**UNDERGROUND SERVICES**

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QUALITY LEVEL B	GPR OR RADIO DETECTION WAND
QUALITY LEVEL C	INFERRED FROM LOCATION OF VISIBLE SITE FEATURES
QUALITY LEVEL D	FROM DBYD INFORMATION

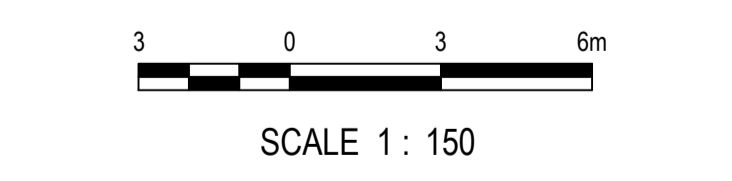
No.	REVISION DETAILS	CHK	DATE
01	ADDITIONAL INFORMATION ON SHEET 2	NC	26/02/2026
00	PREPARED FOR INFORMATION	NC	18/12/2025



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 darwin@eja.com.au

**CLIENT**  
 ENVR SOLUTIONS PTY LTD

SURVEYOR	DATE OF SURVEY
NC	16/12/2025
DRAFTER	DATE DRAWN
LC	18/12/2025
HORIZONTAL DATUM	VERTICAL DATUM
MGA 94 - ZONE 52	AHD

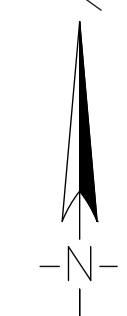
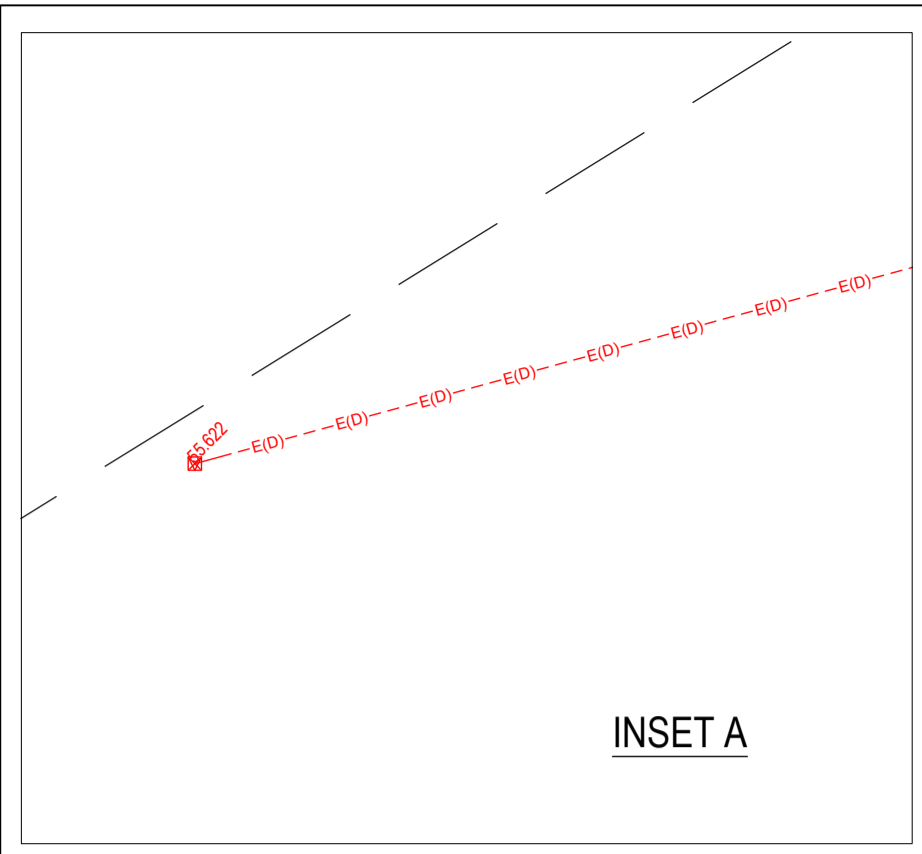
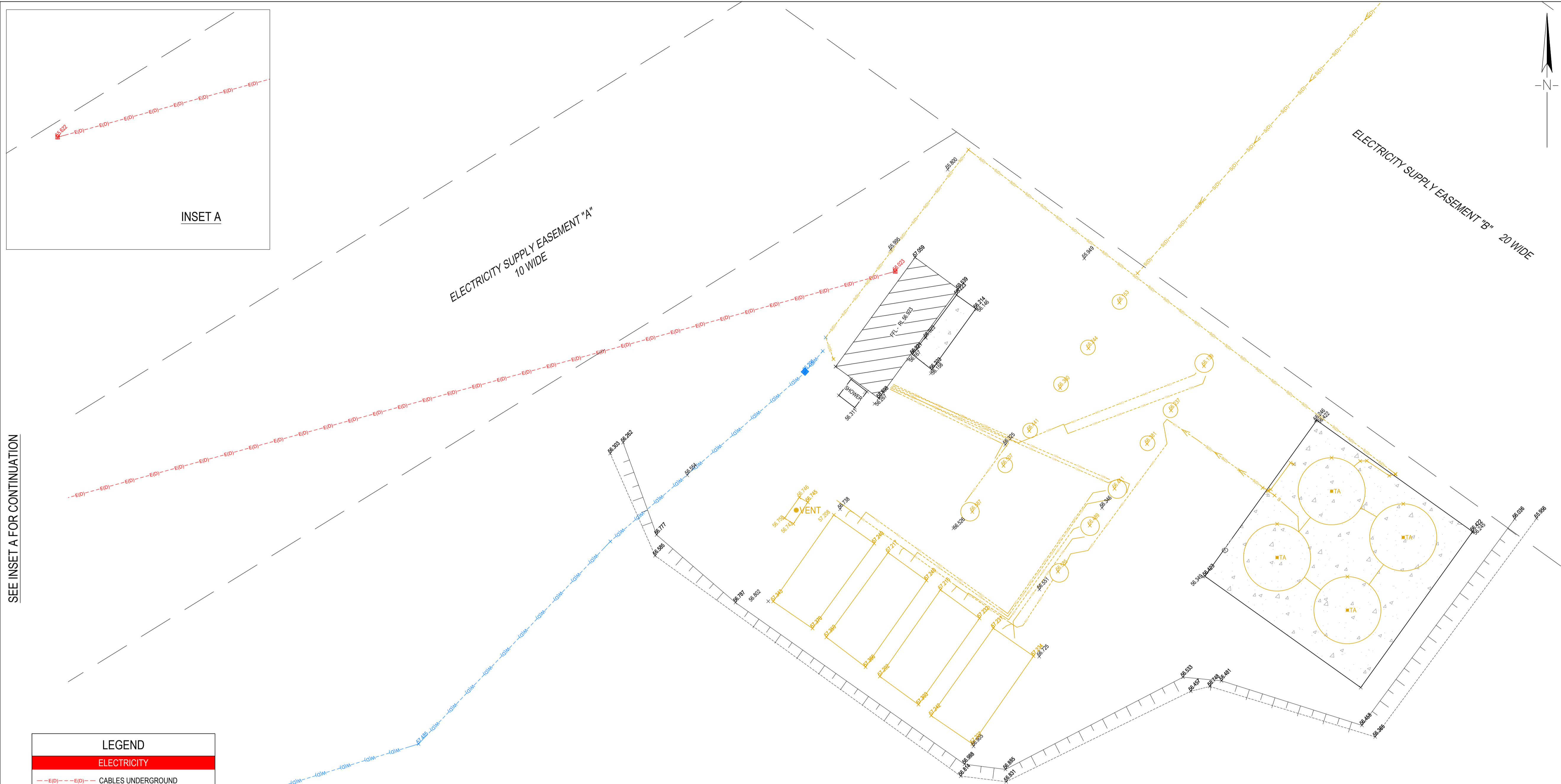


SECTION 1252, HUNDRED OF HOWARD  
 LAKE BENNETT WASTE WATER  
 TREATMENT PLAN  
 AS CONSTRUCTED

SHEET	DRAWING	REV
3 OF 5	13489-08-R01	00

ISO A1 594mm x 841mm

SEE INSET A FOR CONTINUATION



LEGEND	
<b>ELECTRICITY</b>	
	CABLES UNDERGROUND (QUALITY LEVEL D)
	CABLES UNDERGROUND-EXISTING (QUALITY LEVEL B)
	PIT
<b>PROPERTY</b>	
	BOUNDARY
<b>SEWERAGE</b>	
	PIPE UNDERGROUND (QUALITY LEVEL D)
	PIPE UNDERGROUND (QUALITY LEVEL C)
	PIPE UNDERGROUND - EXISTING (QUALITY LEVEL C)
	RISING MAIN UNDERGROUND (QUALITY LEVEL D)
	RISING MAIN UNDERGROUND - EXISTING (QUALITY LEVEL B)
	(AX100) FOOTPRINT
	RISER
	VENT
	PIT
	TANK ABOVE GROUND
<b>STRUCTURE</b>	
	CONCRETE BUILDING
<b>TOPOGRAPHY</b>	
	BOTTOM OF EMBANKMENT
	TOP OF EMBANKMENT
	NATURAL SURFACE SPOT LEVEL
<b>WATER SUPPLY</b>	
	PIPE BELOW GROUND (QUALITY LEVEL D)
	PIT

SEC 1252

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**UNDERGROUND SERVICES**

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QUALITY LEVEL A	DIRECT MEASUREMENT TO TOP OF UTILITY/EASEMENT
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QUALITY LEVEL D	FROM DBYD INFORMATION

No.	REVISION DETAILS	CHK	DATE
01	ADDITIONAL INFORMATION ON SHEET 2	NC	26/02/2026
00	PREPARED FOR INFORMATION	NC	18/12/2025

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www.eja.com.au

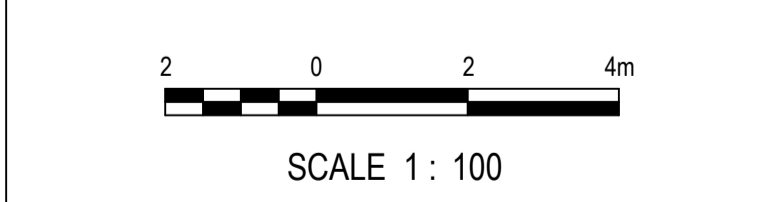
PH. (08) 8981 2494  
FAX. (08) 8981 5205  
darwin@eja.com.au

CLIENT

ENVR SOLUTIONS PTY LTD

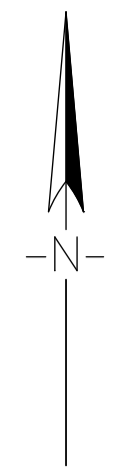
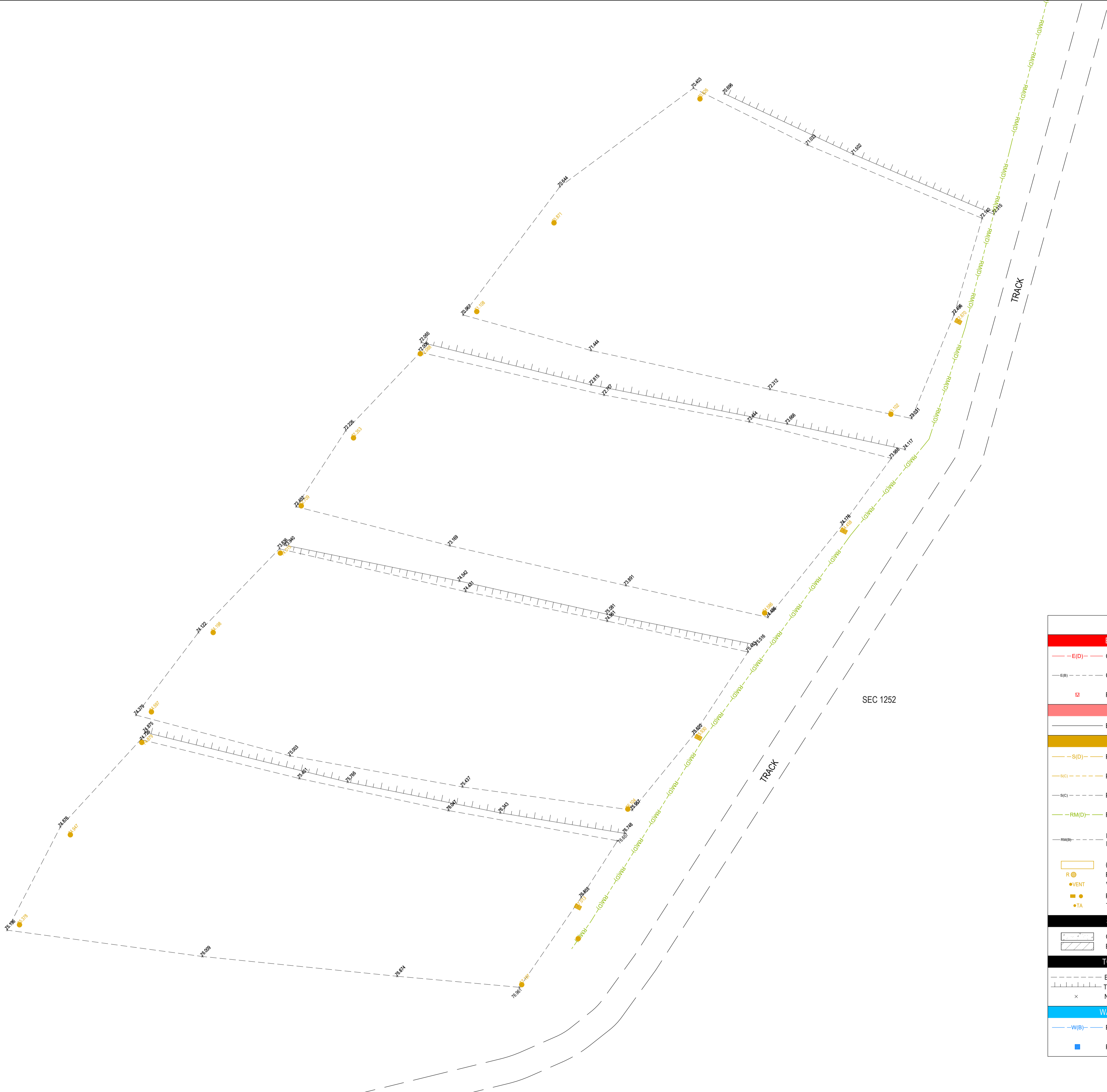
SUSTAINABLE wastewater management SOLUTIONS

SURVEYOR	DATE OF SURVEY
NC	16/12/2025
DRAFTER	DATE DRAWN
LC	18/12/2025
HORIZONTAL DATUM	VERTICAL DATUM
MGA 94 - ZONE 52	AHD



SECTION 1252, HUNDRED OF HOWARD LAKE BENNETT WASTE WATER TREATMENT PLAN AS CONSTRUCTED

SHEET	DRAWING	REV
4 OF 5	13489-08-R01	00



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No.	REVISION DETAILS	CHK	DATE
01	ADDITIONAL INFORMATION ON SHEET 2	NC	26/02/2026
00	PREPARED FOR INFORMATION	NC	18/12/2025



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 DARWIN NT 0801 FAX. (08) 8981 5205  
 www.eja.com.au darwin@eja.com.au

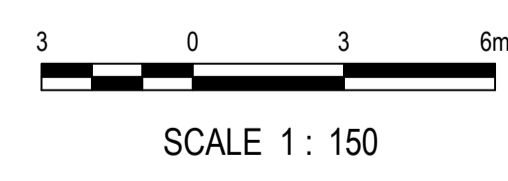
CLIENT  
 ENVR SOLUTIONS PTY LTD



SURVEYOR DATE OF SURVEY  
 NC 16/12/2025

DRAFTER DATE DRAWN  
 LC 18/12/2025

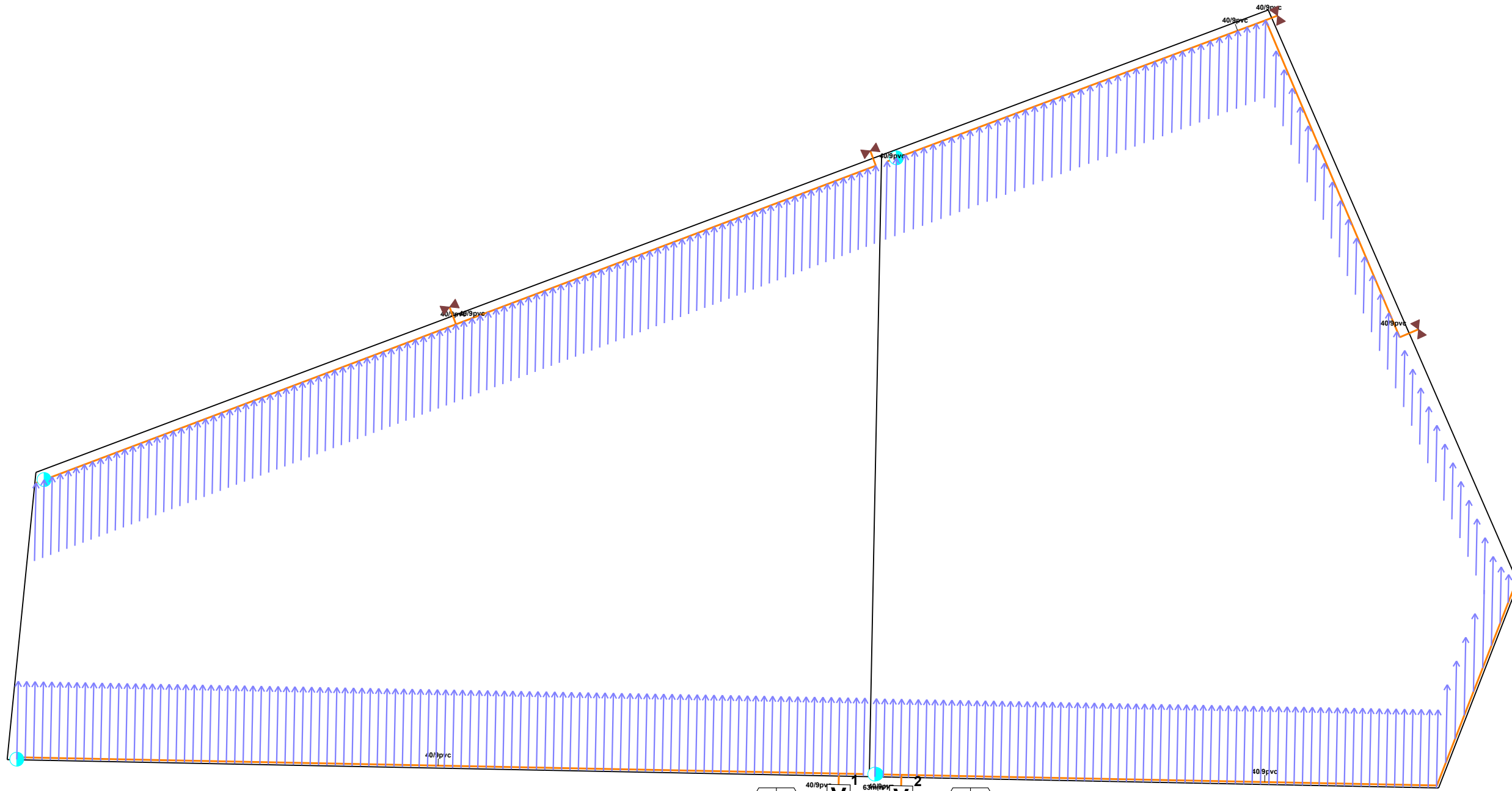
HORIZONTAL DATUM VERTICAL DATUM  
 MGA 94 - ZONE 52 AHD



SECTION 1252, HUNDRED OF HOWARD  
 LAKE BENNETT WASTE WATER  
 TREATMENT PLAN  
 AS CONSTRUCTED

SHEET	DRAWING	REV
5 OF 5	13489-08-R01	00

LEGEND	
<b>ELECTRICITY</b>	
—E(D)—	CABLES UNDERGROUND (QUALITY LEVEL D)
—E(B)—	CABLES UNDERGROUND-EXISTING (QUALITY LEVEL B)
⊠	PIT
<b>PROPERTY</b>	
—	BOUNDARY
<b>SEWERAGE</b>	
—S(D)—	PIPE UNDERGROUND (QUALITY LEVEL D)
—S(C)—	PIPE UNDERGROUND (QUALITY LEVEL C)
—S(C)—	PIPE UNDERGROUND - EXISTING (QUALITY LEVEL C)
—RM(D)—	RISING MAIN UNDERGROUND (QUALITY LEVEL D)
—RM(B)—	RISING MAIN UNDERGROUND - EXISTING (QUALITY LEVEL B)
⊠	(AX100) FOOTPRINT
●	RISER
●	VENT
●	PIT
●	TANK ABOVE GROUND
<b>STRUCTURE</b>	
⊠	CONCRETE
⊠	BUILDING
<b>TOPOGRAPHY</b>	
---	BOTTOM OF EMBANKMENT
---	TOP OF EMBANKMENT
x	NATURAL SURFACE SPOT LEVEL
<b>WATER SUPPLY</b>	
—W(B)—	PIPE BELOW GROUND (QUALITY LEVEL D)
■	PIT



1 1 1/2" 120.32 L/M

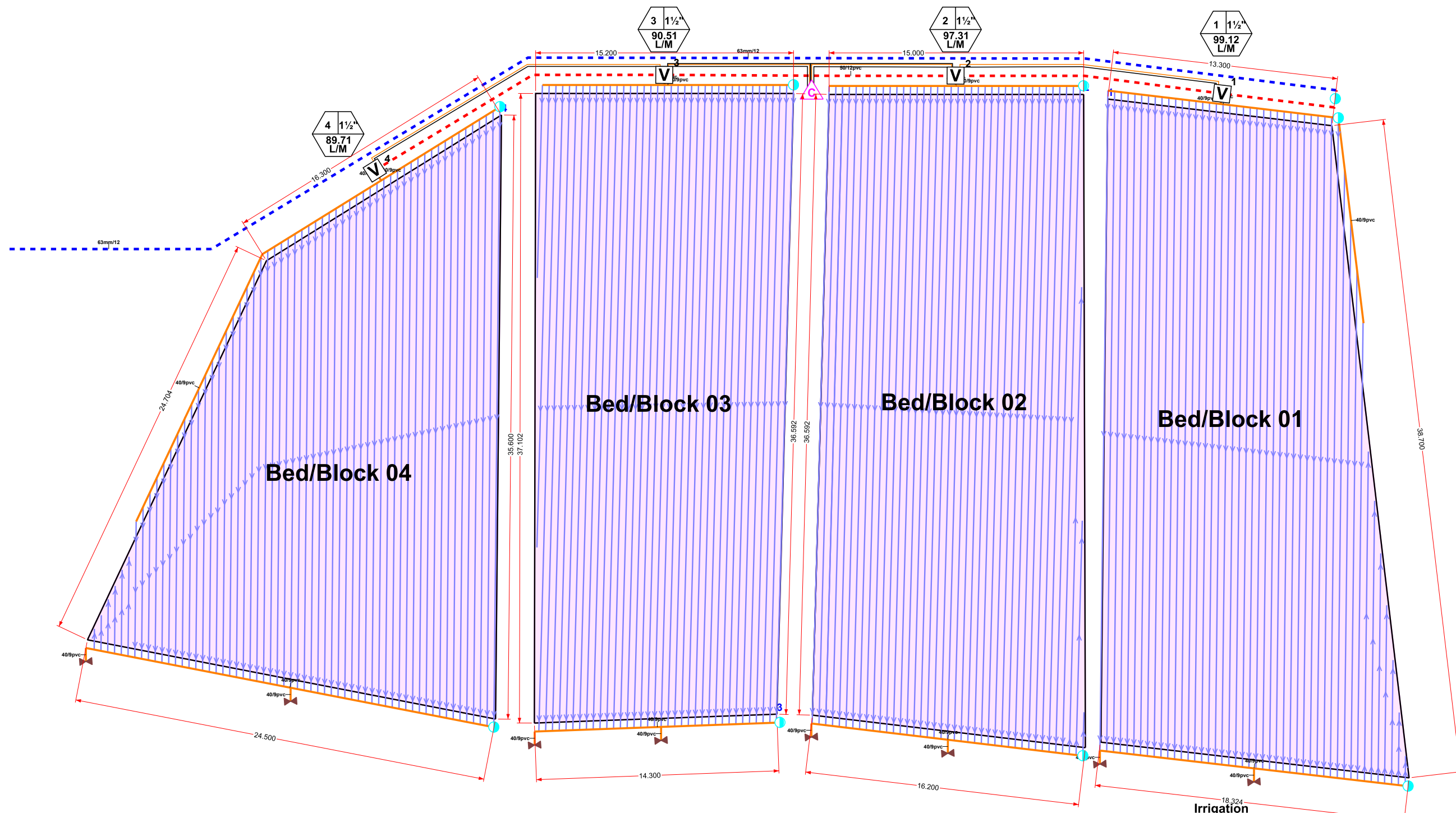
2 1 1/2" 121.33 L/M

**Irrigation**

Quantity	Symbol	Description
<b>Meters/Pumps</b>		
1		PF (50hz)7520
<b>Control Valves</b>		
2		Netafim 40mm Control Valve
<b>Y-Strainers / Filters</b>		
1		Filter
<b>Irrigation Accessories</b>		
4		Netafim ARV
4		1 1/2" isolation valve Flush Point
<b>Lateral Line Pipe</b>		
149 m		40mm PVC PN9
<b>Mainline Pipe</b>		
20 m		Poly 63mm PN12.5
<b>Drip Tubing</b>		
3625 m		Netafim Bioline 16010 1.6 0.4

**Water Source #1**  
 Available Working Pressure 2.65 bars  
 Maximum Pump Flow 126 l/m


NORTH: SCALE 01: 1:200 @ A3 SCALE 02: SCALE BAR: PROJECT/JOB #: NA DRAWING #: NA			
DRAWING TITLE: AREA #01 LAYOUT	PROJECT TITLE: LAKE BENNETT DISPERSAL SYSTEM	CLIENT: ENVR SOLUTIONS	
01 ISSUE	00 REV	00 AMENDMENT	25.09.2025 DATE SM BY
ORIGINAL PLANS SUPPLIED BY: > Client	ADDITIONAL DATA: > Refer to notes where applicable. © COPYRIGHT - All rights reserved. This work is copyright and cannot be reproduced or copied by any means without the written permission of Think Water Darwin. Do not scale from drawing. Use indicated dimensions at all times. Verify all dimensions and set-outs on site before commencing work. Clarify discrepancies before commencing work.		



Drip Line Row Spacing: 0.4m  
 Drip Line Emitters Spacing: 0.4m  
 Drip Line Emitters Flow Rate: 1.6 l/hr

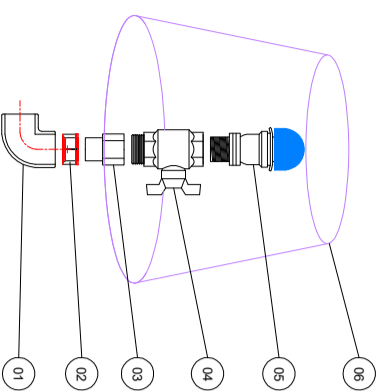
**Irrigation**

Quantity	Symbol	Description
<b>Control Valves</b>		
4	V	Netafim 40mm Control Valve
<b>Irrigation Accessories</b>		
1	IR	Irrigation Control Receiver
9	ARV	Netafim ARV
8	IFP	1 1/2" isolation valve Flush Point
<b>Lateral Line Pipe</b>		
173 m	40mm PVC PN9	
<b>Mainline Pipe</b>		
70 m	Poly 63mm PN12.5	
60 m	50mm PVC PN12.5	
<b>Drip Tubing</b>		
5651 m	Netafim Bioline 16010 1.6 0.4	
<b>Wire</b>		
61 m	Hydraulic Tube Conduit	
78 m	Hydraulic Control Tube	

NORTH:	SCALE 01:	1:250 @ A3	DRAWING #:	NA
	SCALE 02:			PROJECT/JOB #:
DRAWING TITLE:	SCALE BAR:		FOR CONSTRUCTION	SM
				AMENDMENT
PROJECT TITLE:	AREA #02 LAYOUT			
	LAKE BENNETT DISPERSAL SYSTEM			
CLIENT:	ENVR SOLUTIONS			
				
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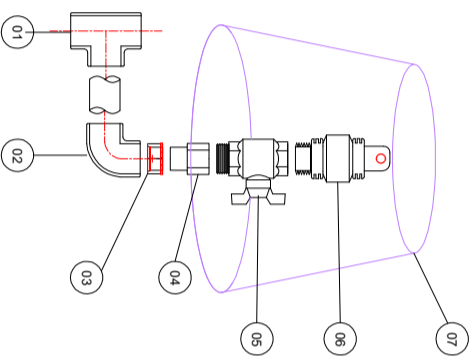
1 2 3 4 5 6 7 8

ARI KINETIC AIR VALVE 1" AV-010 BSP  
SUB MAINS AND FLUSH MANIFOLD



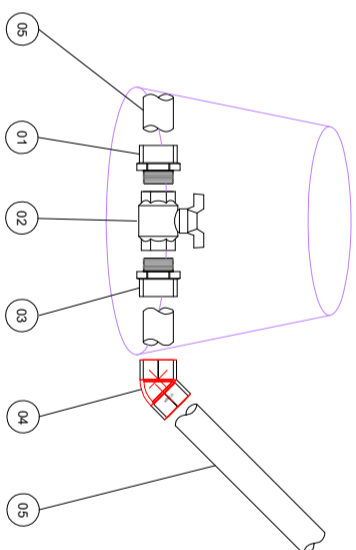
- 01 40mm PVC SW Tee
- 02 40mm x 25mm PVC SW Bush
- 03 25mm Faucet TO Adaptor
- 04 25mm M/F Ball Valve
- 05 ARI KINETIC AIR VALVE 1" AV-010 BSP
- 06 250mm Round Lliac Effluent Water VB

BARAK COMBINATION A VALVE DG-O10 1" PN10 (MAINS)  
MAINLINE HIGH POINTS



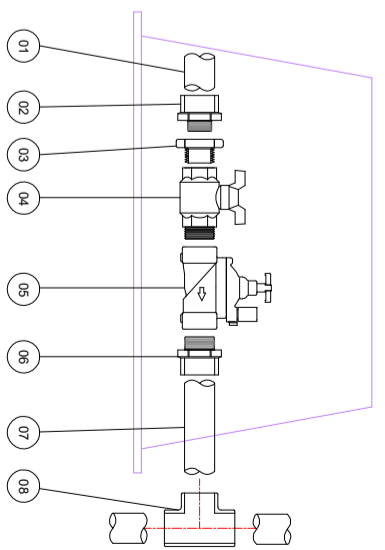
- 01 50mm PVC SW Tee
- 02 50mm PVC SW Elbow
- 03 50mm x 25mm PVC SW Bush
- 04 25mm Faucet TO Adaptor
- 05 25mm M/F Ball Valve
- 06 BARAK COMBINATION A VALVE DG-O10 1" PN10 (MAINS)
- 07 250mm Round Lliac Effluent Water VB

FLUSH / SCOUR VALVE - AS PER PLAN



- 01 40mm PVC SW Valve Socket
- 02 40mm Ball Valve
- 03 40mm PVC SW Valve Socket
- 04 40mm PVC SW Elbow 45deg
- 05 40mm PVC Flush Manifold Pipe

IRRIGATION CONTROL VALVE ASSEMBLY



- 01 32mm PVC Pipe - On Site
- 02 32mm PVC Valve Socket - On Site
- 03 40mm x 32mm Poly Bush
- 04 40mm M/F Ball Valve
- 05 40mm Solenoid Irr Control Valve
- 06 40mm PVC Valve Socket
- 07 40mm PVC Sub Main Pipe
- 08 40mm PVC SW Tee

1 2 3 4 5 6 7 8

**ORIGINAL PLANS SUPPLIED BY:**

> Client

**ADDITIONAL DATA:**

> Refer to notes where applicable.

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**CLIENT:**

ENVR SOLUTIONS

**PROJECT TITLE:**

LAKE BENNET DRIP  
DISPERSAL SYSTEM

**DRAWING TITLE:**

ASSEMBLY LAYOUTS -  
BASIC VERSION

ISSUE	REV.	AMENDMENT	BY	DATE
01	00	FOR CONSTRUCTION	SM	22.10.2023

**SCALE 01:**  
1:10 @ A3

**SCALE 02:**

**NORTH:**

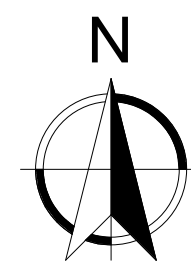
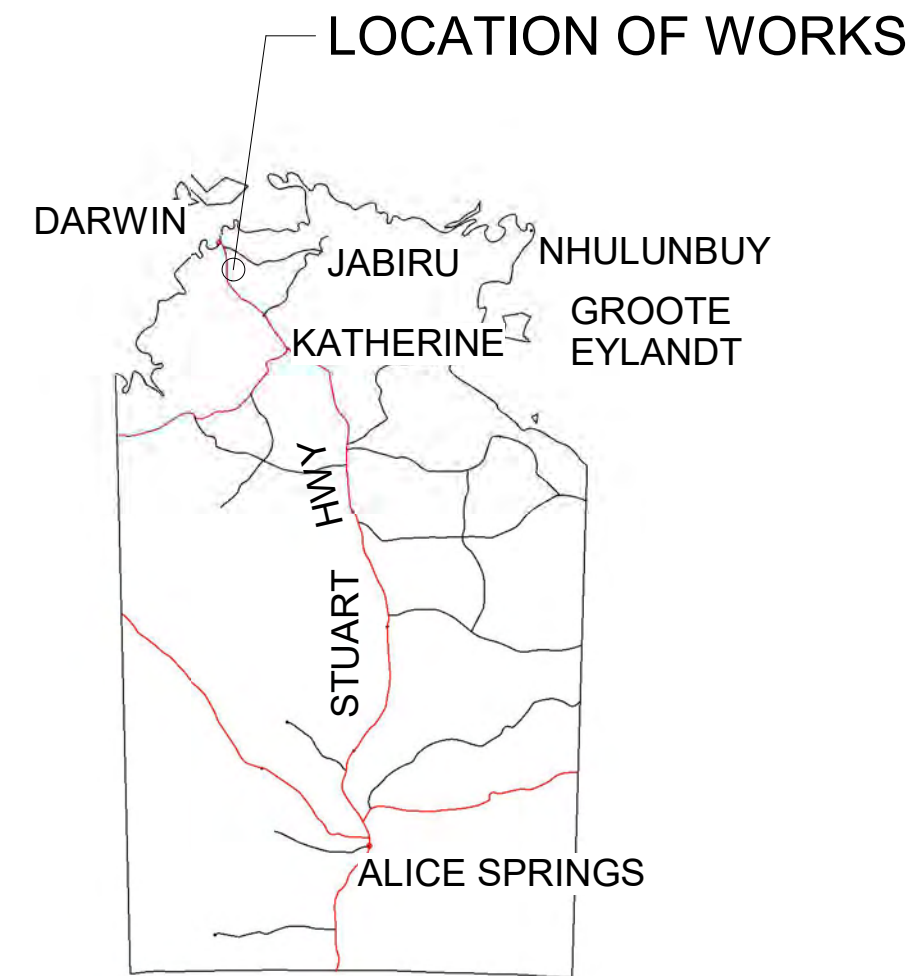
**PROJECT/JOB #:**

**DRAWING #:**

# STRUCTURAL DESIGN SUPPORT FOR LAKE BENNETT WWTP

## 841 CHINNER RD, LAKE BENNETT, NT 0822

DRAWING SCHEDULE				
SHEET No.	DWG No.	DRAWING TITLE	REV.	
01	25199-S000	COVER SHEET	2	
02	25199-S001	GENERAL NOTES SHEET 1	1	
03	25199-S002	GENERAL NOTES SHEET 2	1	
04	25199-S010	SITE PLAN	1	
05	25199-S101	TANK SLAB PLAN	1	
06	25199-S201	CONTROL ROOM PLAN	2	
07	25199-S202	STAIR ELEVATIONS	2	
08	25199-S301	ANTI-FLOATATION RING BEAM DETAIL	0	



**LOCALITY PLAN**  
SCALE NTS

ALL DIMENSIONS SHOWN IN MM. DO NOT SCALE FROM DRAWINGS.  
DIMENSIONS TAKE PRECEDENCE. IF IN DOUBT REFER TO HK SOLUTIONS

**FOR CONSTRUCTION**

REV.	DESCRIPTION	DATE	INIT.	COMPANY
2	UPDATED STAIR LANDING HEIGHT	14/10/25	HO	HKS
1	REISSUED FOR CONSTRUCTION	01/10/25	HO	HKS
0	ISSUED FOR CONSTRUCTION	19/09/25	HO	HKS

**HK Solutions**  
ENGINEERING PROJECT MANAGEMENT  
DARWIN, GEELONG, CAIRNS, TOWNSVILLE, PERTH, BALLARAT  
admin@hksolutions.com.au  
www.hksolutions.com.au

CLIENT

**ENVR SOLUTIONS**

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DRAWN	HO	ENVR SOLUTIONS
CHECKED	SH	STRUCTURAL DESIGN SUPPORT FOR LAKE BENNETT WWTP
DESIGNED	JB	841 CHINNER RD, LAKE BENNETT, NT 0822
CHECKED	AN	<b>COVER SHEET</b>
APPROVED	AN	
DATE	01/10/25	
THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED		
PAGE No	PROJECT No	DRAWING No
<b>01</b>	<b>25199 - S000</b>	<b>S000</b>
OF		
<b>08</b>		
DISCIPLINE	REV.	SHEET SIZE
<b>STRUCTURAL</b>	<b>2</b>	<b>A1</b>

**GENERAL**

1. READ THESE NOTES IN CONJUNCTION WITH ARCHITECTURAL AND OTHER ENGINEERING DRAWINGS AND SPECIFICATIONS, AND WITH SUCH OTHER WRITTEN INSTRUCTIONS ISSUED. REFER TO ARCHITECTURAL DRAWINGS FOR SETTING OUT AND DETAIL DIMENSIONS. IN CASE OF DISCREPANCY, PRECEDENCE IS GIVEN TO DRAWINGS, THEN NOTES, THEN SPECIFICATION.
2. CARRY OUT WORK IN A SAFE MANNER IN ACCORDANCE WITH APPLICABLE STATUTORY REGULATIONS, BY-LAWS OR RULES. COMPLY WITH THE RELEVANT OCCUPATIONAL HEALTH AND SAFETY ACT INCLUDING ASSOCIATED REGULATIONS AND CODES OF PRACTICE. CONTRACTOR IS RESPONSIBLE FOR OCCUPATIONAL HEALTH AND SAFETY OF SITE PERSONNEL AND GENERAL PUBLIC IN ACCORDANCE WITH LEGISLATIVE REQUIREMENTS, INDUSTRIAL AGREEMENTS AND ACCEPTED INDUSTRY PRACTICE.
3. CARRY OUT ERECTION OF STEELWORK IN ACCORDANCE WITH AS3828 GUIDELINES FOR THE ERECTION OF BUILDING STEELWORK.
4. REFER DISCREPANCIES TO SUPERINTENDENT BEFORE PROCEEDING WITH WORK.
5. SUBMIT DETAILS OF CHANGES TO SCOPE, WORK METHODS OR MATERIALS etc FOR APPROVAL BEFORE PROCEEDING. APPROVAL DOES NOT AUTHORISE A VARIATION TO THE CONTRACT.
6. CHECK STRUCTURAL DRAWINGS AGAINST ARCHITECTURAL, MECHANICAL, ELECTRICAL SERVICES AND OTHER DRAWINGS FOR REQUIREMENTS FOR PENETRATIONS, CONDUITS, DUCTS, PIPES, etc.
7. NOMINATION OF PROPRIETARY ITEMS DOES NOT INDICATE EXCLUSIVE PREFERENCE BUT INDICATES REQUIRED PROPERTIES OF ITEM. SIMILAR ALTERNATIVES HAVING REQUIRED PROPERTIES MAY BE OFFERED FOR APPROVAL. APPROVAL DOES NOT AUTHORISE A VARIATION TO THE CONTRACT. INSTALL PROPRIETARY ITEMS IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
8. OBTAIN NECESSARY PERMITS AND APPROVALS FROM RELEVANT AUTHORITIES BEFORE COMMENCING WORK ON SITE.
9. NOTIFY RELEVANT SERVICE AUTHORITIES BEFORE COMMENCING WORK ON SITE.
10. GIVE TWO WORKING DAYS' (48 HOURS) NOTICE SO THAT INSPECTION MAY BE MADE OF CRITICAL STAGES OF WORK.
11. INSPECTIONS UNDERTAKEN BY SUPERINTENDENT/OTHERS DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR COMPLIANCE WITH DRAWINGS AND SPECIFICATIONS.
12. DO NOT OBTAIN DIMENSIONS BY SCALING FROM DRAWINGS.
13. DIMENSIONS ARE IN MILLIMETRES UNO, LEVELS ARE IN METRES UNO, CHAINAGES ARE IN METRES UNO.
14. HAVE SURVEY AND SETTING OUT UNDERTAKEN BY A REGISTERED SURVEYOR.
15. VERIFY ON SITE SETTING OUT DIMENSIONS AND EXISTING MEMBER SIZES SHOWN ON DRAWINGS BEFORE SHOP DRAWINGS, CONSTRUCTION AND FABRICATION IS COMMENCED. EXISTING STRUCTURES ARE SHOWN INDICATIVELY ONLY.
16. PREPARE WORKSHOP DRAWINGS etc AND SUBMIT THREE COPIES OF EACH FOR SUPERINTENDENT'S REVIEW OF GENERAL COMPLIANCE WITH DESIGN CONCEPT. DO NOT COMMENCE FABRICATION UNTIL SHOP DRAWINGS HAVE BEEN REVIEWED. ALLOW 14 DAYS FOR SUPERINTENDENT'S REVIEW. SUPERINTENDENT'S REVIEW OF SHOP DRAWINGS IS OF GENERAL CONFORMANCE WITH DESIGN CONCEPT AND GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS ONLY. CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING QUANTITIES AND DIMENSIONS, SELECTING FABRICATION PROCEDURES AND CONSTRUCTION TECHNIQUES, AND PERFORMING WORK IN A SAFE MANNER. CORRECTIONS OR COMMENTS MADE ON SHOP DRAWINGS DO NOT RELIEVE CONTRACTOR FROM RESPONSIBILITY FOR COMPLIANCE WITH REQUIREMENTS OF CONTRACT DRAWINGS AND SPECIFICATION.
17. TAKE CARE OF HAZARDS ASSOCIATED WITH BURIED, CONCEALED OR OVERHEAD SERVICES. TAKE PRECAUTIONS TO ESTABLISH LOCATION OF AND PROTECT EXISTING SERVICES AT SITE. SERVICES SHOWN ON DRAWINGS ARE IN APPROXIMATE LOCATIONS ONLY. SERVICES OTHER THAN THOSE SHOWN MAY EXIST ON SITE. MARK LOCATIONS OF SERVICES CLEARLY ON SITE, AND ON AS-BUILT DRAWINGS. HAND EXCAVATE WITHIN ONE METRE OF IN-GROUND SERVICES.
18. WORKMANSHIP AND MATERIALS TO COMPLY WITH REQUIREMENTS OF AUSTRALIAN STANDARDS, BUILDING CODE OF AUSTRALIA AND BY-LAWS AND ORDINANCES OF RELEVANT BUILDING AUTHORITIES. ALL STANDARDS REFERRED TO ARE THOSE CURRENT (AS AMENDED) AT COMMENCEMENT OF CONTRACT.
19. MAINTAIN STRUCTURE IN A STABLE CONDITION DURING CONSTRUCTION AND PROVIDE TEMPORARY BRACING AND/OR SUPPORT AS REQUIRED. PROVIDE SPREADERS AT LOADS AND/OR LIFTING POINTS WHERE REQUIRED. ENSURE NO PART IS OVERSTRESSED. DO NOT PLACE OR STORE BUILDING MATERIALS ON STRUCTURAL MEMBERS WITHOUT SUPERINTENDENT'S APPROVAL. PROVIDE CALCULATIONS TO PROVE ADEQUACY OF STRUCTURE FOR PROPOSED CONSTRUCTION METHODS AND LOADS.
20. THESE DRAWINGS DO NOT DETAIL TEMPORARY WORKS. CONSTRUCTION METHODS AND TEMPORARY WORKS ARE THE RESPONSIBILITY OF THE CONTRACTOR.
21. DISPOSE OF SURPLUS MATERIAL OFF SITE.
22. IMPLEMENT SOIL AND WATER MANAGEMENT PROCEDURES TO AVOID EROSION, CONTAMINATION AND SEDIMENTATION OF SITE, SURROUNDING AREAS AND DRAINAGE SYSTEMS.

23. OBTAIN REQUIREMENTS FOR ADJOINING ELEMENTS TO BE FIXED TO OR SUPPORTED ON WORK AND PROVIDE FOR REQUIRED FIXINGS. DRAWINGS DO NOT SHOW DETAILS OF ALL FIXTURES, INSERTS, SLEEVES, RECESSES OR OPENINGS etc REQUIRED. PROVIDE FOR TEMPORARY SUPPORT OF ADJOINING ELEMENTS DURING CONSTRUCTION.
24. MAKE GOOD ANY DAMAGE TO EXISTING ELEMENTS AT COMPLETION OF WORKS.
25. WHERE NEW WORK ABUTS EXISTING, PROVIDE SMOOTH TRANSITION FREE OF ABRUPT CHANGES.
26. HAVE TESTING PERFORMED BY AN INDEPENDENT NATA (NATIONAL ASSOCIATION OF TESTING AUTHORITIES) ACCREDITED AUTHORITY AND PROVIDE TEST REPORTS TO SUPERINTENDENT.
27. SEPARATE METALS FROM INCOMPATIBLE MATERIALS (eg GALVANIZED AND UNGALVANIZED STEEL, TREATED TIMBER AND STEEL etc) BY CONCEALED LAYERS OF SUITABLE INERT MATERIALS OF SUITABLE THICKNESSES. USE PLASTIC SLEEVES AND WASHERS FOR BOLTS, etc.
28. STRUCTURAL WORK HAS BEEN DESIGNED FOR THE FOLLOWING LOADS:

DESIGN PARAMETERS	
NEW STRUCTURAL WORK HAS BEEN DESIGNED FOR THE PERMANENT LOAD OF THE STRUCTURE AS SHOWN ON THE DRAWINGS.	
NEW STRUCTURAL WORK HAS BEEN DESIGNED FOR THE FOLLOWING IMPOSED LOADS:	
AREA	LIVE LOAD
CONTROL ROOM STAIRS	2.5 kPa
CONTROL ROOM	5 kPa
NEW STRUCTURAL WORK HAS BEEN DESIGNED FOR THE FOLLOWING WIND CONDITIONS TO AS/NZS 1170.2:	
IMPORTANCE LEVEL	2
AVERAGE RECURRENCE INTERVAL, R:	500
REGION:	B2
ULS REGIONAL WIND SPEED, VR:	57.0 m/s
SLS REGIONAL WIND SPEED, V25:	39.0 m/s
TERRAIN CATEGORY:	1.5
DESIGN BUILDING HEIGHT:	3.5 m
TERRAIN/HEIGHT MULTIPLIER:	0.95
SHIELDING MULTIPLIER:	1.0
TOPOGRAPHIC MULTIPLIER:	1.0
ULS DESIGN WIND SPEED:	56.9 m/s
SLS DESIGN WIND SPEED:	38.9 m/s

29. SUPPLY RELEVANT NOTES, DRAWINGS AND SPECIFICATIONS etc TO SUB-CONTRACTORS.
30. UNO=UNLESS NOTED OTHERWISE, SLS=SERVICEABILITY LIMIT STATE, ULS=ULTIMATE LIMIT STATE.
31. BUILD, FABRICATE AND PROCURE ONLY FROM DRAWINGS 'ISSUED FOR CONSTRUCTION'. KEEP ON SITE A COMPLETE SET OF CONTRACT DOCUMENTS (INCLUDING DRAWINGS AND SPECIFICATIONS) AND SITE INSTRUCTIONS.

**SAFETY IN DESIGN**

1. THE SAFETY RISK MITIGATION ITEMS BELOW ARE BASED ON EXPERIENCE AND DO NOT NECESSARILY ACCOUNT FOR ALL CONSTRUCTION, OPERATION, MAINTENANCE AND DEMOLITION SAFETY RISKS. BASED ON INFORMATION AVAILABLE WHEN THIS DRAWING WAS MADE, IN ITS CAPACITY AS DESIGNER ONLY, HARRIS KMON SOLUTIONS HAS TRIED TO IDENTIFY SAFETY RISKS PERTAINING TO CONSTRUCTION, OPERATION, MAINTENANCE AND DEMOLITION PHASES OF THE ASSET. INCLUSION (OR NOT) OF ANY ITEM DOES NOT REDUCE OR LIMIT OBLIGATIONS OF CONSTRUCTOR, USER, MAINTAINER AND DEMOLISHER TO UNDERTAKE APPROPRIATE RISK MANAGEMENT ACTIVITIES TO REDUCE RISK AND IS NOT AN ADMISSION BY HARRIS KMON SOLUTIONS THAT INCLUSION OF ANY ITEM IS DESIGNER'S RESPONSIBILITY.
2. CONSTRUCT BUILDING ELEMENTS THAT CONTRIBUTE TO SAFETY, SUCH AS HANDRAILS AND TOE BOARDS, FALL ARREST SYSTEMS, ACCESS STAIRS, etc AS EARLY AS POSSIBLE.
3. PROVIDE SAFETY BARRIERS AT EDGES OF OPENINGS AND ELEVATED AREAS.
4. REVIEW ADEQUACY OF WORKING SPACE AVAILABLE FOR CONSTRUCTION ACTIVITIES. ENSURE SEPARATION OF PLANT AND PERSONNEL ON SITE, INCLUDING MOVEMENTS OF BOTH.
5. LOCATE LIFTING SLEW AND LAY DOWN AREAS AWAY FROM REGULAR CONSTRUCTION TRAFFIC.
6. PROVIDE PROTECTION TO PERSONNEL FROM PLANT AND EQUIPMENT, INCLUDING POST-TENSIONED GROUND ANCHOR INSTALLATION WORKS.
7. ENSURE ISOLATION SAFE SYSTEMS OF WORK OR PROTECTIVE MEASURES ARE INSTALLED BEFORE WORKING NEAR LIVE ELECTRICAL INFRASTRUCTURE. PROVIDE PROTECTION OF ELECTRICAL OVERHEAD WIRING SYSTEMS DURING CONSTRUCTION.

8. WRITTEN RISK ASSESSMENTS ARE ADVISED FOR ACCESS TO OPEN EXCAVATIONS.
9. PROVIDE ACCESS AND EGRESS TO EXCAVATIONS APPROPRIATE IN CASE OF INUNDATION, COLLAPSE OR ENGULFMENT.
10. LOCATE STOCKPILES AND HEAVY EQUIPMENT INCLUDING CRANES AWAY FROM BURIED SERVICES AND BUILDING BOUNDARIES WHERE ADJACENT BASEMENTS ARE PRESENT.
11. SEEK ADVICE FROM SUITABLY QUALIFIED GEOTECHNICAL OR STRUCTURAL ENGINEER PRIOR TO OPERATION OF HEAVY SURFACE PLANT AND EQUIPMENT OR STOCKPILING MATERIAL NEAR OPEN EXCAVATIONS OR EXISTING RETAINING STRUCTURES.
12. DO NOT STOCKPILE MATERIALS BEHIND OR EXCAVATE IN FRONT OF EXISTING RETAINING WALLS UNTIL WALL STABILITY HAS BEEN REVIEWED BY SUITABLY QUALIFIED STRUCTURAL ENGINEER.
13. SEEK ADVICE FROM SUITABLY QUALIFIED STRUCTURAL ENGINEER BEFORE LAYING SERVICES BELOW EXISTING FOOTING LEVELS.

**FOUNDATIONS AND FOOTINGS**

1. NOTIFY SUPERINTENDENT IF CONDITIONS ENCOUNTERED DIFFER FROM THOSE DESCRIBED IN THE REPORT AND SEEK DIRECTIONS.
2. NOTIFY SUPERINTENDENT IF GROUND WATER IS ENCOUNTERED.
3. DESIGN PARAMETERS BELOW ARE BASED ON DATA FROM DISCRETE LOCATIONS AS RECORDED IN THE GEOTECHNICAL INVESTIGATION REPORT. SUBSURFACE CONDITIONS SHOWN ON DRAWINGS IS INFERRED FROM DATA IN GEOTECHNICAL INVESTIGATION REPORT AND IS GIVEN AS A GUIDE ONLY. ACTUAL GROUND CONDITIONS MAY VARY FROM THOSE SHOWN.
4. REMOVE TOP SOIL CONTAINING GRASS ROOTS OR OTHER ORGANIC MATTER RUBBLE AND /OR DEBRIS AND OTHER UNSUITABLE MATERIAL BELOW FOUNDATIONS.
5. COMPACT THE TOP 500mm OF SUBGRADE TO 98% SMDD IN LAYERS < 150mm.
6. KEEP EXCAVATIONS FREE OF WATER. PROVIDE ADEQUATE DRAINAGE TO ENSURE FORMATION IS NOT AFFECTED BY MOISTURE. PREVENT FOUNDATION DRYING OUT DUE TO EXPOSURE. PLACE BLINDING, FOOTINGS AND BACKFILL AS SOON AS PRACTICABLE AFTER EXCAVATION.
7. FOOTINGS HAVE BEEN DESIGN FOR A SAFE WORKING BEARING PRESSURE OF 100kPa IN SOIL TBA. REMOVE SOFTENED OR LOOSE MATERIAL AND MATERIAL THAT DOES NOT ACHIEVE THESE PRESSURES. ENSURE FORMATION IS CLEAN AND LEVEL.
8. PROVIDE 0.2 mm HIGH IMPACT RESISTANT VIRGIN POLYETHYLENE FILM DAMP PROOF MEMBRANE TO AS2870 ON 50 mm SAND BLINDING WHERE SHOWN ON DRAWINGS. LAP 200 mm AND SEAL DAMP PROOF MEMBRANES, TAPE AT PENETRATIONS, etc TO ENSURE A COMPLETE VAPOUR BARRIER IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS2870.

**GEOTECHNICAL INVESTIGATION**

REPORT No:	237212.00
PREPARED BY:	DOUGLAS PARTNERS
DATED:	22/08/2025
<b>FOR BORED PIERS</b>	
UNIT WEIGHT:	20 kN/m3
UNDRAINED COHESION:	75 kPa
ULTIMATE END BEARING CAPACITY:	3,000 kPa
SHAFT ADHESION:	40 kPa (DOWN), 27 kPa (UP)
<b>FOR ABOVE GROUND TANKS</b>	
MODULUS OF SUBGRADE REACTION:	20 kPa/mm
BASED ON COMPACTION:	93.5% MMDD
UNDER LOAD OF:	50 kPa

**CONCRETE**

1. WORKMANSHIP AND MATERIALS TO COMPLY WITH AS3600, AS2870, AS3610, AS1379, AS1478, AS3582 AND AS3972.
2. WET CONCRETE TO BE UNIFORM, HOMOGENEOUS, COHESIVE AND ABLE TO WORK READILY INTO CORNERS AND AROUND REINFORCEMENT COMPLETELY FILLING FORMWORK WITHOUT SEGREGATION, EXCESS FREE WATER ON SURFACE, LOSS OF MATERIAL OR CONTAMINATION. CONCRETE TO HAVE GOOD DIMENSIONAL STABILITY AND ABLE TO RESIST PLASTIC SETTLEMENT CRACKING, THERMAL CRACKING AND SHRINKAGE CRACKING.
3. FINISHED CONCRETE TO BE A DURABLE, DENSE, HOMOGENEOUS MASS COMPLETELY FILLING FORMWORK, EMBEDDING REINFORCEMENT AND TENDONS, AND FREE OF STONE POCKETS, OF UNIFORM COLOUR AND TEXTURE, WITH LOW PERMEABILITY AND ADEQUATE BUT NOT EXCESSIVE STRENGTH FOR GRADE.
4. SLUMP TO BE AS REQUIRED FOR PLACEMENT, COMPACTION AND FINISHING.
5. REFER TO CONCRETE DRAWINGS FOR QUALITY OF CONCRETE ELEMENTS.
6. MIX CONCRETE TO ENSURE UNIFORM DISTRIBUTION OF CONSTITUENTS.
7. RESPONSIBILITY FOR DESIGN, CERTIFICATION, CONSTRUCTION AND PERFORMANCE OF FORMWORK AND FALSEWORK LIES WITH CONTRACTOR.
8. DO NOT STRIP FORMWORK PRIOR TO 36 HOURS AFTER PLACEMENT.

9. DO NOT STRIP FORMWORK UNTIL CONCRETE IS HARDENED SUFFICIENTLY TO WITHSTAND MOVEMENT AND FORM REMOVAL WITHOUT DAMAGE.
10. USE PLACEMENT METHODS THAT WILL MINIMISE PLASTIC SETTLEMENT AND SHRINKAGE CRACKING.
11. IN HOT WEATHER PREVENT PREMATURE STIFFENING OF FRESH CONCRETE; REDUCE WATER ABSORPTION AND EVAPORATION LOSSES. MIX, TRANSPORT, PLACE AND COMPACT CONCRETE AS QUICKLY AS POSSIBLE. DURING PLACEMENT TEMPERATURE OF CONCRETE MUST NOT EXCEED 32 DEG C. DO NOT MIX CONCRETE WHEN SURROUNDING OUTDOOR SHADE TEMPERATURE 38 DEG C. MAINTAIN TEMPERATURE OF FORMWORK AND REINFORCEMENT AT 32 DEG C BEFORE AND DURING PLACING. MAINTAIN SPECIFIED TEMPERATURE OF PLACED CONCRETE BY:
  - ~ COOL CONCRETE USING LIQUID NITROGEN INJECTION BEFORE PLACING, OR
  - ~ COVER CONTAINER IN WHICH CONCRETE IS TRANSPORTED TO FORMS, OR
  - ~ SPRAY COARSE AGGREGATE USING COLD WATER, OR
  - ~ USE CHILLED MIXING WATER.
12. PROTECT FRESH CONCRETE FROM PREMATURE DRYING - PARTICULARLY IN HOT, WINDY OR DRY (LOW HUMIDITY) CONDITIONS, EXCESSIVELY HOT OR COLD TEMPERATURES, RAIN, etc. PROVIDE WIND BREAKS. MAINTAIN CONCRETE AT A REASONABLY CONSTANT TEMPERATURE WITH MINIMUM MOISTURE LOSS FOR CURING PERIOD.
13. COMMENCE CURING OF CONCRETE TO AS3600 AS SOON AS POSSIBLE AFTER PLACING AND FINISHING OR STRIPPING, AND WITHIN ONE HOUR. CURE CONTINUOUSLY UNTIL NUMBER OF DAYS DURING WHICH AIR TEMPERATURE IS ABOVE 10 DEG C TOTALS:
  - ~ 3 DAYS FOR EXPOSURES CLASSIFICATION A1 AND A2
  - ~ 7 DAYS FOR EXPOSURE CLASSIFICATION B1, B2 AND C.
15. PREVENT RAPID DRYING OUT AT END OF CURING PERIOD.
16. FINISH CONCRETE SURFACES TO AS3610 AND AS SHOWN BELOW UNLESS OTHERWISE DETAILED BY ARCHITECT:
  - FORMED SURFACES:**
    - ~ EXPOSED SURFACES: 3
    - ~ HIDDEN SURFACES: 5
  - FINISHES AS LAID:**
    - ~ EXPOSED SURFACES: STEEL TROWEL UNO
    - ~ HIDDEN SURFACES: WOOD FLOAT
17. BEAM SIZES ARE DESIGNATED DEPTH (INCLUDING SLAB, IF ANY) x WIDTH. PLACE CONCRETE IN SLABS AT SAME TIME AS BEAMS INTEGRAL WITH THEM. SIZES OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
18. PROVIDE EXPOSED EDGES AND RE-ENTRANT CORNERS WITH 45 DEGREES x 25 mm CHAMFERS OR FILLETS UNO.
19. COVER IS CLEAR DISTANCE BETWEEN ANY REINFORCEMENT (INCLUDING LIGATURES, TIE WIRE etc) AND OUTSIDE SURFACE OF STRUCTURAL CONCRETE.
20. COVER MUST NOT BE LESS THAN SPECIFIED. PROVIDE MINIMUM CLEAR COVER TO REINFORCEMENT AS SHOWN ON CONCRETE DRAWINGS, EXCEPT WHERE SPECIFIED OTHERWISE.
21. FORWARD CONCRETE PROJECT ASSESSMENT INFORMATION TO SUPERINTENDENT AS PER AS1379 CLAUSE 6.3 WHEN PROJECT ASSESSMENT IS UNDERTAKEN. REFER CONCRETE TESTING NOTES.
22. PROVIDE CONCRETE TEST RESULTS TO SUPERINTENDENT PROMPTLY, WITHIN TWO WEEKS OF TESTING.
  - CONCRETE TESTING**
23. TARGET SLUMP WITHIN TOLERANCES GIVEN IN AS1379 CLAUSE 5.2.3
24. REGISTER PROJECT FOR DISSEMINATION OF CONCRETE PRODUCTION ASSESSMENT INFORMATION. MANUFACTURER TO CARRY OUT PRODUCTION ASSESSMENT OF CONCRETE FOR COMPLIANCE WITH REQUIREMENTS OF AS1379.
25. CARRY OUT PROJECT ASSESSMENT OF CONCRETE TO AS1379 CLAUSE 6.4 AND 6.5. TAKE SAMPLES AT PROJECT SITE AT POINT OF DISCHARGE FROM AGITATOR. SPREAD SAMPLING EVENLY THROUGH POUR. SAMPLE CONCRETE FOR PROJECT ASSESSMENT CONCURRENTLY WITH EACH SAMPLE TAKEN FOR PRODUCTION ASSESSMENT AT PROJECT SITE. FOR EACH CONCRETE DESIGN MIX TAKE ONE SAMPLE FROM EACH 25 CUBIC METRES OF CONCRETE DELIVERED PER DAY, NOT LESS THAN FIVE SAMPLES TOTAL FOR EACH MIX DESIGN. EACH SAMPLE TO COMPRISE FOUR CYLINDERS: TEST TWO AT 7 DAYS AND TWO AT 28 DAYS.
26. CARRY OUT DRYING SHRINKAGE TESTING TO AS1012.13. FOR EACH CONCRETE DESIGN MIX TAKE ONE SAMPLE EVERY THREE MONTHS, OR FOR EVERY 200 m3 OF CONCRETE PLACED. A MINIMUM OF ONE SAMPLE. EACH SAMPLE TO COMPRISE THREE SPECIMENS. SAMPLE CONCRETE AT PROJECT SITE, DIRECTLY FROM DELIVERY VEHICLE. BASE ASSESSMENT ON AVERAGE OF THREE TEST RESULTS.

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<b>02</b>	<b>08</b>	<b>25199 - S001</b>	<b>STRUCTURAL</b>	<b>1</b>	<b>A1</b>

DRAWINGS TO BE PRINTED IN COLOUR

**STEEL**

- WORKMANSHIP AND MATERIALS TO COMPLY WITH AS4100, AS/NZS4600 AND AS/NZS1554
- PROVIDE STEEL IN ACCORDANCE WITH:
  - ~ AS1163 GRADE C350 FOR RECTANGULAR AND SQUARE HOLLOW SECTIONS,
  - ~ AS1163 GRADE C250 OR C350 FOR CIRCULAR HOLLOW SECTIONS, AS NOTED ON DRAWINGS
  - ~ AS/NZS3678 FOR PLATES AND FLOOR PLATE,
  - ~ AS/NZS3679 PART 2, GRADE 300 FOR WELDED BEAMS AND WELDED COLUMNS,
  - ~ AS/NZS3679 PART 1 GRADE 300 OR BHP GRADE 300 PLUS FOR UNIVERSAL BEAMS, UNIVERSAL COLUMNS, PARALLEL FLANGE CHANNELS, ANGLES, FLATS, BARS AND RODS,
  - ~ AS1397 GRADE G450 FOR PURLINS AND GIRTS
  - ~ OTHERWISE TO COMPLY WITH AS/NZS3678 OR AS/NZS3679 GRADE 250 UNO.
- PROVIDE 3mm CAP PLATES SEAL WELDED TO HOLLOW SECTIONS UNO WELDING
- WELDING TO BE UNDERTAKEN BY SUITABLY QUALIFIED EXPERIENCED WELDER. ALL WELDING TO BE CARRIED OUT IN ACCORDANCE WITH AS/NZS1554. UNLESS NOTED OTHERWISE, WELDING TO BE AS FOLLOWS:
  - ~ SITE WELDED
  - ~ CATEGORY GP
  - ~ 6mm CONTINUOUS FILLET WELDS ALL ROUND.
  - ~ BUTT WELDS TO BE FULL (COMPLETE) PENETRATION UNO.
  - ~ ELECTRODES TO BE LOW CARBON WITH TENSILE STRENGTH OF 490 MPa, PRE-APPROVED TO AS/NZS1554, eg CLASSIFICATION B-E49XX.
- REPAIR FAULTY WELDS REVEALED BY WELD INSPECTION/TESTING AND REPEAT THE EXAMINATION.
- WELDS TO BE INSPECTED BY INDEPENDENT NATA ACCREDITED QUALIFIED WELDING INSPECTOR TO AS2214. PROVIDE WELDING INSPECTOR'S REPORT TO SUPERINTENDENT.
- WELDING SYMBOLS ARE TO AS1101.3.
  - ~ "CFW" INDICATES CONTINUOUS FILLET WELD.
  - ~ "FSBW" INDICATES FULL STRENGTH BUTT WELD WHICH IS EQUIVALENT TO CPBW.
  - ~ "CPBW" INDICATES COMPLETE PENETRATION BUTT WELD.

**BOLTS**

- USE BOLTS WITH THREADS IN COMPLIANCE WITH AS1275. BOLTS OF STRENGTH GRADE 4.6 TO BE COMMERCIAL GRADE BOLTS TO AS1111 AND 1112. BOLTS OF STRENGTH GRADE 8.8 TO BE HIGH STRENGTH STRUCTURAL BOLTS, NUTS AND WASHERS TO AS/NZS1252. MECHANICAL PROPERTIES OF BOLTS, NUTS, SCREWS AND STUDS TO COMPLY WITH AS/NZS4291.2. WASHERS TO COMPLY WITH AS1237.
- TIGHTENING PROCEDURES TO COMPLY WITH AS4100:
  - ~ S SNUG TIGHT.
  - ~ TB BEARING MODE JOINT, BOLTS FULLY TENSIONED
  - ~ TF FRICTION MODE JOINT, BOLTS FULL TENSIONED. (CONTACT SURFACES OF FRICTION CONNECTIONS TO BE UNCOATED AND FREE OF MILL SCALE.)
- M16 AND LARGER BOLTS TO BE HIGH STRENGTH STRUCTURAL BOLTS, 8.8/S PROCEDURE UNO AND M12 SIZE BOLTS SHALL BE COMMERCIAL BOLTS, 4.6/S PROCEDURE UNO.
- USE BOLT LENGTHS SO THAT PROJECTION BEYOND NUT IS AT LEAST TWO THREADS, AND NOT MORE THAN 10mm.

**DURABILITY & PROTECTIVE COATINGS**

- USE BOLTS, SCREWS, NUTS AND WASHERS HOT DIP GALVANISED BY MANUFACTURER TO AS 1214.
- AFTER COMPLETION OF FABRICATION / DEMOLITION / OTHER WORKS, PREPARATION FOR SURFACE TREATMENT TO BE: ROUND OFF ROUGH WELDS, SHARP EDGES (2mm RADIUS) etc. SURFACE TO BE FREE OF WELDING SPATTER, SLAG, UNDERCUTS, VISIBLE PORES PITS AND CRATERS, VISIBLE SLIVERS, ROLL-OVERS, LAMINATIONS, ROLLED-IN EXTRANEIOUS MATTER, GROOVES (RADIUS OF GOUGES TO BE LESS THAN 4 mm), INDENTATIONS, ROLL MARKS, BURRS, ARISES, CRACKS, ETC. PREPARE WELDS, EDGES AND OTHER AREAS WITH SURFACE IMPERFECTIONS TO ISO 8501-3 PREPARATION GRADE P3.
- SURFACE PREPARATION: REMOVE OIL, GREASE AND OTHER CONTAMINANTS TO AS1627.1. ABRASIVE BLAST CLEAN TO AS1627.4 CLASS SA 2½ WITH SURFACE PROFILE 40 TO 70MICRONS OR AS SPECIFIED BY COATINGS MANUFACTURER FOR THE SERVICE CONDITIONS. ASSESS ABRASIVE BLAST CLEANED SURFACE TO AS1627.9 AND SURFACE PROFILE TO AS3894.5. FOR SMALL AREAS WHERE ABRASIVE BLAST CLEANING IS NOT POSSIBLE OBTAIN APPROVAL FROM SUPERVISOR TO USE POWER TOOL CLEANING TO AS1627.2 CLASS S13/PST3 AS DEFINED IN ISO8501.1 FOR STEEL CLEANED TO A METALLIC FINISH WITH MINIMUM 25MICRON SURFACE PROFILE. REMOVE DUST BY BRUSHING OR VACUUM CLEANING.
- APPLY PROTECTIVE COATINGS AS SOON AS PRACTICABLE AFTER PREPARATION, WITHIN FOUR HOURS AND BEFORE FLASH RUST OR RUST BLOOM APPEARS. APPLICATION OF PROTECTIVE COATINGS TO COMPLY WITH MANUFACTURER'S RECOMMENDATIONS.

- UNLESS NOTED OTHERWISE ON DRAWINGS OR IN SPECIFICATION, SURFACE TREATMENT OF STEEL WORK FOR ATMOSPHERIC CORROSION PROTECTION TO BE:
  - ~ STEELWORK: TWO COATS OF DULUX DUREBILD STE

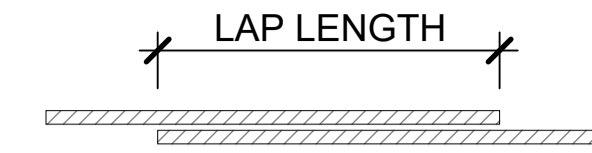
**COATING REPAIRS**

- REINSTATE COATING TO DAMAGED AREAS TO PROTECTIVE COATINGS SPECIFICATION. FIELD WELD REPAIRS: DO NOT WELD THROUGH EXISTING GALVANISING OR COATINGS. REMOVE WELD SPATTER, RESIDUAL FLUX etc BY CHIPPING, GRINDING OR ABRASIVE BLAST CLEANING. GRIND FLUSH ROUGH WELD BEADS. PREPARE SURFACE FOR PAINTING AS PER COATING SPECIFICATION. REMOVE RUST, LOOSE AND BURNT PAINT AND SUFFICIENT SOUND COATING SO PAINT EDGE IS FEATHERED AND SMOOTH. STRIPE COAT ALL WELDS, EDGES AND ROUGH SURFACES USING A BRUSH. REINSTATE COATING AS PER PROTECTIVE COATINGS SPECIFICATION.

**REINFORCEMENT**

- SYMBOLS ON DRAWINGS FOR GRADE AND TYPE OF REINFORCEMENT ARE AS FOLLOWS:
  - ~ R: STRUCTURAL GRADE 250 PLAIN ROUND BAR TO AS/NZS4671
  - ~ N: HOT ROLLED GRADE 500 DEFORMED (RIBBED) BAR DUCTILITY CLASS N TO AS/NZS4671
  - ~ L: HOT ROLLED GRADE 500 DEFORMED BAR DUCTILITY CLASS L TO AS/NZS4671
  - ~ SL: HARD DRAWN WIRE GRADE 500 SQUARE MESH DUCTILITY CLASS L TO AS/NZS4671
  - ~ RL: HARD DRAWN WIRE GRADE 500 RECTANGULAR MESH DUCTILITY CLASS L TO AS/NZS4671
  - ~ TM: HARD DRAWN STEEL GRADE 500 TRENCH MESH DUCTILITY CLASS L TO AS/NZS4671
  - ~ GRADE 500 STEEL REINFORCING WIRE TO AS/NZS4671
- PROVIDE ACRS (AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEEL LTD) CERTIFICATION OF COMPLIANCE WITH AS/NZS4671 FOR ALL REINFORCEMENT.
- PROVIDE DOCUMENTATION TO SHOW THAT REINFORCEMENT SUPPLIER AND MILL COMPLIES WITH AS/NZS4671.
- REINFORCEMENT MUST HAVE UNIQUE MARKS TO IDENTIFY SUPPLIER.
- USE MESH SUPPLIED IN FLAT SHEETS UNLESS APPROVED OTHERWISE.
- REINFORCEMENT TO BE CLEAN, FREE OF LOOSE MILL SCALE, RUST, OIL, GREASE, MUD OR OTHER MATERIAL THAT MIGHT REDUCE BOND BETWEEN REINFORCEMENT AND CONCRETE.
- FOLLOWING ABBREVIATIONS APPLY TO LOCATION OF REINFORCEMENT:
  - EW: EACH WAY FF: FAR FACE BB: BOTTOM BOTTOM (LAID FIRST)
  - EF: EACH FACE B: BOTTOM TT: TOP TOP (LAID LAST)
  - NF: NEAR FACET: TOP C OR CP: CENTRALLY PLACED
- PROVIDE N12 DIAGONAL TRIMMER BARS BY 1000 mm LONG AT EACH LAYER OF REINFORCEMENT AT RE-ENTRANT CORNERS, OPENINGS, SERVICE PENETRATIONS etc UNO.
- SECURE REINFORCEMENT IN POSITION AGAINST DISPLACEMENT AND MAINTAIN SPECIFIED CLEAR CONCRETE COVER TO REINFORCEMENT (INCLUDING FITMENTS) BY APPROVED CHAIRS, SPACERS, LIGATURES OR TIES AT 800mm MAXIMUM CENTRES EACH WAY UNO. PROVIDE ADEQUATE SUPPORT TO PREVENT DISPLACEMENT OF REINFORCEMENT BY WORKMEN OR EQUIPMENT DURING CONCRETE PLACEMENT.
- SECURELY TIE REINFORCEMENT WITH WIRE TIES. TURN ENDS OF TIE WIRES INTO CONCRETE, CLEAR OF COVER ZONE.
- SUPPORT REINFORCEMENT ON PROPRIETARY CONCRETE, METAL OR PLASTIC SUPPORTS ADEQUATE TO WITHSTAND CONSTRUCTION AND TRAFFIC LOADS AND MAINTAIN DURABILITY OF FINISHED CONCRETE STRUCTURE.
- DO NOT PLACE OR MOVE REINFORCEMENT DURING OR AFTER CONCRETE PLACEMENT.
- ENSURE EMBEDDED ITEMS (INSERTS, THREADED SOCKETS, FERRULES, BOLTS, DISSIMILAR METAL ITEMS, etc) IN COVER CONCRETE OR EXPOSED TO AIR ARE NOT IN CONTACT WITH REINFORCEMENT. PROVIDE ISOLATION BETWEEN DISSIMILAR METALS, AND BETWEEN REINFORCEMENT AND EXPOSED ITEMS.
- LAY MESH REINFORCEMENT SO THAT MINIMUM COVER IS TO MAIN WIRES UNO.
- DO NOT BEND OR STRAIN REINFORCEMENT IN A WAY THAT MAY CAUSE DAMAGE. BEND DIAMETERS TO BE TO AS3600. BARS TO BE BENT COLD UNO. GRADE 250 BARS MAY BE BENT AT TEMPERATURES UP TO 850 DEG C. DO NOT COOL HEATED BARS BY QUENCHING.
- ENSURE HOT BENDING OF REINFORCEMENT COMPLIES WITH AS3600 CLAUSE 17.2.3.1. USE TEMPERATURE INDICATOR PAINTS AND/OR CRAYONS TO ENSURE REINFORCEMENT TEMPERATURE DOES NOT EXCEED MANUFACTURERS RECOMMENDED LIMITS.

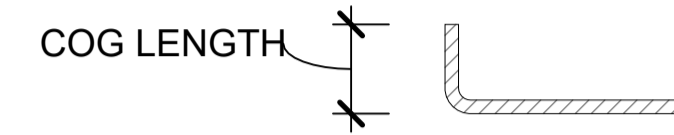
BAR LAP LENGTHS 'L'			
FOR SLABS < 300 THICK			
BAR SIZE	CONCRETE GRADE (MPa)		
	32	40	50
N12	500	500	500
N16	700	650	650
N20	950	850	800
N24	1200	1100	960



**NOTES:**

- LAP LENGTH DETERMINED BY THE SMALLER DIA BAR
- LAP LENGTH TO BE AS PER SCHEDULE U.N.O.
- FOR 25 MPa CONCRETE INCREASE LAP LENGTHS SPECIFIED FOR 32MPa BY A FACTOR OF 1.15

BAR COG	
BAR DIA.	MIN. COG LENGTH (mm)
N12	100
N16	150
N20	200
N24	250
N28	300
N32	350
N36	400



COG LENGTHS TO BE AS PER SCHEDULE U.N.O.

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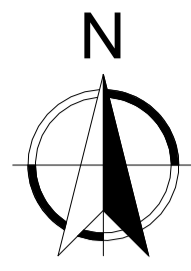
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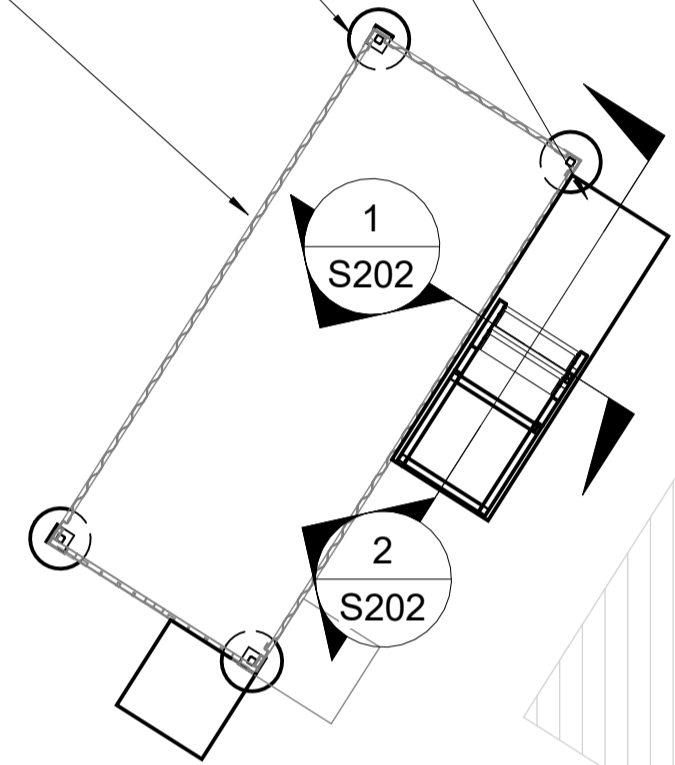
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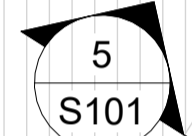
NEW CONTROL ROOM ACCESS STAIRS. REFER DWG S202

NEW CONTROL ROOM FOOTINGS. REFER DWG S201

NEW CONTROL ROOM

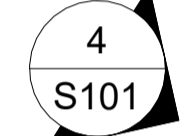
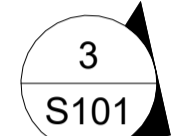


6x UNDERGROUND CONC. PROCESSING TANKS (BY OTHERS)



WASTE WATER TREATMENT TANKS (BY OTHERS)

WALKING TRACK



NEW ABOVE GROUND TANK SLAB. REFER DWG S101

4 x 27,000 LITRE POLY TANKS (BY OTHERS)

CUT OFF RIP RAP SURFACE DRAINS. EARTHWORKS AND DRAINAGE SHOWN INDICATIVELY ONLY. REFER CIVIL PLANS FOR DETAILS.

**SITE PLAN**  
SCALE NTS

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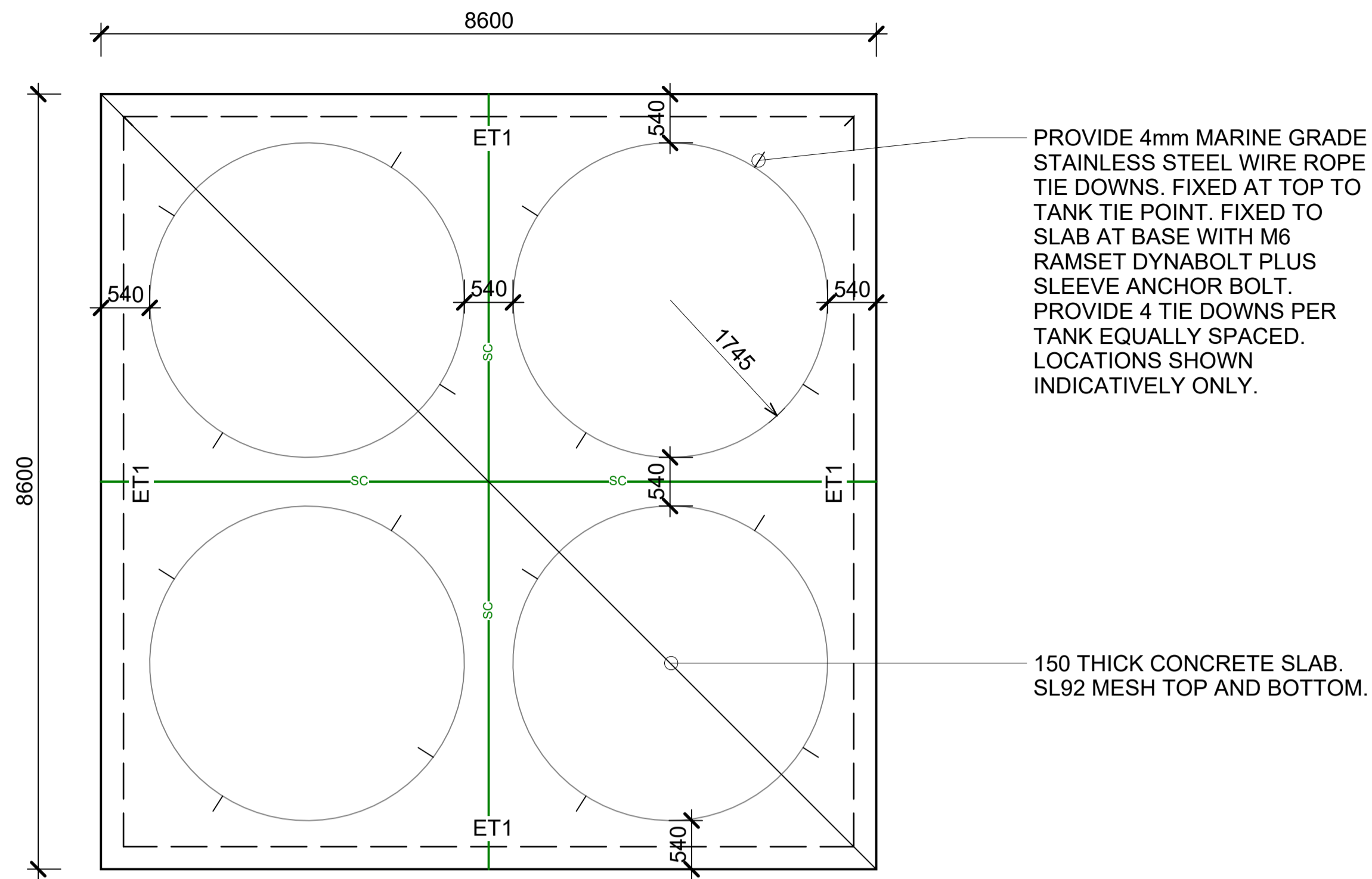
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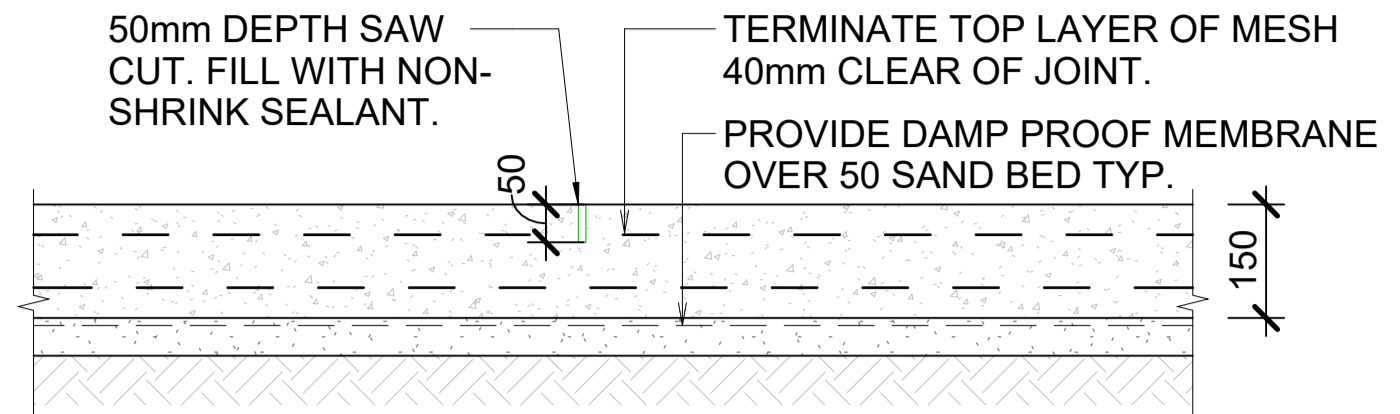
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PROVIDE 4mm MARINE GRADE STAINLESS STEEL WIRE ROPE TIE DOWNS. FIXED AT TOP TO TANK TIE POINT. FIXED TO SLAB AT BASE WITH M6 RAMSET DYNABOLT PLUS SLEEVE ANCHOR BOLT. PROVIDE 4 TIE DOWNS PER TANK EQUALLY SPACED. LOCATIONS SHOWN INDICATIVELY ONLY.

150 THICK CONCRETE SLAB. SL92 MESH TOP AND BOTTOM.



INITIAL SAWCUTS TO BE CARRIED OUT WITHIN 7-10 HOURS AFTER POUR. THE CUTS ARE TO BE MADE BEFORE ANY CRACKING TO THE SLABS OCCUR. THE CONTRACTOR IS RESPONSIBLE FOR THE TIMING OF THE SAWCUTS.  
ENSURE SAWCUTS EXTEND FOR FULL LENGTH TO FACE OF WALLS/COLUMNS.

**SAW CUT - SC**  
SCALE 1 : 10

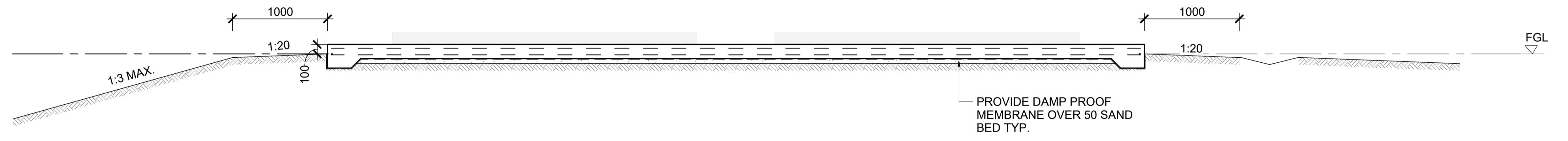
FOOTING SCHEDULE		
MARK	SIZE	COMMENTS
ET1	250 W x 250 D	EDGE THICKENING. 1-N16 TRIMMER TIED TO TOP OF BOTTOM MESH.

**LEGEND**  
—sc— SAW CUTS REFER SAW CUT DETAIL

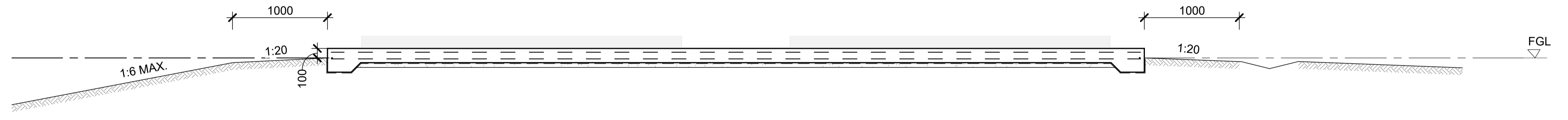
- NOTES**
- FOUND TANK SLAB ON FILL COMPACTED TO 93.5% MMDD. DESIGN OF TANK SLAB IS BASED ON GOOD SURFACE DRAINAGE AROUND SLAB. BATTERS STABILISED WITH GEOTEXTILE FABRIC AND ROCK PITCHING. REFER CIVIL DRAWINGS.
  - EARTHWORKS AND DRAINAGE SHOWN INDICATIVELY ONLY. REFER TO CIVIL PLAN FOR DETAILS.

STRUCTURAL ELEMENT	EXPOSURE CLASS.	STRENGTH GRADE (MPa)	MAX. AGGREGATE SIZE (mm)	COVER (mm)
TANK SLAB	B1	N32	20	40
STAIR SLAB	B1	N32	20	40
CONTROL ROOM FOOTINGS	B1	N32	20	-

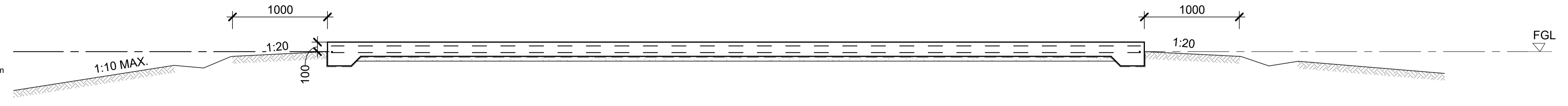
**SLAB SETOUT PLAN**  
SCALE 1 : 50



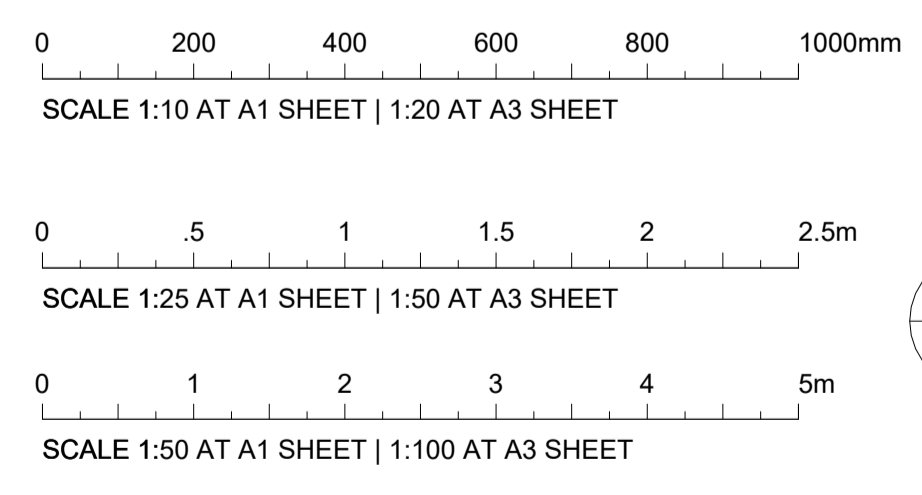
**3 SECTION**  
S010 SCALE 1 : 25



**4 SECTION**  
S010 SCALE 1 : 25



**5 SECTION**  
S010 SCALE 1 : 25



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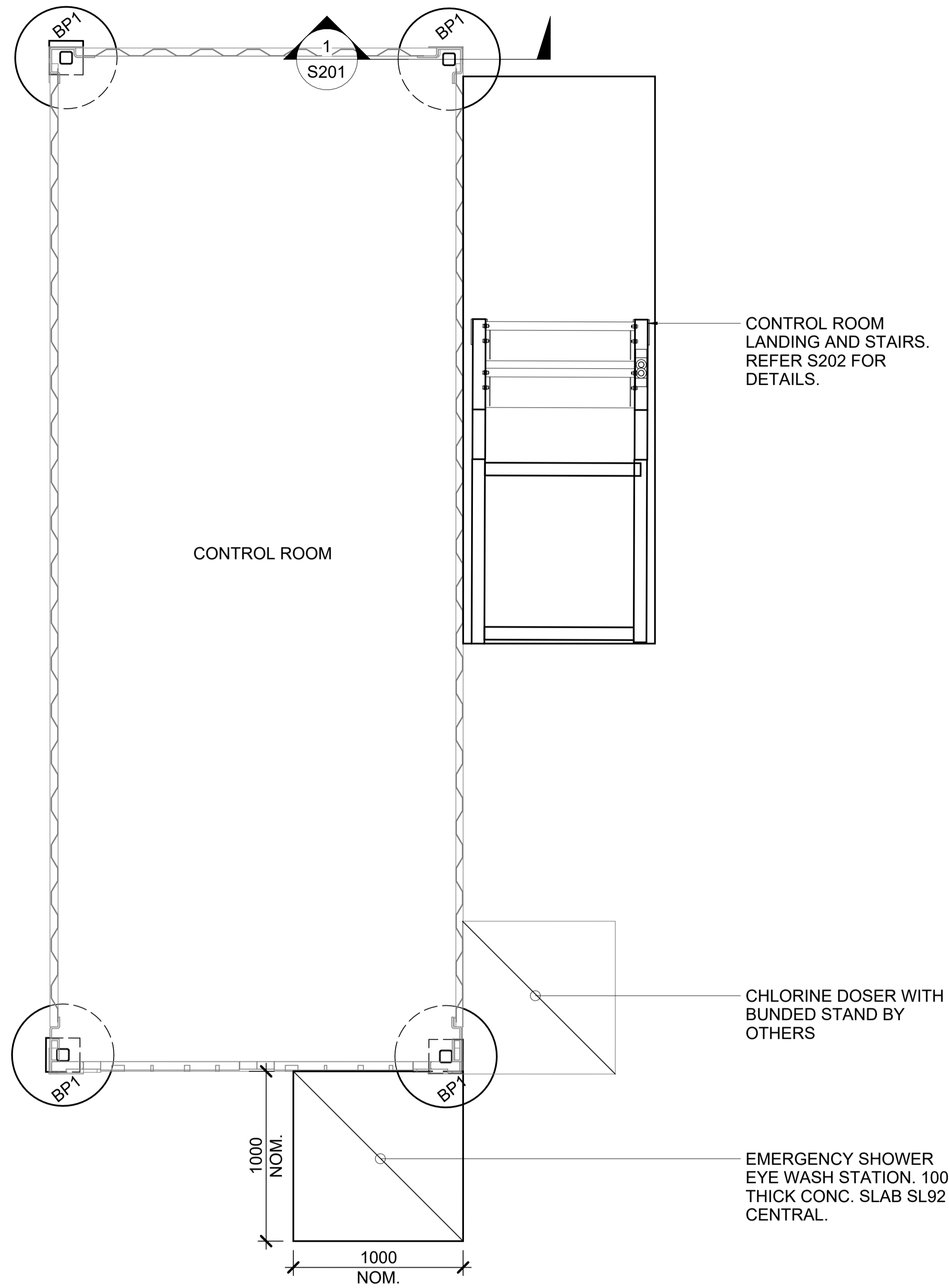
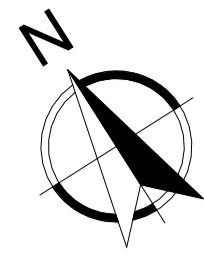
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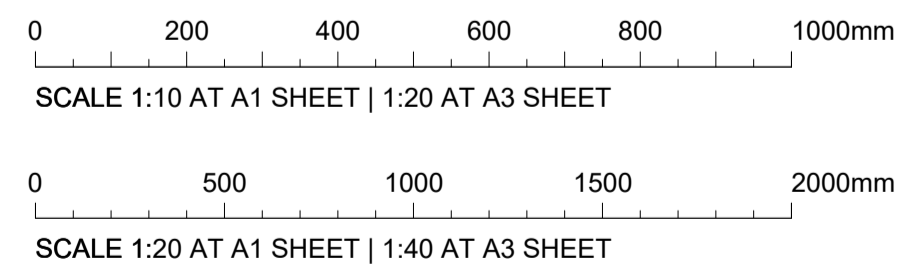
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APPROVED	AN	<b>TANK SLAB PLAN</b>
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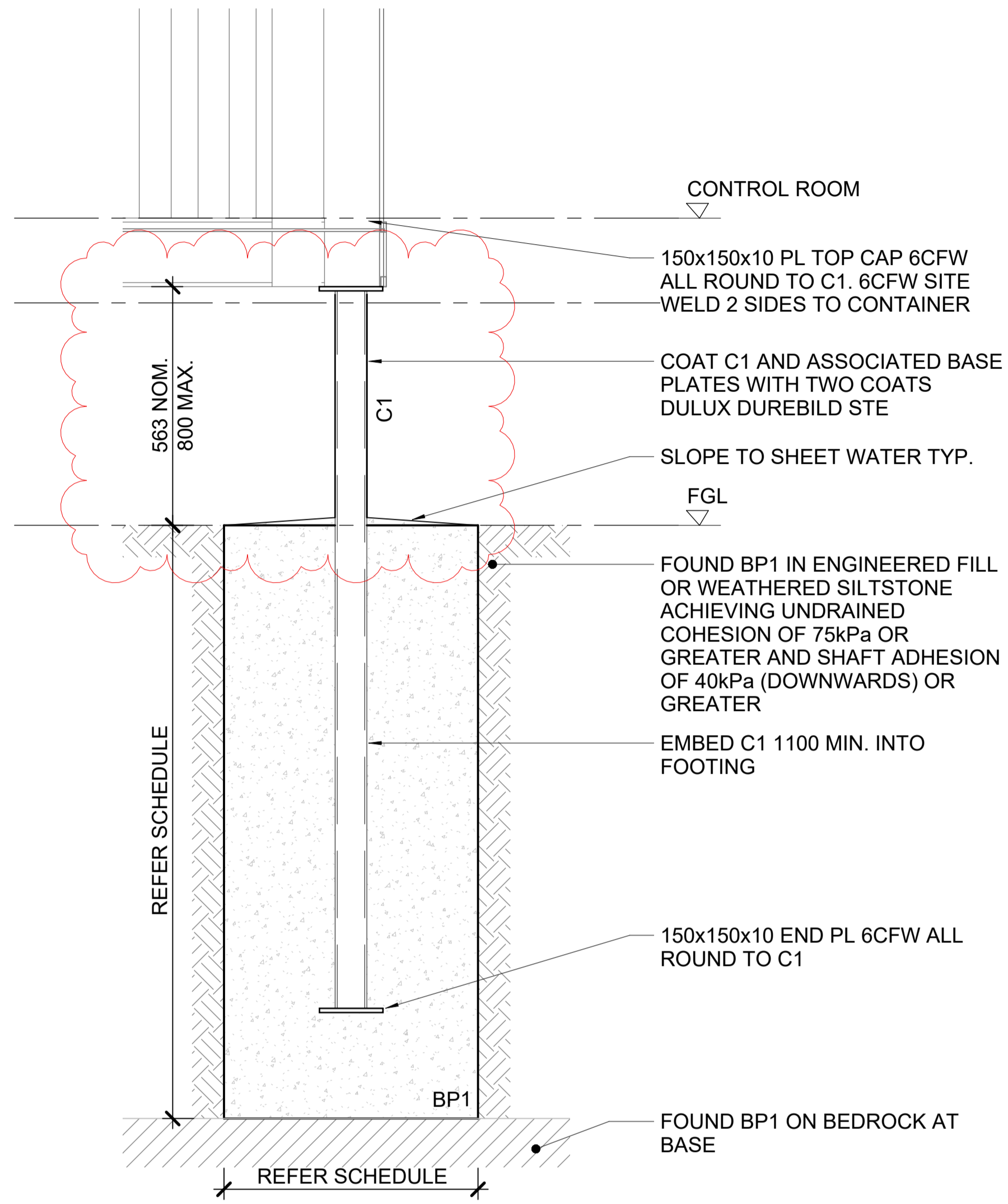
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**CONTROL ROOM PLAN**  
SCALE 1 : 20



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**1 TYPICAL BORED PIER DETAIL**  
S201 1 : 10

FOOTING SCHEDULE		
MARK	SIZE	COMMENTS
BP1	600 DIA. x 1400 D	BORED PIER

MEMBER SCHEDULE		
MARK	SIZE	COMMENTS
C1	75 x 5.0 SHS	COLUMN
C2	75 x 5.0 SHS	COLUMN

STRUCTURAL ELEMENT	EXPOSURE CLASS.	STRENGTH GRADE (MPa)	MAX. AGGREGATE SIZE (mm)	COVER (mm)
TANK SLAB	B1	N32	20	40
STAIR SLAB	B1	N32	20	40
CONTROL ROOM FOOTINGS	B1	N32	20	-

**CONTROL ROOM NOTES**

- NEW CONTROL ROOM IS A RE-PURPOSED 20FT SHIPPING CONTAINER WITH APPROXIMATE DIMENSIONS: 6.1m LONG x 2.45m WIDE x 2.6m HIGH (ABOVE STUB COLUMN).
- CONTROL ROOM SUPPLY, MODIFICATIONS, FIT OUT ETC IS BY OTHERS.
- MAX LOADS SHOWN ON DRAWING S001 RELATE TO THE DESIGN OF FOOTINGS ONLY.

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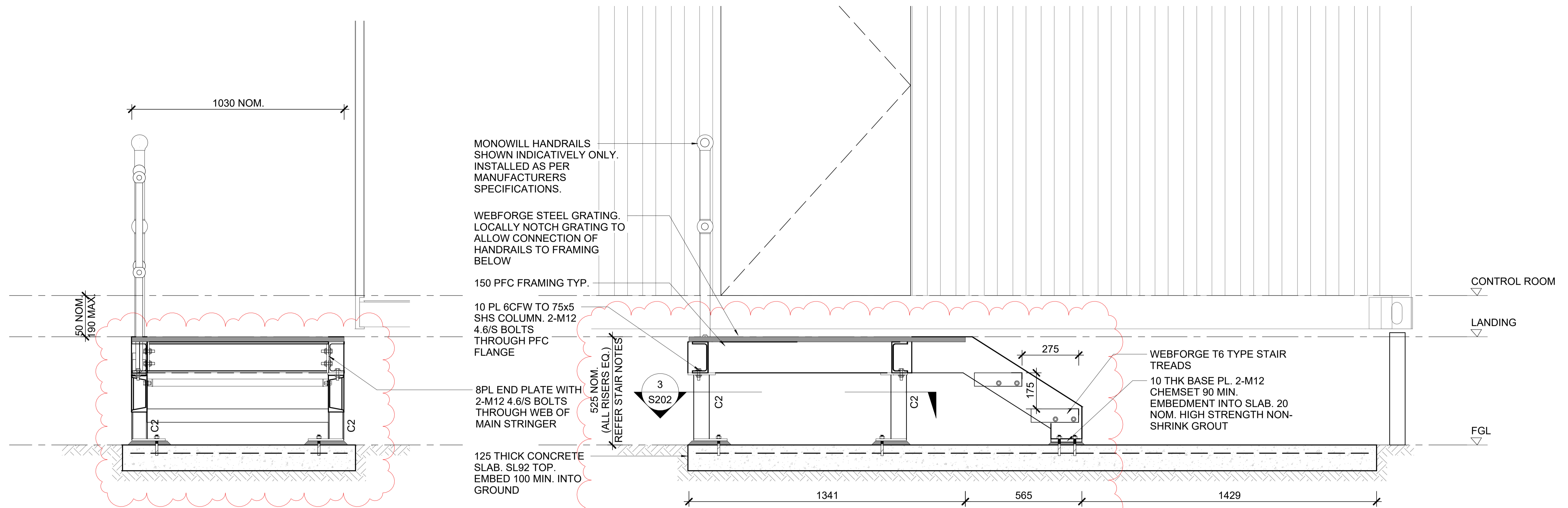
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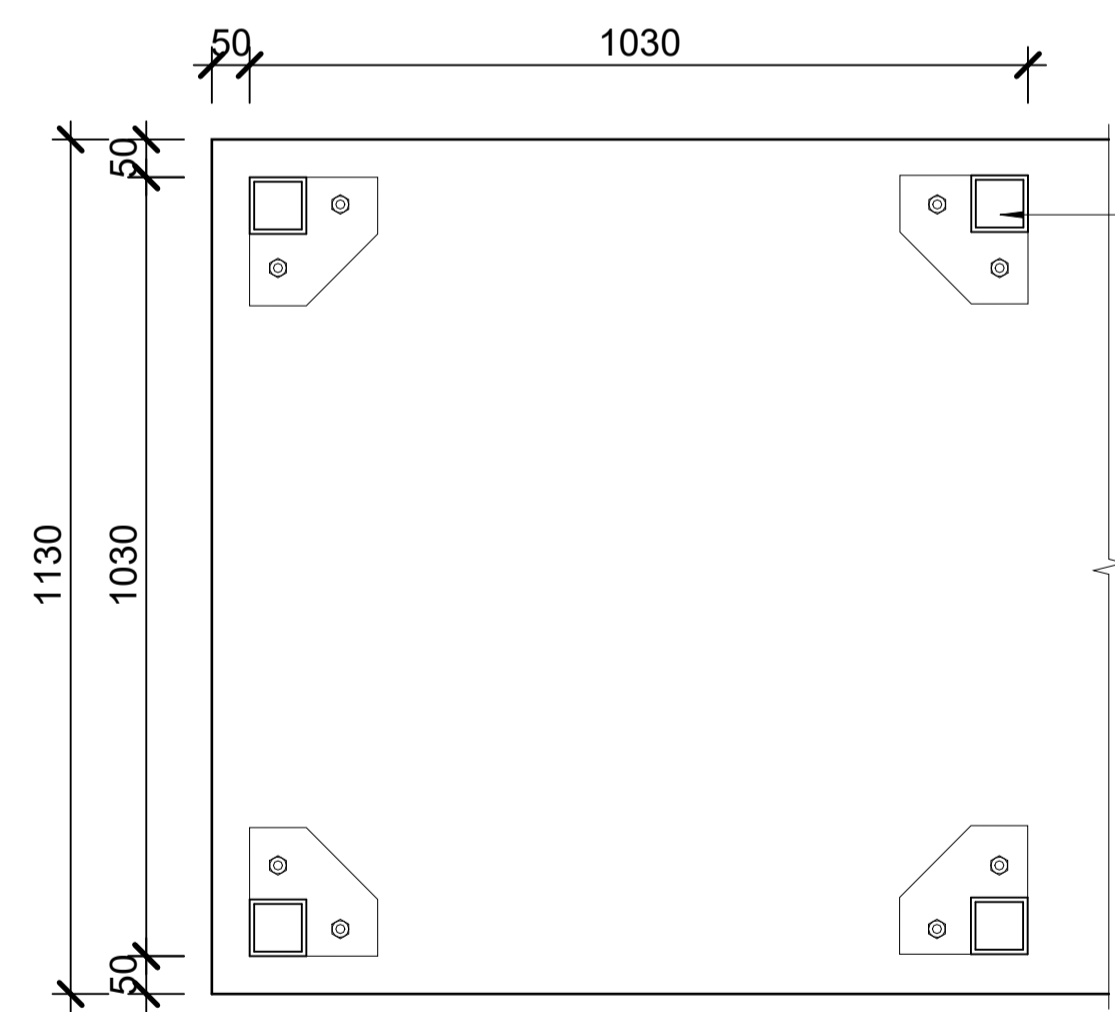
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<b>CONTROL ROOM PLAN</b>					
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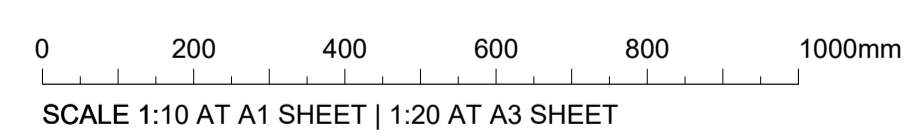


**1 SECTION**  
S010 SCALE 1 : 10

**2 SECTION**  
S010 SCALE 1 : 10



**3 SECTION**  
S202 SCALE 1 : 10



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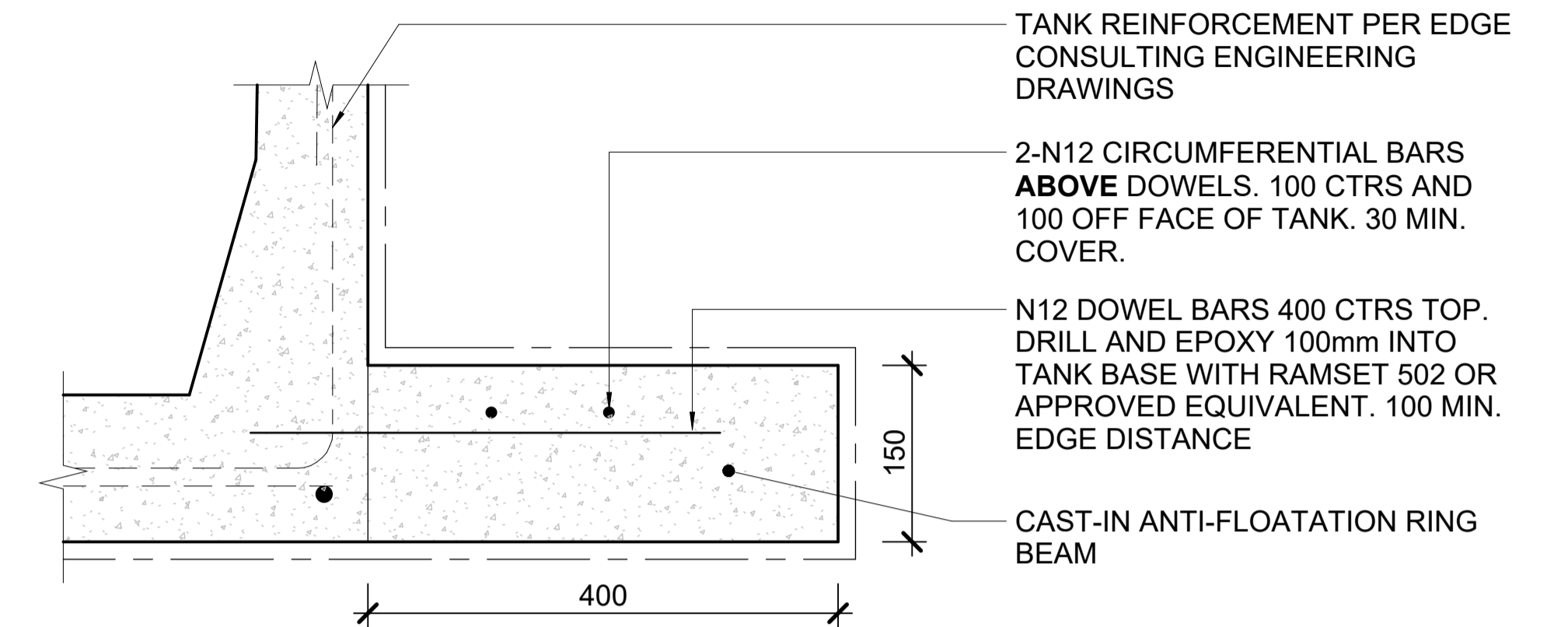
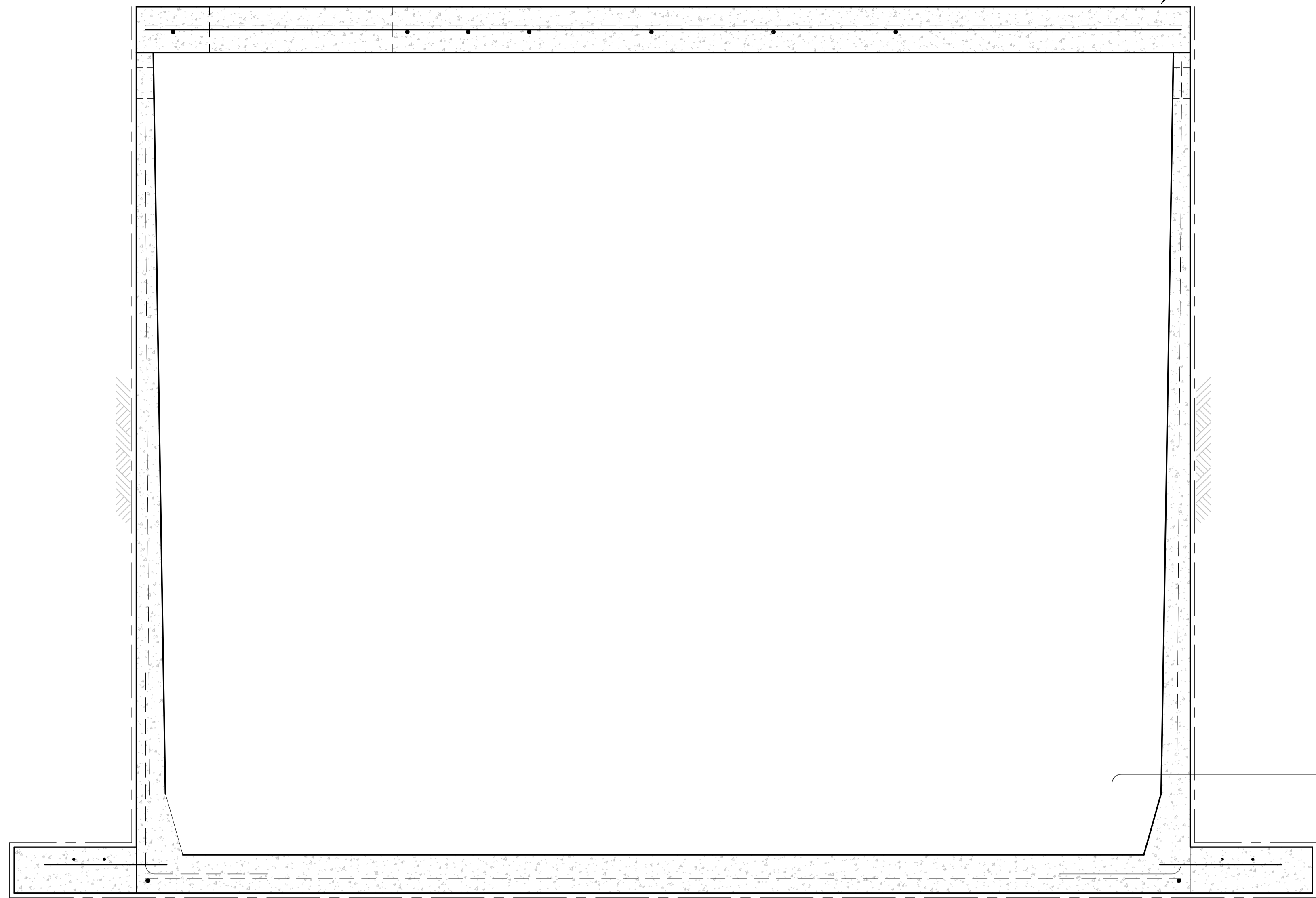
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TAYLEX TANK DESIGN AND CERTIFIED BY OTHERS. REFER EDGE CONSULTING ENGINEERING DRAWINGS TAYLEX-087 S011, S021, S031.



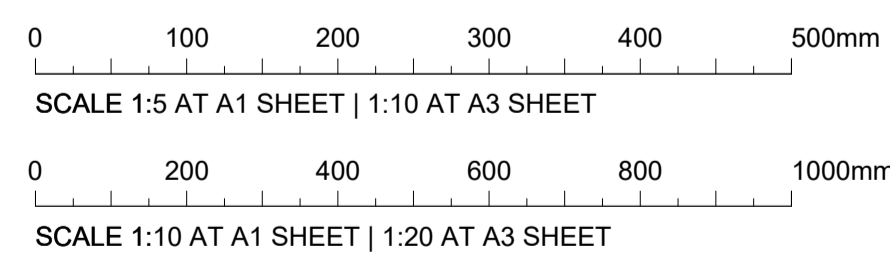
ENSURE HOLES FOR DOWELS ARE DRILLED **ABOVE** THE TANK REINFORCEMENT AS SHOWN

**1** DETAIL  
S301 SCALE 1 : 5

TANK REINFORCEMENT PER EDGE CONSULTING ENGINEERING DRAWINGS  
2-N12 CIRCUMFERENTIAL BARS **ABOVE** DOWELS. 100 CTRS AND 100 OFF FACE OF TANK. 30 MIN. COVER.  
N12 DOWEL BARS 400 CTRS TOP. DRILL AND EPOXY 100mm INTO TANK BASE WITH RAMSET 502 OR APPROVED EQUIVALENT. 100 MIN. EDGE DISTANCE  
CAST-IN ANTI-FLOATATION RING BEAM

**UNDERGROUND TANK DETAIL**  
SCALE 1 : 10

**1**  
S301



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**ANTI-FLOATATION RING BEAM DETAIL**

PAGE No	PROJECT No	DRAWING No	DISCIPLINE	REV.	SHEET SIZE
08 OF 08	25199 - S301		STRUCTURAL	0	A1

## 11. Appendix 3 – Orenco Contact Details

DRAFT

# **AdvanTex Treatment System**

## **Contact Information**

Contact information for each of the responsible parties is provided below:

### **Dealer**

Matt Mckennariey  
ENVR Solutions Pty Ltd  
24 Hayward Street  
Stafford Australia 4053  
Australia  
m.mckennariey@envr.com.au  
+61 402 524 033

### **Orenco Water**

Bill Hensley  
Senior Systems Engineer  
Orenco Systems  
814 Airway Ave  
Sutherlin, OR 97479  
bhensley@orencocom  
541-459-4449 x423 (Primary)  
541-537-0049 (Mobile)

### **Orenco Controls**

Orenco Panel Support  
Orenco Systems, Inc.  
814 Airway Ave  
Sutherlin, OR 97479  
(800) 707-2611  
support@orencococontrols.com

## 12. Appendix 4 – AdvanTex Material List

DRAFT

## Orenco Commercial Applications

# AdvanTex Treatment System

## Materials List

Quantity	Item	Documents
2	SPECIALORDER-C Sanitron 10-0155: Ballast: S2400B/C 220/240V	
<b>Preanoxic tank equipment</b>		
1	FLD24G Fiberglass Lid, DuraFiber, 24" W/ EPDM Gasket; 4 bolts	NTD-GOP-FLS-1
1	FLD30G Fiberglass Lid, Durafiber, 30" W/ EPDM Gasket; 4 Bolts	NTD-GOP-FLS-1
1	RF-C RF2436+L	
1	RF-C RF3036+(2)SX+(2)12	
1	SBEX-2G External Splice Box w/(2) 3/4" cord grips and (2) 1/2" cord grips	NIN-SB-SBEX-1 NTD-SBEX-1
1	SBEX1-4-NA PVC Splice Box w/ 1 - 4 Cord Grips Available; No adapter	
1	PRTA24 ABS Riser/Tank Adapter 24" Dia	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA24BDKIT Bolt Down Kit, Prta24	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA30 ABS Riser/Tank Adapter 30" Dia	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA30BDKIT Bolt Down Kit, PRTA30 and RRFTA30	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
3	ADH200 Adhesive, Riser Adapter, ADH200, 10.1 fl oz.	
1	PVU72-2425-L Universal Biotube Pump Vault , 24" cartridge	NIN-PVU-1-PRN NTD-GOP-PVU-5
2	HV125BCQASPRX Hose & Valve Assembly, 1.25" High Pressure w/B,C,Q,AS,X	
1	MF4P-39V Float Assembly; 39" stem, Pump Vault	NIN-MF-2 NTD-GOP-FSA-1
2	PF(50HZ)300534 **SO Effluent Pump; 1/2Hp, 30gpm, 380-415V, 50Hz, 3-phase, 10' Lead	XLD-PU-PF-1 NTD-GOP-PMP-3
<b>Recirculation tank equipment</b>		
1	G2L 2" Grommet, Loose	NIN-RLA-RR-1-PRN NTD-GOP-GRM-1
4	FLD30G Fiberglass Lid, Durafiber, 30" W/ EPDM Gasket; 4 Bolts	NTD-GOP-FLS-1
1	RF-C RF3024+FRP4 (invert up 6")	

Quantity	Item	Documents
1	RF3024+(2)SX+(2)20 Fiberglass Access Riser, 30" Dia. x 24" Tall, Drilled for (2)SX and (2)G2 Installed	
1	RF-C RF3024+(2)SX+(2)20+12	
3	SBEX-2G External Splice Box w/(2) 3/4" cord grips and (2) 1/2" cord grips	NIN-SB-SBEX-1 NTD-SBEX-1
1	SBEX1-4 PVC Splice Box w/ 1 - 4 Cord Grips Available	NIN-SB-SBEX-1 NTD-SBEX-1
1	RF-C RF2424+TSB	
3	PRTA30 ABS Riser/Tank Adapter 30" Dia	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
3	PRTA30BDKIT Bolt Down Kit, PRTA30 and RRFTA30	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA24 ABS Riser/Tank Adapter 24" Dia	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA24BDKIT Bolt Down Kit, Prta24	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	RTS24 Tank Shield for RF24	
8	ADH200 Adhesive, Riser Adapter, ADH200, 10.1 fl oz.	
1	MM4-FRP Float Ball Valve 4" - FRP	NIN-RSV-4 NTD-MM-FRP-1
1	MF3P-45FS Float Assembly; 45" stem, Field Set	NIN-MF-2 NTD-GOP-FSA-1
4	HV200BCPRX Hose & Valve Assembly, 2"w/B,C,PR,X	NIN-HV-1 NTD-GOP-HVA-1
1	HV125BCASPRX Hose & Valve Assembly, 1.25" Pressure w/B,C,AS,X	NIN-HV-1 NTD-GOP-HVA-1
1	FITR-D126 Flow Inducer Tower - Recirc - Duplex 126"	
1	FITR-T126 Flow Inducer Tower - Recirc - Triplex 126"	
4	PF(50HZ)500734 **SO Effluent Pump; 3/4Hp, 50gpm, 380-415V, 50Hz, 3-phase, 10' Lead	
1	PF(50HZ)300534 **SO Effluent Pump; 1/2Hp, 30gpm, 380-415V, 50Hz, 3-phase, 10' Lead	XLD-PU-PF-1 NTD-GOP-PMP-3
5	PCLEAD30-3 PF Motor Lead, 30' 14/4 SOOW, Jam Nut Style, 3-wire + GND	
<b>AdvanTex equipment</b>		
4	AX100-LL Advantex Filter Commercial, 100 Sqft.- DCPD no latch	
1	AXVFAF AX Above Ground Vent Fan Assembly; Tan	NIN-ATX-VFA-1
<b>Discharge tank equipment</b>		

Quantity	Item	Documents
1	FLD24G Fiberglass Lid, DuraFiber, 24" W/ EPDM Gasket; 4 bolts	NTD-GOP-FLS-1
1	FLD30G Fiberglass Lid, Durafiber, 30" W/ EPDM Gasket; 4 Bolts	NTD-GOP-FLS-1
1	RF-C RF2424+40 (invert up 4") RF3024+(2)SX+(2)20	
1	Fiberglass Access Riser, 30" Dia. x 24" Tall, Drilled for (2)SX and (2)G2 Installed	
1	SBEX-2G External Splice Box w/(2) 3/4" cord grips and (2) 1/2" cord grips	NIN-SB-SBEX-1 NTD-SBEX-1
1	SBEX1-4 PVC Splice Box w/ 1 - 4 Cord Grips Available	NIN-SB-SBEX-1 NTD-SBEX-1
1	PRTA24 ABS Riser/Tank Adapter 24" Dia	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA30 ABS Riser/Tank Adapter 30" Dia	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA24BDKIT Bolt Down Kit, Prta24	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
1	PRTA30BDKIT Bolt Down Kit, PRTA30 and RRFTA30	NIN-TA-PRTA-2 NTD-RLA-PRTA-1
3	ADH200 Adhesive, Riser Adapter, ADH200, 10.1 fl oz.	
2	HV200BCPRASX Hose & Valve Assembly, 2"w/B,C,PR,AS,X	NIN-HV-1 NTD-GOP-HVA-1
1	MF4P-VC MF4P-43FS	NIN-MF-2 NTD-GOP-FSA-1
1	FITD-D126 Flow Inducer Tower - Discharge - Duplex 126"	
2	PF(50HZ)752034 **SO Effluent Pump; 2Hp, 75gpm, 380-415V, 50Hz, 3-phase, 10' Lead	
2	PCLEAD30-3 PF Motor Lead, 30' 14/4 SOOW, Jam Nut Style, 3-wire + GND	
<b>UV Disinfection equipment</b>		
1	SPECIALORDER-C S5000C (220-240 VAC)	
<b>Micronfiltration unit</b>		
1	SPECIALORDER-C 90-gpm 5 micron miconfiltration unit	
<b>Liquid chemical feed system</b>		
1	LCF-C Fiberglass Liquid Chem feed Units.	NTD-LCF-1
<b>Misc.</b>		
5	MFP Mechanical Float, Normally Open	NIN-MF-2 NTD-GOP-FSA-1

Quantity	Item	Documents
10	SBABOKING Aqua Blue/Orange King Connector (Small)	
10	SBABRKING Aqua Blue/Red King Connector (Large)	
5	SN-100-SPRAYER Orenco Spin Nozzle, 1" w/o Clip or Tee	
1	PF(50HZ)500734 **SO Effluent Pump; 3/4Hp, 50gpm, 380-415V, 50Hz, 3-phase, 10' Lead	
1	PCLEAD30-3 PF Motor Lead, 30' 14/4 SOOW, Jam Nut Style, 3-wire + GND	
1	NP-STARTUP-ENG Project Startup / Oversight	
1	NPOM-ELECTRONIC Custom Commercial O&M Manual; Electronic Only	
1	OM-BIOTUBE BRUSH Biotube Cleaning Brush for Biotube Cartridges	
1	TCOM-CAX Custom Water Div. Commercial Telecomm Control Panel	NTD-CP-TCOM-1
1	NP-STARTUP-ENG Project Startup / Oversight	
1	NP-ORD-PANEL INSPECTION Bill Hensley Ext. 423	
1	PF(50HZ)300534 **SO Effluent Pump; 1/2Hp, 30gpm, 380-415V, 50Hz, 3-phase, 10' Lead	XLD-PU-PF-1 NTD-GOP-PMP-3
2	PF(50HZ)752034 **SO Effluent Pump; 2Hp, 75gpm, 380-415V, 50Hz, 3-phase, 10' Lead	
1	EP-S Standard Water Div. Electrical Part, p/n 13-16-61-1039	

### 13. Appendix 5 – Orenco Design Review Letter

DRAFT

July 15, 2025

Matt McKennarley  
ENVR Solutions Pty Ltd  
24 Hayward Street  
Stafford, Queensland  
Australia  
4053

Subject: Final Design Review of Lake Bennett WWTP

Matt,

Orenco Systems, Inc. (“Orenco”) has received a copy of the plan set showing the designed site layout and configuration plans, and other documents that comprise the Final Design for the Lake Bennett WWTP project. Orenco staff reviews the Final Design of all wastewater collection and treatment systems for commercial applications to ensure that the design is compliant with the most current version of the system’s applicable design criteria published by Orenco for the specified parameters provided by the system’s designer in the Plans. The findings and conclusions of my review of this Final Design are as follows:

### **Design Basis**

The system has been designed for a Type 1, residential community application. Influent flow and constituent concentrations and effluent constituent concentration requirements have been provided by the system’s designer on the attached Plans and were used in my review of the Final Design.

### **System Design**

The proposed Final Design of the system consists of:

- 1 x 22,500 L STEP (Septic tank effluent pump) tank
- 2 x 22,500 L primary septic tanks
- 1 x 22,500 L anoxic tank
- 2 x 15,000 L recirculation tanks
- 4 x AX100 treatment pods
- 1 x 15,000 L discharge tank
- 1 x Harmsco HUR 90 HP micronfilter
- 1 x UV disinfection unit
- 1 x Orenco Telemetry control panel

## Design Criteria

The applicable design criteria for this system, which I used to conduct the review of its Final Design, is revision 11.0 of document NDA-ATX-1, titled Orenco® AdvanTex® Design Criteria, Commercial Treatment Systems, which was published by Orenco in May 2023. A copy of the design criteria can be downloaded from Orenco’s online document library at [www.orenco.com/corporate/doclibrary.cfm](http://www.orenco.com/corporate/doclibrary.cfm).

## Findings

The findings of my review as to whether the Final Design complies with Orenco’s design criteria for treating wastewater to the effluent constituent concentration requirements provided in the Plans are as follows:

### Primary Treatment

Orenco recommends the use of a pre-anoxic return tank and requires them on projects that require greater than 90% BOD reduction (through secondary treatment) and/or greater than 70% denitrification. This pre-anoxic tank should be sized equal to one-half day at maximum day design flow and is considered part of the overall primary tank volume.

The Final Design specifies the use of 1 – 22,000 L STEP tank, 2 - 22,000 Liter Primary septic tanks and 1 - 22,000 Liter anoxic tank in series for primary treatment. Using the flow data specified on the Plans the hydraulic retention times for grease capture and primary treatment calculate as follows:

Primary Tank(s) Hydraulic Retention Time (HRT) <sup>1</sup>				
Design Average Flow (lpd)	Design Maximum Day Flow (lpd)	Effective Combined Primary Tankage (lpd)	Avg HRT (days)	Max Day HRT (days)
12,000	37,800	88,000	7.3	2.3

<sup>1</sup> Design Max Day Flow is the maximum daily flow a facility is expected to receive no more than one day within any week’s time.

The Primary Tank Sizing Recommendations states that the recommended primary tankage for a residential subdivision should be sized to at a minimum of 2 days of hydraulic retention time based on Design Max Day Flow. Therefore, the configuration and specifications of the primary treatment tanks in the Final Design satisfy Orenco’s recommendation for primary treatment.

### Recirculation Tank — Standard Stage

The Final Design further specifies the use of 2 - 15,000 Liter tanks for recirculation and blending of the AdvanTex-treated effluent with primary tank effluent. Using the flow data specified on the Plans the tank is sized to be equal to 79% of the Maximum Day Design Flow. The recirculation tank for the standard stage should be sized at a minimum of 75% of the Maximum Day Design Flow. Therefore, the specification of the recirculation-blend tank in the Final Design satisfies Orenco’s design criteria.

### Hydraulic Load — Standard Stage

The Final Design specifies the use of 4 - AX100,s which contain a nominal surface area of 37.2 square meters of treatment media. Using the flow data specified on the Plans the hydraulic loading rate for the system calculates as follows:

Hydraulic Loading Rate (HLR) — Standard Stage				
Design Average Flow (lpd)	Design Maximum Day Flow (lpd)	Nominal Textile Area (sq. m.)	Average HLR (liters per day/sq. m.)	Peak HLR (liters per day/sq. m.)
12,000	37,800	37.2	322.6	1016.1

According to the AdvanTex System Loading Chart in the applicable design criteria, the standard AdvanTex treatment system (Stage 1) should not be hydraulically loaded more than 1019 liters/square meter at Design Average Flow or 2038 liters/square meter at Design Max Day Flow. Therefore, the specified type and number of AdvanTex pods in the Final Design satisfy Orenco’s design criteria.

**Organic Load — Standard Stage**

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 1, residential subdivision applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile			
Average BOD5 (mg/L)	Max BOD5 (mg/L)	Average TSS (mg/L)	Max FOG (mg/L)
140	200	55	25

Based on the average influent biochemical oxygen demand (BOD5) concentration and flow data specified on the Plans, the system will receive approximately 1.7 kilograms of BOD5 per day at Design Average Flow, and 5.3 kilograms of BOD5 per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Organic Loading Rate (OLR) — Standard Stage				
Average Organic Load (kg/day)	Maximum Organic Load (kg/day)	Nominal Treatment Area (sq. m.)	Average OLR (kg BOD/sq. m./day)	Maximum OLR (kg BOD/sq. m./day)
1.7	5.3	37.2	0.05	0.14

According to the Organic Load Requirements in the applicable design criteria, an AdvanTex Treatment System should not be organically loaded more than 0.2 kg BOD5/square meter at Design Average Flow or 0.4 kg BOD5/square meter at Design Peak Flow. Therefore, the specified type and number of AdvanTex pods in the final design satisfy Orenco’s design criteria.

**Nutrient Load — Standard Stage**

The following influent characteristics provided on the Plans were estimated and not derived from direct sampling. Even though the influent characteristics were not derived from direct sampling, the values provided are consistent with values we have seen in other, similar Type 1, residential subdivision applications.

Influent (Primary Tank Effluent) Characteristics — Loading to Textile	
Average TKN (mg/L)	Max TKN (mg/L)
50	80

Based on the average influent biochemical oxygen demand (BOD5) concentration and flow data specified on the Plans, the system will receive approximately 0.10 kilograms of Total Nitrogen per day at Design Average Flow, and 1.9 kilograms of Total Nitrogen per day at Maximum Day Design Flow. Using this information, the organic loading rate of the system calculates as:

Total Nitrogen (TNLR) — Standard Stage				
Average TN Load (kg/day)	Maximum TN Load (kg/day)	Nominal Treatment Area (sq. m.)	Average TN (kg TN/sq. m./day)	Maximum TN (kg TN/sq. m./day)
0.10	1.9	37.2	0.003	0.05

According to the Total Nitrogen Load Requirements in the applicable design criteria, an AdvanTex Treatment System should not be loaded more than 0.07 kg TN/square meter at Design Average Flow or 0.14 kg TN/square meter at Design Peak Flow. Therefore, the specified type and number of AdvanTex pods in the final design satisfy Orenco’s design criteria. However, sufficient buffering alkalinity will be required for nitrification and pH balance.

### Conclusions

I have reviewed the Final Design of the Lake Bennett WWTP wastewater treatment system and have found that the design is compliant with the most current version of the system’s applicable design criteria. In addition, I noted no anomalies in the site layout or configuration of the system during my review.

Compliance Table — Meets Minimum Design Standards			
	Standard Stage	Stage 2	Polishing Stage
Recirc Tank Size	Yes	n/a	n/a
Hydraulic Load	Yes	n/a	n/a
Organic Load	Yes	n/a	n/a
Nitrogen Load	Yes	n/a	n/a

As such, the system as designed satisfactorily complies with Orenco’s design criteria to meet the following effluent limits specified in the Plans at a 95% confidence level, provided that all influent flows and constituent concentrations specified in the Plans are not exceeded:

Expected Effluent Quality	
Constituent	Average (mg/L)
BOD5	15
TSS	15
Total Nitrogen	60

It is important to note that even though the AdvanTex Treatment System has the capability to meet or exceed the required treatment parameters, there is no way that Orenco can guarantee that a particular system will be operated or maintained in a manner consistent with the Final Design reviewed. Once the facility is placed into operation, the influent flows and constituent concentrations to the facility should be monitored, and if flow or any of the influent constituent concentrations exceed those listed in the Plans, measures should be taken to reduce the flow or constituent concentration to those listed.

Proper air ventilation is a critical feature of all commercial AdvanTex Treatment Systems, and as such, adequate active ventilation is required for all systems. In addition, please note that disposing of toxics or chemicals into the system is strictly prohibited. Examples of toxics include restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo, waste products, or any other toxins. Furthermore, water softener brine discharge is prohibited from being discharged into the AdvanTex Treatment System. Failure to adhere to these policies will void Orenco's limited product warranties.

If you have any questions about my review process, findings, or conclusions, please feel free to call or e-mail me.

Sincerely,



William (Bill) Hensley  
 Sr. Systems Engineer  
 Orenco Systems Inc.  
 +1 (541) 537-0049  
 bhensley@orencocom

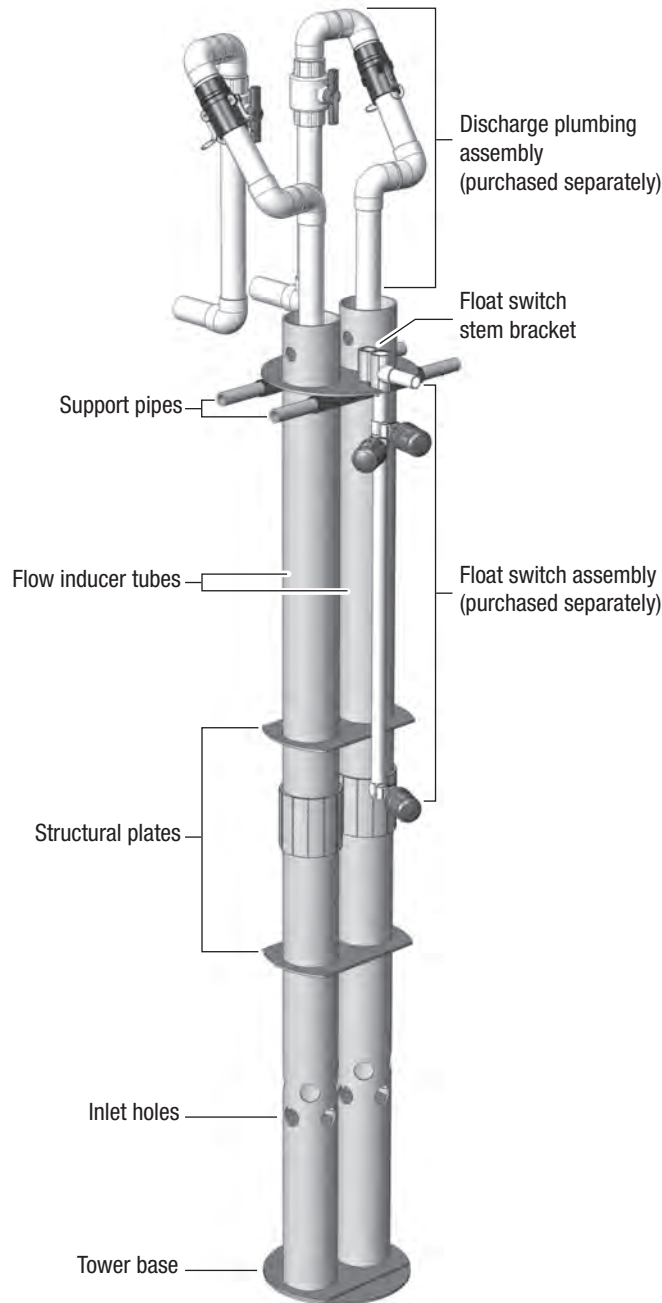
## 14. Appendix 6 – Technical Data Sheets

DRAFT

# Flow Inducer Towers

## Applications

Orenco's Flow Inducer Towers are designed for use in commercial/municipal recirculation and final discharge tanks following secondary treatment, where filtration is not required. Flow inducer towers can be ordered to house from two to five of Orenco's 4in Submersible Effluent Pumps.



Orenco Flow Inducer Tower  
(duplex model shown)

## General

The base of the flow inducer tower rests on the bottom of the tank and the top of the tower extends at least eight inches into the riser. For tanks with curved bottoms, an Orenco Vault Basin (VB1806-FRP) is necessary to create a flat surface on which the tower can rest. The pumps sit on raised fiberglass platforms inside of the 5in (127mm) diameter Class 125 flow inducer tubes.

A float switch bracket is attached to the tower to accommodate an Orenco Float Switch Assembly.

## Standard Models

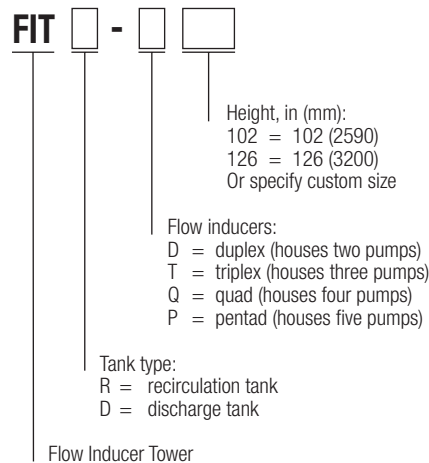
### Recirculation Tank Models

FITR-D102, FITR-T102, FITR-D126, FITR-T126

### Discharge Tank Models

FITD-D102, FITD-D126

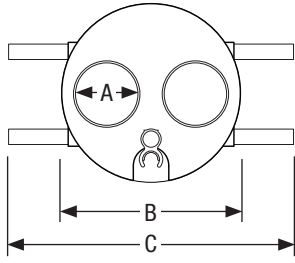
## Product Code Diagram



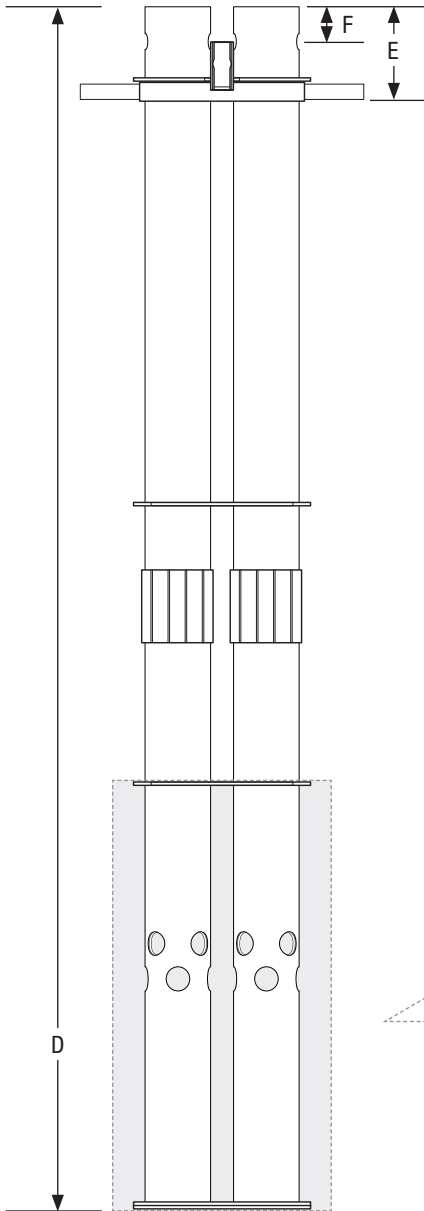
**Not all product code configurations may be available as standard products.**

## Materials of Construction

Support pipes	Schedule 80 PVC
Float switch bracket	PVC
Flow inducer tubes	PVC
Structural plates	Fiberglass
Tower base	Fiberglass



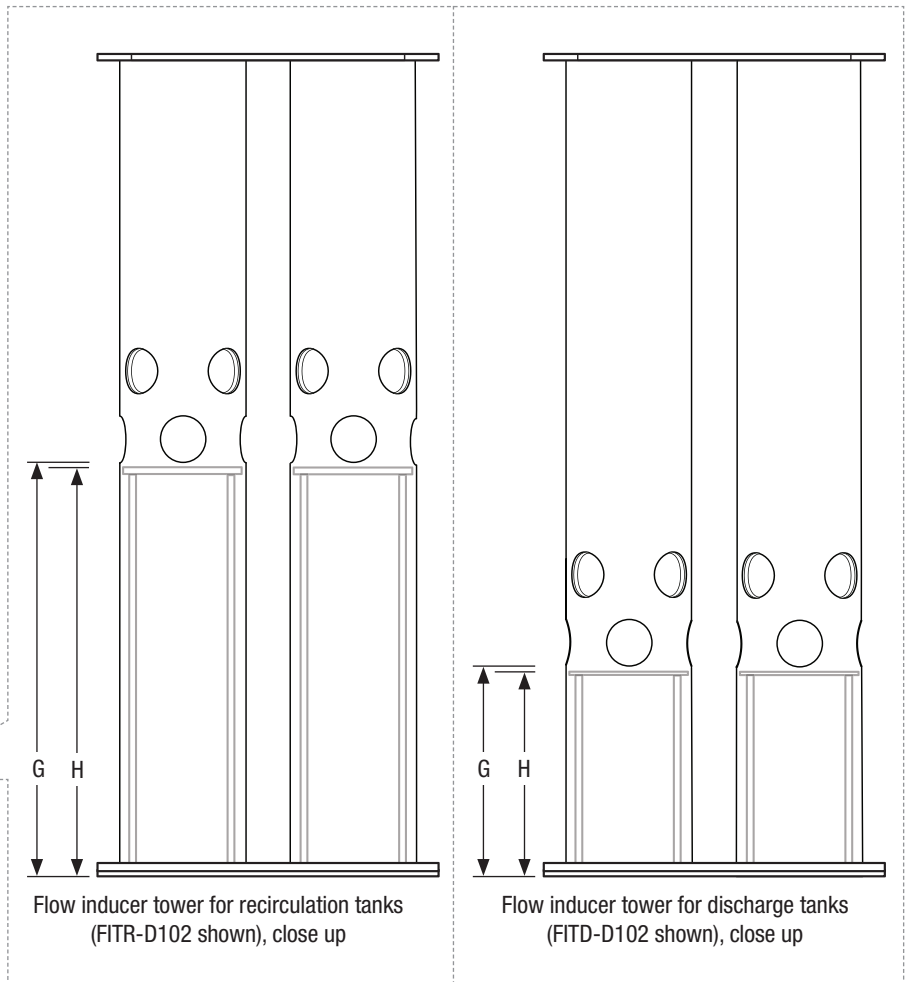
Flow inducer tower (FITR-D102 shown), top view



Flow inducer tower (FITR-D102 shown), side view

### Specifications

Tank Example Models	FITR-D102	FITR-T126	FITD-D102
<b>A</b> Tube diameter, nominal, in (mm)	5 (125)	5 (125)	5 (125)
<b>B</b> Structural plate diameter, in (mm)	15 (381)	15 (381)	15 (381)
<b>C</b> Support pipe length, in (mm)	24 (610)	24 (610)	24 (610)
<b>D</b> Tower height, in (mm)	102 (2591)	126 (3200)	102 (2591)
<b>E</b> Support pipe height, in (mm)	8 (203)	8 (203)	8 (203)
<b>F</b> Top of stem bracket, in (mm)	3 (76)	3 (76)	3 (76)
<b>G</b> Inlet hole height, in (mm)	19.25 (489)	19.25 (489)	9.25 (235)
<b>H</b> Pump plate height, in (mm)	19 (483)	19 (483)	9 (229)
Inlet hole diameter, in (mm)	2 (50)	2 (50)	2 (50)
Number of tubes	2	3	2
Inlet holes per tube	8	8	8



Flow inducer tower for recirculation tanks (FITR-D102 shown), close up

Flow inducer tower for discharge tanks (FITD-D102 shown), close up

# PF-Series 50Hz Effluent Pumps

## Applications

Orenco's PF-Series 50Hz, 100mm (4in) Submersible Effluent Pumps are designed to transport screened effluent with low TSS counts from septic or dosing tanks. These pumps are engineered using lightweight, corrosion-resistant stainless steel and polymers and are field serviceable and repairable with common tools.

PF-Series pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.



Powered by  
**Franklin Electric**

## General

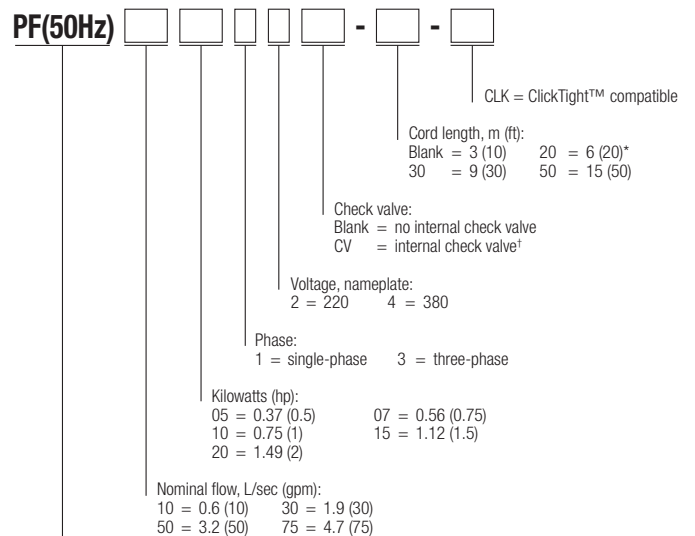
To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability (liquid end) with no decline in pump life or performance
- 3mm (1/8in) bypass orifice to ensure flow recirculation for motor cooling and to prevent air binding
- 3mm (1/8in) mesh intake screen to limit solids
- Liquid-end repair kit availability for lower long-term ownership cost
- Franklin Electric TRI-SEAL™ floating impeller design on 0.6L/sec and 1.9L/sec (10gpm and 30gpm) models; floating stack design on 3.2L/sec and 4.7L/sec (50gpm and 75gpm) models
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling, with hermetically sealed motor housing for moisture-free windings, and Kingsbury-type thrust bearing
- Thermal overload protection on 1-phase motors through 1.12kW (1.5hp), tripping at 95-105°C (203-221°F)
- Surge arresters on 1-phase and 220V, 3-phase motors
- Type SOOW 600V motor cable
- Torque lock availability for all pump models

## Standard Models

See [Specifications \(beginning on page 2\)](#) for a list of standard pumps. For a complete list of available pumps, call Orenco.

## Product Code Diagram



Pump, PF Series, 50Hz model

\*6m cords are available only for single-phase pumps through 1.12kW  
†Available with PF(50HZ)100512 only.

**Not all product code configurations may be available as standard products.**

## Specifications

Pump Model	Design L/sec (gpm)	Kilowatts (hp)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material <sup>1</sup>	Length mm (in)	Min. liquid level mm (in) <sup>2</sup>	Weight kg (lb) <sup>3</sup>	Rated cycles per day
PF(50HZ)100512CV <sup>7</sup>	0.6 (10)	0.37 (0.50)	1	220	220-240	3.9	4.1	1 1/4in GFP	584 (23.0)	432 (17)	12 (26)	300
PF(50HZ)100532	0.6 (10)	0.37 (0.50)	3	220	220-240	1.8	1.8	1 1/4in GFP	584 (23.0)	432 (17)	12 (26)	300
PF(50HZ)100534	0.6 (10)	0.37 (0.50)	3	380	380-415	1.1	1.1	1 1/4in GFP	584 (23.0)	432 (17)	12 (26)	300
PF(50HZ)100712 <sup>4,5,7</sup>	0.6 (10)	0.56 (0.75)	1	220	220-240	6.2	6.2	1 1/4in GFP	658 (25.9)	432 (17)	14 (30)	300
PF(50HZ)100734 <sup>4,5</sup>	0.6 (10)	0.56 (0.75)	3	380	380-415	1.6	1.6	1 1/4in GFP	658 (25.9)	432 (17)	14 (30)	300
PF(50HZ)101512 <sup>5,6</sup>	0.6 (10)	1.12 (1.50)	1	220	220-240	10.5	11.4	1 1/4in SS	1003 (39.5)	559 (22)	21 (46)	300
PF(50HZ)300512 <sup>7</sup>	1.9 (30)	0.37 (0.50)	1	220	220-240	4.1	4.1	1 1/4in GFP	572 (22.5)	483 (19)	12 (26)	300
PF(50HZ)300532	1.9 (30)	0.37 (0.50)	3	220	220-240	1.8	1.8	1 1/4in GFP	572 (22.5)	483 (19)	12 (26)	300
PF(50HZ)300534	1.9 (30)	0.37 (0.50)	3	380	380-415	1.1	1.1	1 1/4in GFP	572 (22.5)	483 (19)	12 (26)	300
PF(50HZ)300712 <sup>7</sup>	1.9 (30)	0.56 (0.75)	1	220	220-240	6.1	6.1	1 1/4in GFP	630 (24.8)	483 (19)	13 (29)	300
PF(50HZ)301012 <sup>7</sup>	1.9 (30)	0.75 (1.00)	1	220	220-240	7.4	7.4	1 1/4in GFP	721 (28.4)	508 (20)	15 (32)	300
PF(50HZ)301512 <sup>4,5</sup>	1.9 (30)	1.12 (1.50)	1	220	220-240	9.3	9.3	1 1/4in GFP	899 (35.4)	610 (24)	18 (40)	300
PF(50HZ)500512 <sup>7</sup>	3.2 (50)	0.37 (0.50)	1	220	220-240	4.0	4.0	2in SS	516 (20.3)	635 (25)	13 (29)	300
PF(50HZ)500712 <sup>7</sup>	3.2 (50)	0.56 (0.75)	1	220	220-240	6.3	6.4	2in SS	602 (23.7)	635 (25)	14 (30)	300
PF(50HZ)501012 <sup>7</sup>	3.2 (50)	0.75 (1.00)	1	220	220-240	7.3	7.4	2in SS	686 (27.0)	660 (26)	16 (35)	300
PF(50HZ)501034	3.2 (50)	0.75 (1.00)	3	380	380-415	2.1	2.1	2in SS	686 (27.0)	660 (26)	16 (35)	300
PF(50HZ)501512	3.2 (50)	1.12 (1.50)	1	220	220-240	9.1	9.1	2in SS	826 (32.5)	762 (30)	19 (42)	300
PF(50HZ)751012 <sup>7</sup>	4.7 (75)	0.75 (1.00)	1	220	220-240	7.3	7.3	2in SS	762 (30.0)	686 (27)	15 (32)	300
PF(50HZ)751032	4.7 (75)	0.75 (1.00)	3	220	220-240	3.5	3.5	2in SS	762 (30.0)	686 (27)	14 (30)	300
PF(50HZ)751034	4.7 (75)	0.75 (1.00)	3	380	380-415	2.1	2.1	2in SS	762 (30.0)	686 (27)	14 (30)	300
PF(50HZ)752012	4.7 (75)	1.49 (2.00)	1	220	220-240	12.1	12.4	2in SS	1000 (39.4)	925 (36.4)	19.5 (43)	100
PF(50HZ)752034	4.7 (75)	1.49 (2.00)	3	380	380-415	4.0	4.0	2in SS	965 (38.0)	889 (35)	18.2 (40)	300

- GFP = glass-filled polypropylene; SS = stainless steel. The 1 1/4in NPT GFP discharge is 2 7/8in octagonal across flats; the 1 1/4in NPT SS discharge is 2 1/8in octagonal across flats; and the 2in NPT SS discharge is 2 7/8in hexagonal across flats. Discharge is NPT threaded receptacle-style port, US nominal size, to accommodate Orenco discharge hose and valve assemblies. Consult your Orenco distributor about fittings to connect hose and valve assemblies to metric-sized piping.
- Minimum liquid level is for single pumps installed in an Orenco Biotube Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.
- Weight includes 3m (10ft) cord.
- High-pressure discharge assembly required.
- Do not use cam-lock option (Q) on discharge assembly.
- Custom discharge assembly required for these pumps. Contact Orenco.
- ClickTight compatible.

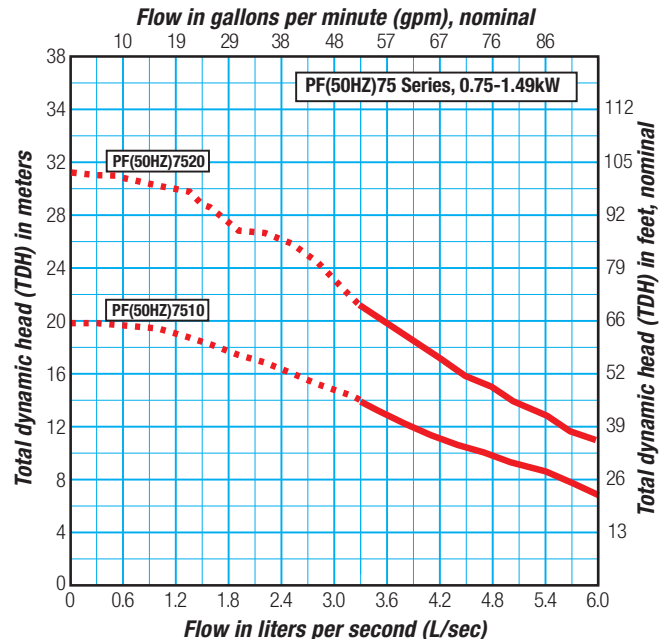
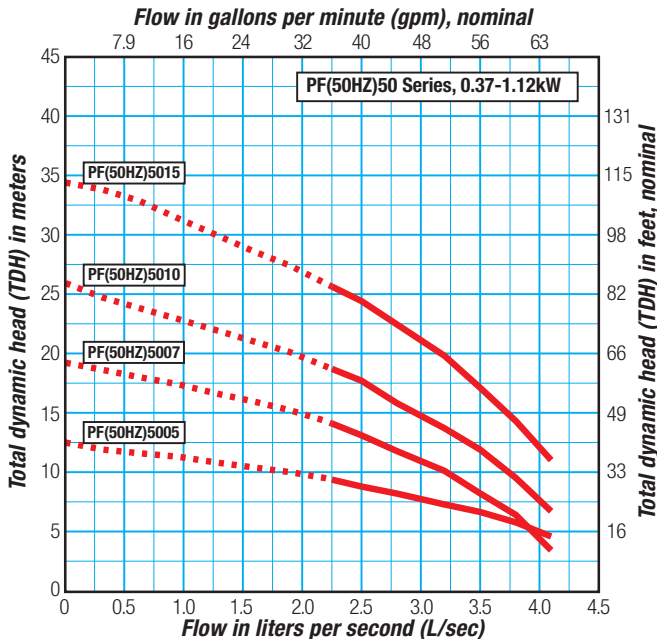
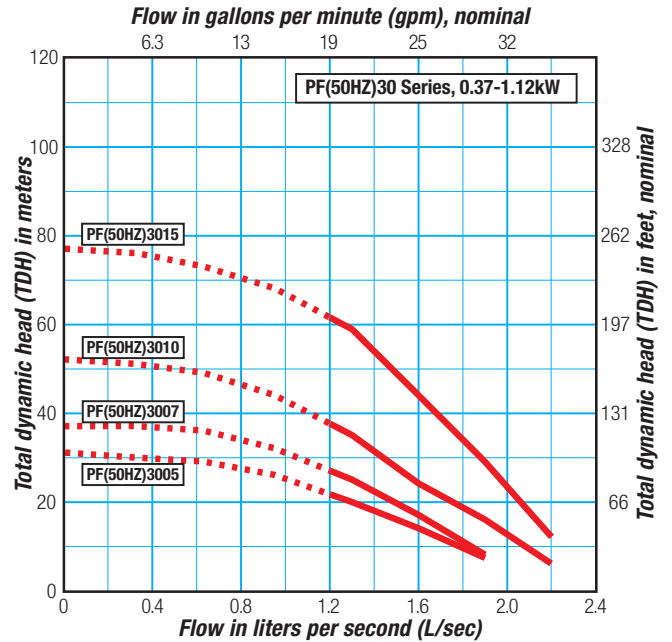
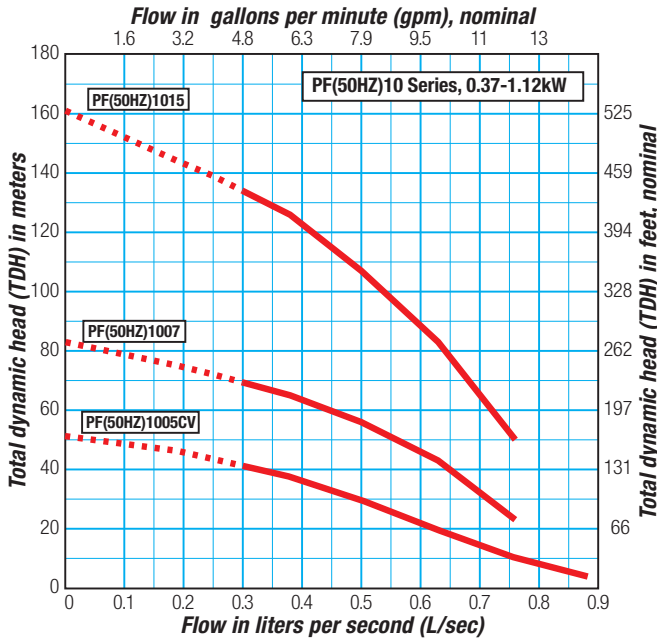
## Materials of Construction

Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (SABIC's NORYL™ GFN3 resin)
Impellers	Celanese's Celcon® acetal copolymer on 0.6L/sec and 1.9L/sec models; 3.2L/sec impellers are NORYL GFN3 resin
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	11mm (7/16in) hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin Electric motor filled with deionized water and propylene glycol for constant lubrication. Stainless steel exterior.

## Using a Pump Curve

A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow (L/sec or gpm) and pressure (total dynamic head or TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their nominal flow rate – the value, measured in L/sec, expressed by the first two numerals in an Orenco pump nomenclature. These graphs use solid lines to show the optimal pump operation range. Dashed lines indicate flow rates outside of the optimal range for each pump. For the most accurate pump specification, use Orenco's PumpSelect™ software.

## Pump Curves



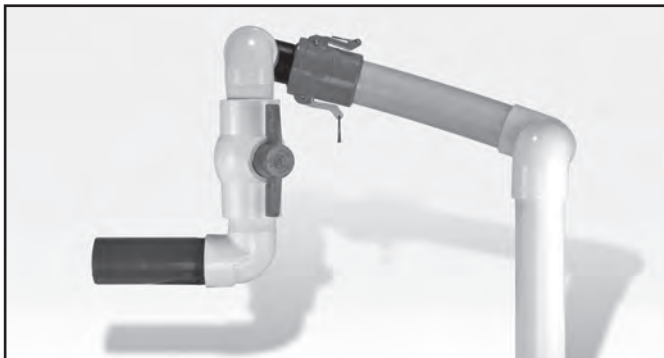
# HV-Series Pump Discharge Assemblies

## Applications

Orenco HV-Series Pump Discharge Assemblies convey effluent from a pump to the exterior of a riser or pump basin. They come in the following configurations:

- Field cut, for high-head discharge assemblies where field adjustment is likely necessary
- Drainback, for use with shallowly buried tanks and transport lines in cold climates
- High head, for use with submersible turbine effluent pumps
- Low head, for use with low-pressure effluent pumps

A cold weather kit is available for high-head configurations only, for use in deeply buried tanks and transport lines where cold weather is a concern. Additionally, an external flex extension is available for installations where tank settling may occur to avoid line breakage during settling. Orenco strongly recommends using an external flex extension if settling may occur.



High-head configuration with optional quick-disconnect installed

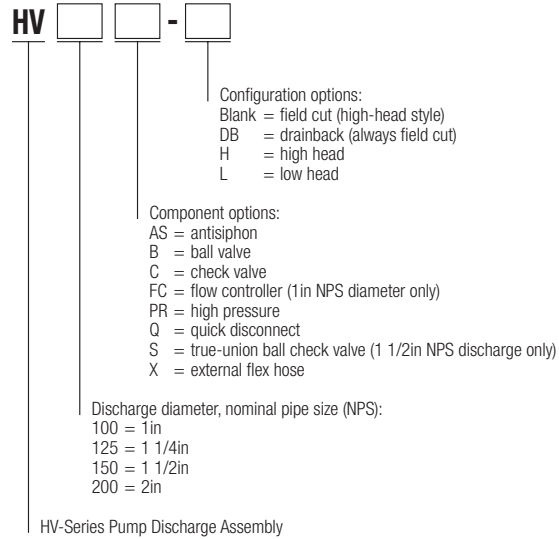
## General

HV-Series pump discharge assemblies are corrosion resistant and adjustable for a proper fit. They are composed of PVC valves and flexible hose that simplify installation and maintenance. The flexible hose also dampens vibrations from the pump. Cam-style quick-disconnect fittings are available on all configurations. All parts are either solvent welded or threaded and sealed with PTFE paste. For the most accurate information on pairing Orenco's pumps to HV-Series pump discharge assemblies, use Orenco's PumpSelect™ software.

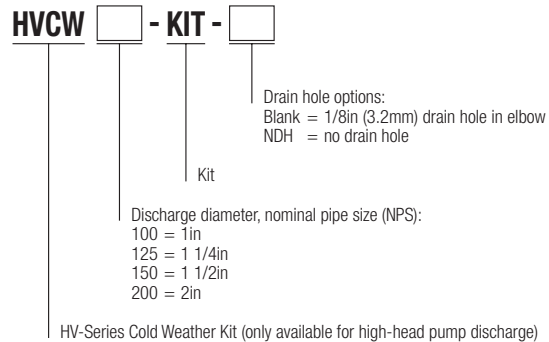
## Standard Models

HV100BCX, HV125BCX, HV150BCX, HV200BCX

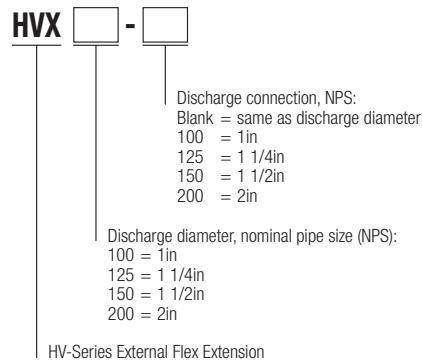
## Product Code Diagrams



*Not all product code configurations may be available as standard products.*



*Not all product code configurations may be available as standard products.*



*Not all product code configurations may be available as standard products.*



1. High-head configuration
2. High-head configuration with cold weather kit installed
3. High-head drainback configuration
4. Low-head configuration
5. Cold weather kit
6. External flex extension

### Materials of Construction\*

External flex extension	PVC
Flexible hose	PVC
Flow control disc	Schedule 80 PVC
High-pressure flex hose	Special elastomer compound
Pipe and fittings	Schedule 40 PVC

\*For information regarding materials of construction for unions and valves used in HV-Series pump discharge assemblies, see [Unions and Valves for Orenco Products, NTD-GOP-VLV-1](#).

### Flexible Hose Thickness and Working Pressure at 73°F (23°C)\*

Type	Nominal pipe size, in (mm)	Wall thickness, in (mm)	Working pressure, psi (bar)	Bursting pressure, psi (bar)
Standard and external	1 (25)	0.11 (2.8)	100 (7)	355 (24)
	1 1/4 (32)	0.13 (3.3)	80 (6)	250 (17)
	1 1/2 (40)	0.13 (3.3)	65 (4)	200 (14)
	2 (50)	0.16 (4.1)	60 (4)	175 (12)
High pressure	1 (25)	0.235 (6.0)	250 (17)	N/A
	1 1/4 (32)	0.24 (6.1)	250 (17)	N/A
	1 1/2 (40)	0.24 (6.1)	250 (17)	N/A
	2 (50)	0.22 (5.6)	200 (14)	N/A

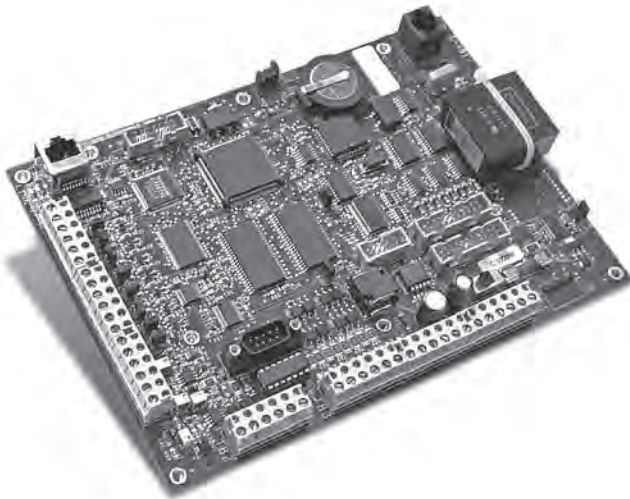
\*For information regarding working pressures of unions and valves used in HV-Series pump discharge assemblies, see [Unions and Valves for Orenco Products, NTD-GOP-VLV-1](#).

# Orenco<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> HyperTerminal).
- Bluetooth<sup>®</sup> 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 ( $\pm 20,000,000$ )
  - 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

## 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.

# Grade Rings and Grade Ring Inserts

## Applications

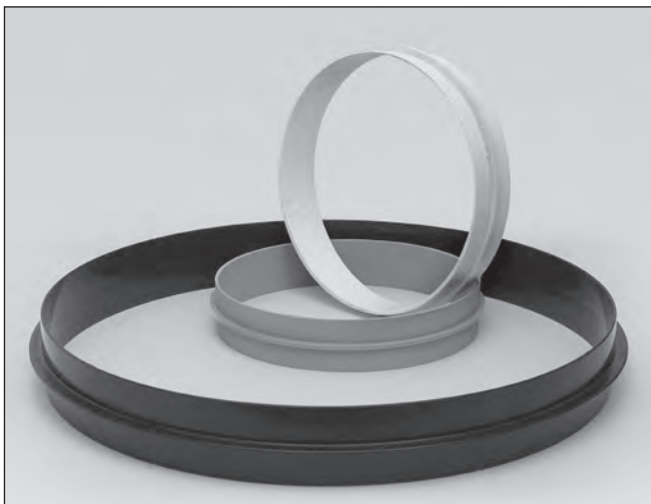
Orenco Grade Rings can be attached to access risers to extend the length of the risers. Orenco Grade Ring Inserts connect sections of access riser pipe with a strong, watertight bond.

## General

Orenco grade rings consist of a section of Orenco fiber-reinforced polymer (FRP) or polyvinyl chloride (PVC) riser pipe with an Orenco grade ring insert affixed to the edge. The grade ring inserts serve as a coupling and are bonded to the end of a riser with adhesive. See [Adhesives and Dispensers for Orenco Products Technical Data Sheet, NTD-ADH-1](#).



Orenco grade rings with grade ring inserts attached

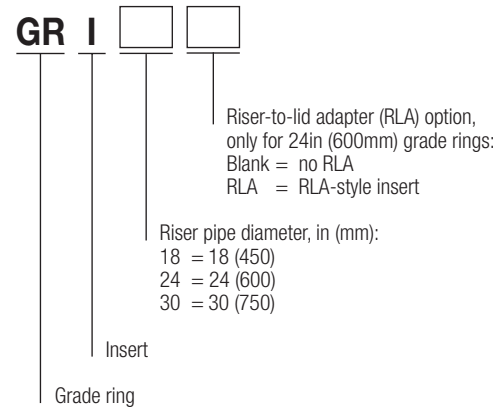
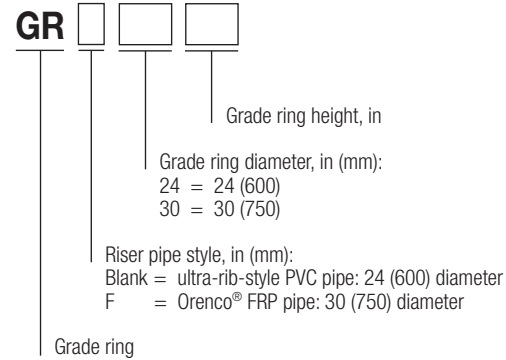


Orenco grade ring inserts

## Standard Models

GRI18, GRI24, GRI24RLA, GRI30

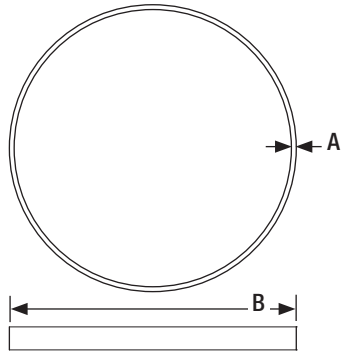
## Product Code Diagrams



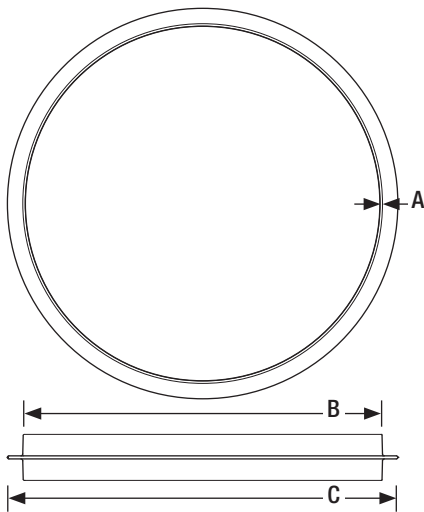
**Not all product code configurations may be available as standard products.**

## Materials of Construction

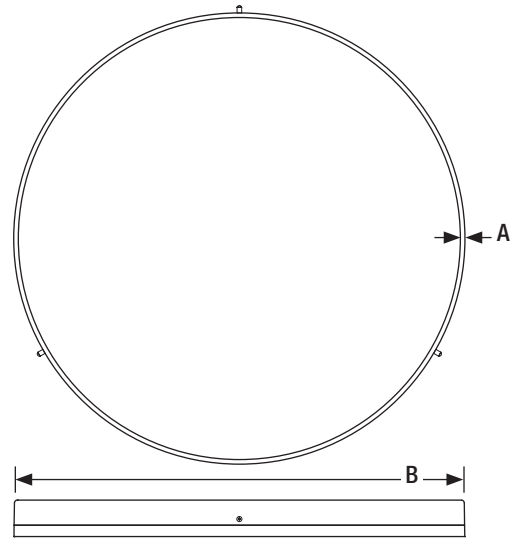
18, 24, and 30in (450, 600, and 750mm) inserts	ABS
Screws and spacers (GRI30 only)	Stainless steel, nylon
Ribbed riser pipe	PVC
FRP pipe	FRP



GRI18, top and side view



GRI24, top and side view



GRI30, top and side view

### Specifications\*

Grade ring inserts <sup>†</sup>	GRI18	GRI24	GRI24RLA	GRI30
<b>A</b> Insert thickness, in (mm)	0.30 (8)	0.30 (8)	0.30 (8)	0.20 (5)
<b>B</b> Outer diameter, in (mm)	18.70 (475)	23.50 (597)	24.38 (619)	29.25 (743)
<b>C</b> Flange outer diameter, in (mm)	N/A	24.50 (622)	N/A	N/A
Pipe applications	Ultra-rib-style PVC	Ultra-rib-style PVC, spiral-seam PVC, dual-wall corrugated PVC, Orenco FRP	24in (600mm) pipe with riser-to-lid adapters (RLAs), Orenco FRP	Spiral-seam PVC, dual-wall corrugated PVC, Orenco FRP

\*Specifications for pipe portion of grade rings can be found in [Ultra-Rib-Style Access Risers Technical Data Sheet, NTD-GOP-RAR-2](#), and [FRP Access Risers Technical Data Sheet, NTD-GOP-FAR-1](#).

† All inserts adapt to the I.D. of the riser except the GRI18, which adapts to the O.D. of the riser.

# DuraFiber® FLD Access Lids

## Applications

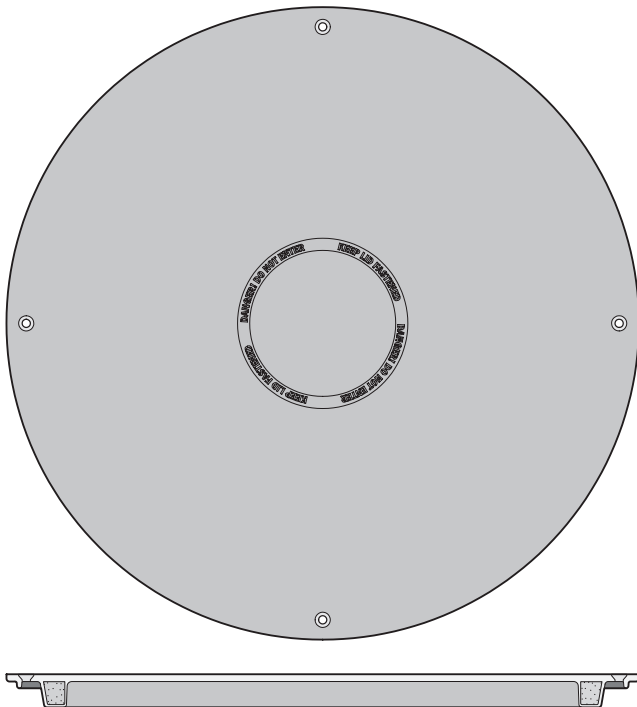
Orenco DuraFiber FLD Access Lids provide secure, durable, watertight coverings for ribbed PVC, HDPE, and Orenco's FRP risers, pump basins, and access ports. They are capable of supporting a 2500lb (1134kg) load; however, they are not recommended for vehicular traffic.

FLD24 24in (600mm) lids require an RLA24 adapter to connect to spiral-seam PVC pipe. FLD30 30in (750mm) lids are not compatible with RLA30 Riser-Lid-Adapters (no longer sold by Orenco) or 30in (750mm) spiral-seam PVC pipe.

## General

DuraFiber FLD lids are designed for extreme durability and damage resistance, with UV- and corrosion-resistant materials, optional EPDM gaskets for watertight lid-to-riser connections, and flat-style flanges for easy access with clean, flush-to-grade installations. The lids have centering rings for easy alignment. The lids also come with four 5/16in (8mm) stainless steel socket cap screws and a hex key wrench.

DuraFiber FLD lids feature a non-skid surface and a molded-in caution statement, with room for a customer logo. For custom logos, contact an Orenco sales representative. Lids are also available with optional insulation, either installed at the factory or in kits that can be installed in the field.

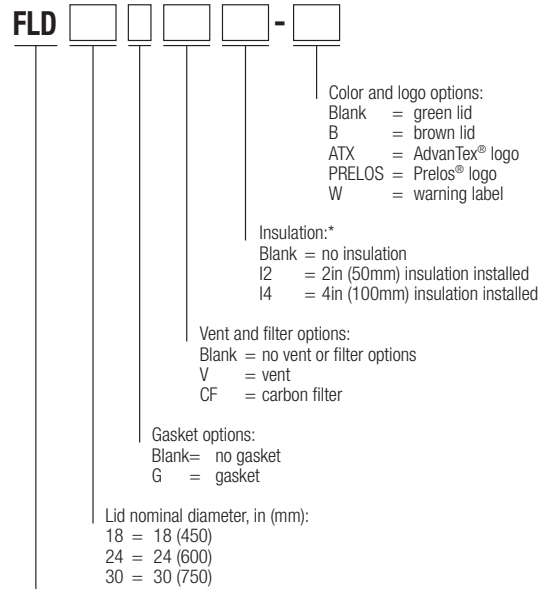


DuraFiber FLD lid: top view and side-cutaway view

## Standard Models

FLD18G, FLD24G, FLD24G-ATX, FLD24G-W, FLD30G, FLD30G-PRELOS, FLD30G-W

## Product Code Diagram



DuraFiber® FLD access lid

\*Insulation has an R-value of 10 per 2in (RSI of 1.8 per 50mm) increment.

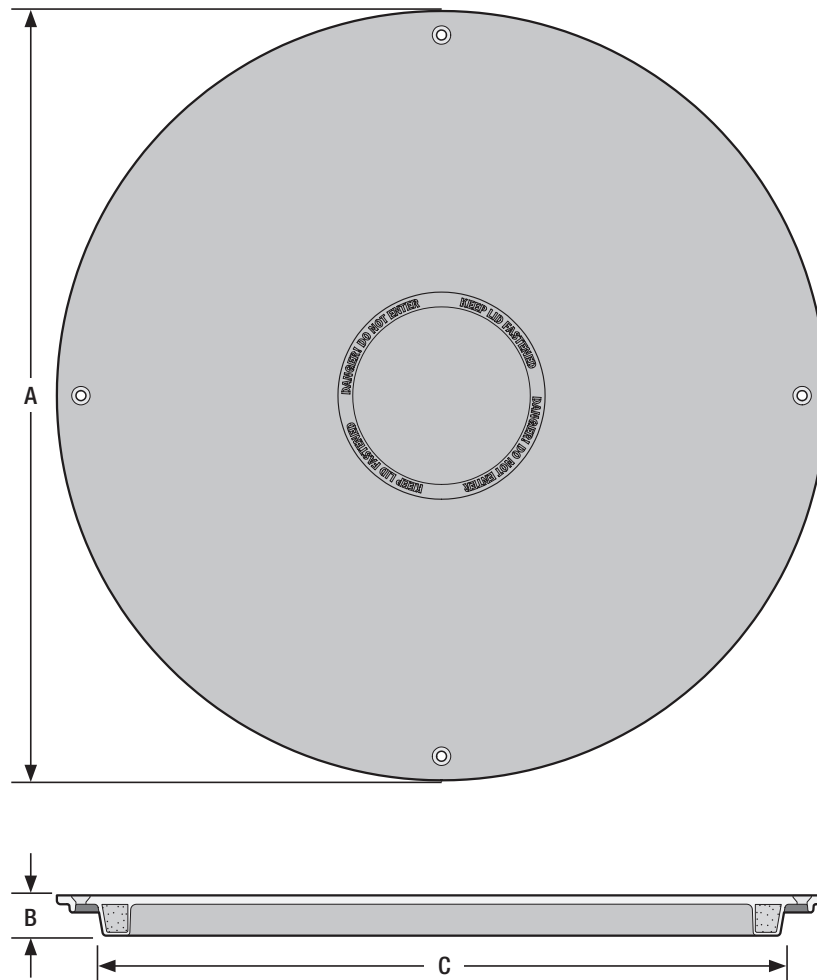
**Not all product code configurations may be available as standard products.**

## Materials of Construction

Lid	Fiber-reinforced polymer (FRP)
Gasket	EPDM
Centering ring core	Structural foam
Mounting hardware	Stainless steel
Insulation, optional	Closed-cell foam
Insulation mounting hardware	Stainless steel

## Specifications

Model	FLD18XX	FLD24XX	FLD30XX
<b>A</b> in (mm)	20.2 (513)	25.75 (654)	32.75 (832)
<b>B</b> in (mm)	1.5 (38)	1.5 (38)	1.5 (38)
<b>C</b> in (mm)	17.5 (445)	23.25 (591)	29.25 (743)
Insulation R-value per 2in (RSI per 50mm) increment	10 (1.8)	10 (1.8)	10 (1.8)
Gasket width, in (mm)	0.38 (10)	0.69 (18)	0.69 (18)
Bolt hole diameter, in (mm)	0.31 (8)	0.31 (8)	0.31 (8)
Weight, lbs (kg)	7 (3)	11 (5)	20 (9)
Bolt holes per lid	4	4	4

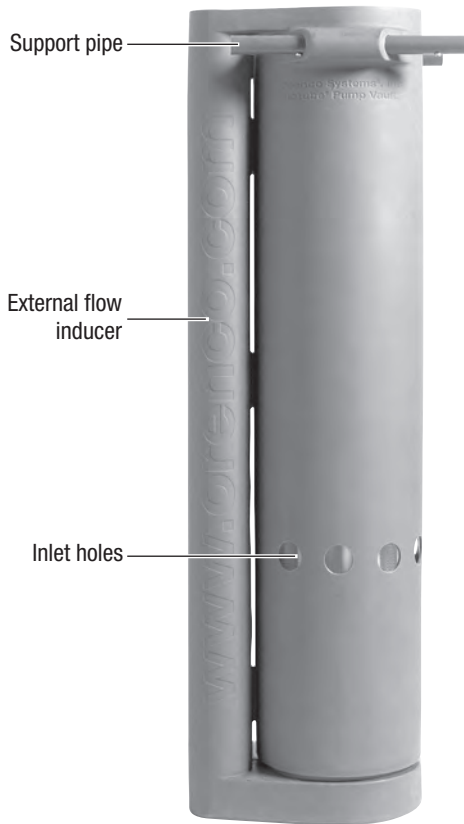


# Biotube® Universal Pump Vaults

For use with Orenco 4in (100mm) Submersible Effluent Pumps

## Applications

Orenco Biotube Universal Pump Vaults are used to filter effluent that is pumped from septic tanks or separate dosing tanks in liquid-only sewer systems and on-site wastewater treatment systems. Pump vaults house a Biotube effluent filter and one or two Orenco 4in (100mm) submersible effluent pumps and can be used in single-compartment septic tanks with flows up to 40gpm (2.5L/sec). When flows are greater than 40gpm (2.5L/sec), a double-compartment septic tank or separate dosing tank is recommended. The Biotube effluent filters remove almost two-thirds of suspended solids.



Side view

## Tank Access and Riser Diameters

Dimensions, in (mm)	PVU with simplex pump	PVU with duplex pumps
Tank access, minimum	19 (483)	19 (483)
Tank access, recommended	20 (508)	20 (508)
Riser, minimum	24 (600)	30 (750)

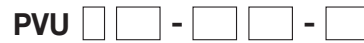
## General

Orenco Biotube Universal Pump Vaults include a molded housing with an internal Biotube filter cartridge. Effluent enters through inlet holes around the perimeter of the Biotube vault and flows through the Biotubes to the external flow inducer. The external flow inducer accommodates one or two pumps. Support pipes are included to suspend the vault in a tank opening. "Earless" 68in (1727mm) vaults, which rest on the bottom of the tank instead of on support pipes, are also available. The filter cartridge can be removed without pulling the pump or the vault.

## Standard Models

PVU48-1818, PVU57-1819, PVU68-2419, PVU84-2419, PVU95-3625

## Product Code Diagram



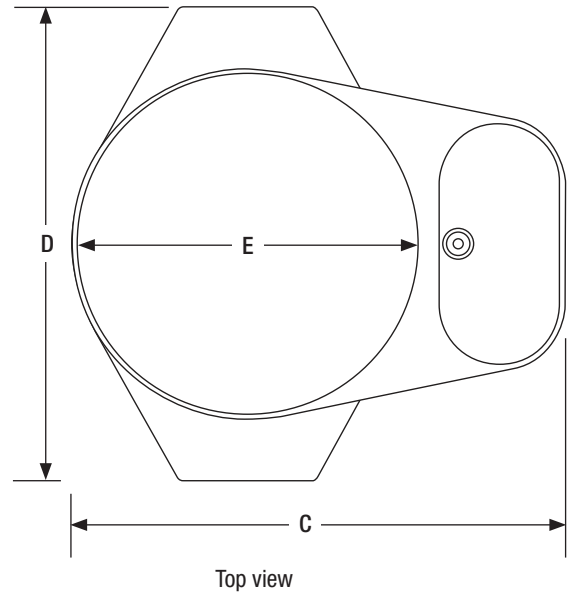
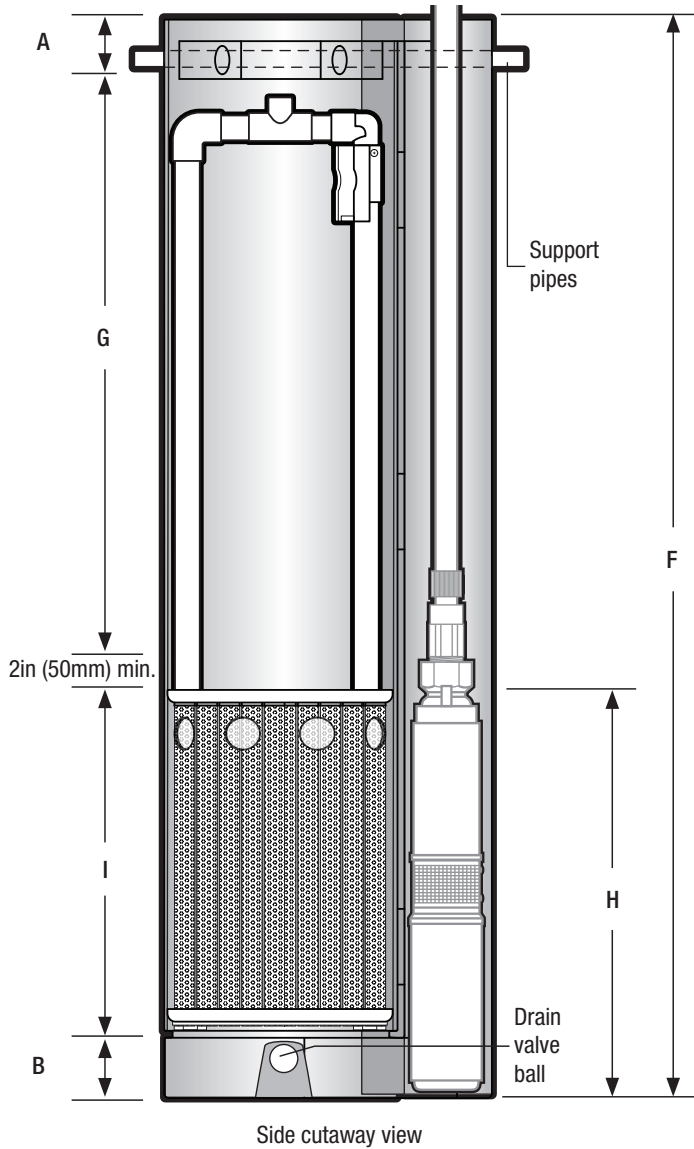
- Support pipe length:
  - Blank = standard, for 24in (600mm) riser
  - L = long, for 30in (750mm) riser
  - NB = no support pipe bracket (earless)
- Inlet hole height, standard:
  - 13 = 13in (330mm)
  - 18 = 18in (457mm)
  - 19 = 19in (482mm)
  - 25 = 25in (635mm)
- Cartridge height, standard:
  - 18 = 18in (457mm)
  - 24 = 24in (610mm)
  - 36 = 36in (914mm)
- Vault height:
  - 48 = 48in (1219mm)
  - 57 = 57in (1448mm)
  - 68 = 68in (1727mm)
  - 72 = 72in (1829mm)
  - 84 = 84in (2134mm)
  - 95 = 95in (2413mm)
  - Custom heights from 42in to 135in available
- Biotube filter mesh:
  - Blank = 1/8in (3.2mm) mesh
  - P = 1/16in (1.6mm) mesh

Orenco® Biotube® Universal Pump Vault

Not all product code configurations may be available as standard products.

## Materials of Construction

Support pipe	Schedule 80 PVC
Biotube vault	Polyethylene
Biotube cartridge	Polypropylene/PVC
Float stem	Schedule 40 PVC
Drain valve ball	Polypropylene



**Standard Dimensions, in (mm)**

<b>A</b>	3 (76)
<b>B</b>	4 (102)
<b>C</b>	17.3 (439)
<b>D</b>	16.6 (422)
<b>E</b>	12 (305)

**Specifications**

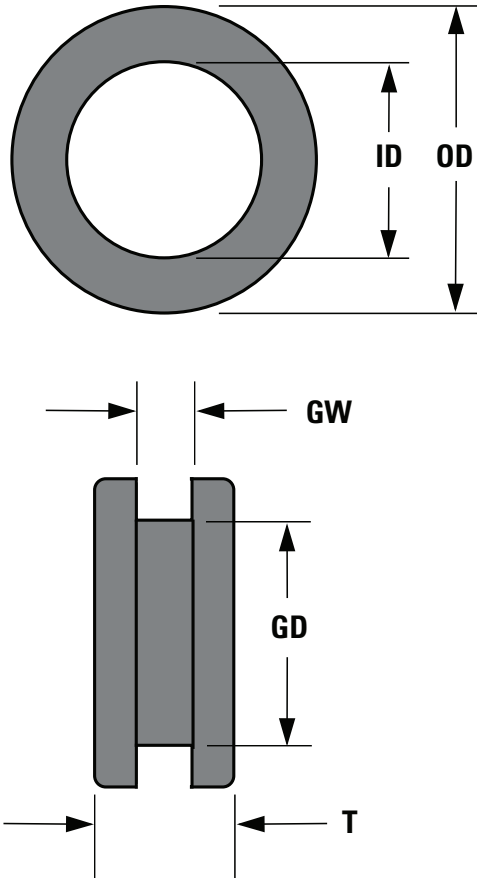
Model	PVU48-1818	PVU57-1819	PVU68-2419	PVU84-2419	PVU95-3625
<b>F</b> Vault height, in (mm)	48 (1219)	57 (1448)	68 (1727)	84 (2134)	95 (2413)
<b>G</b> Lowest float setting point, in (mm)	21 (533)	29 (737)	35 (889)	51 (1295)	50 (1270)
<b>H</b> Inlet hole height, in (mm)*	18 (457)	19 (483)	19 (483)	19 (483)	25 (635)
<b>I</b> Biotube cartridge height, in (mm)	18 (457)	18 (457)	24 (610)	24 (610)	36 (914)
Biotube mesh opening, in (mm)	0.125 (3.2)	0.125 (3.2)	0.125 (3.2)	0.125 (3.2)	0.125 (3.2)
Filter flow area, ft <sup>2</sup> (m <sup>2</sup> )	4.4 (0.4)	4.4 (0.4)	5.9 (0.5)	5.9 (0.5)	9.0 (0.84)
Filter surface area, ft <sup>2</sup> (m <sup>2</sup> )	14.5 (1.35)	14.5 (1.35)	19.7 (1.83)	19.7 (1.83)	30 (2.79)
Maximum flow rate, gpm (L/sec)	140 (8.8)	140 (8.8)	140 (8.8)	140 (8.8)	140 (8.8)

\* May vary depending on the configuration of the tank

# Pipe Grommets

## Applications

Orenco Pipe Grommets are used to provide a seal to prevent the passage of liquids through pipe penetrations.



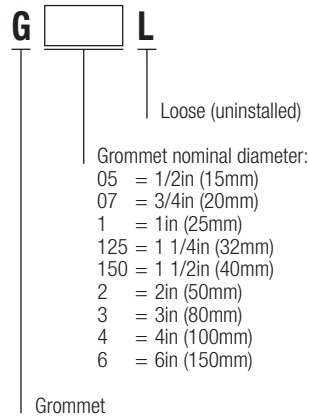
## General

Orenco's pipe grommets are constructed of corrosion-resistant rubber to provide long-lasting seals. Grommets conform to standard IPS sizes. Not all models conform exactly to the image shown.

## Standard Models

G05L, G07L, G1L, G125L, G150L, G2L, G3L, G4L, G6L

## Product Code Diagram



## Material of Construction

Grommet EPDM synthetic rubber in accordance with MIL-STD-417, 50-55 durometer

## Specifications

Dimensions, in (mm)	G05L	G07L	G1L	G125L	G150L	G2L	G3L	G4L	G6L
OD	1 1/4 (32)	1 1/2 (38)	1 7/8 (48)	2 1/8 (54)	2 1/2 (64)	3 7/8 (98)	5 (127)	6 (152)	8 1/8 (206)
ID	3/4 (19)	1 (25)	1 1/4 (32)	1 1/2 (38)	1 3/4 (44)	2 1/8 (54)	3 1/4 (83)	4 3/16 (106)	6 11/16 (170)
GD	1 (25)	1 1/4 (32)	1 5/8 (41)	1 3/4 (44)	2 1/8 (54)	2 11/16 (68)	3 13/16 (97)	4 15/16 (125)	7 5/8 (193)
GW	3/16 (5)	3/16 (5)	1/4 (6)	1/4 (6)	1/4 (6)	5/16 (8)	5/16 (8)	1/4 (6)	1/4 (6)
T	1/2 (13)	7/16 (11)	9/16 (14)	5/16 (8)	5/16 (8)	15/16 (24)	15/16 (24)	7/8 (22)	13/16 (21)
Holesaw size	1 (25)	1 1/4 (32)	1 9/16 (40)	1 3/4 (44)	2 1/8 (54)	2 3/4 (70)	3 7/8 (98)	5 (127)	7 (178)

# External Splice Box

## Applications

The Orenco® External Splice Box attaches outside the access riser of an underground tank. It's engineered specifically for water and wastewater treatment systems and is especially suited for use in locations prone to high groundwater and other wet conditions. Its separate conduit hubs, large volume, and optional dividers make it useful for maintaining isolation of high- and low-voltage wires, where needed. It has four cord grips, which accommodate power cords for floats and pumps of 0.170 - 0.470 inches (4.3 - 11.9 mm) in diameter. Unused cord grips can be plugged watertight with the supplied cord grip plugs. Each External Splice Box includes a riser adapter designed to provide a watertight connection between the splice box and riser.



The External Splice Box is molded PVC.  
It has a UL Type 6P listing for prolonged submergence.

## General

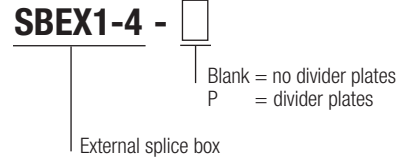
To specify the Orenco External Splice Box for your installation, require the following:

- Watertightness for prolonged submergence per UL listing (Type 6P)
- Attachment external to access riser to allow inspection with no need to open the riser lid
- Volume of 126 in.<sup>3</sup> (2065 cm<sup>3</sup>) for easy wiring access and multiple wiring configurations
- Bottom entry, so conduit or direct-bury cable always remains below minimum burial depth
- UV-resistant rating for outdoor use
- Optional divider plates for isolating high- and low-voltage wires from separate conduits or direct-bury cable
- Included riser adapter to eliminate the need for a grommet

## Standard Models

SBEX1-4, SBEX1-4-P

## Product Code Diagram

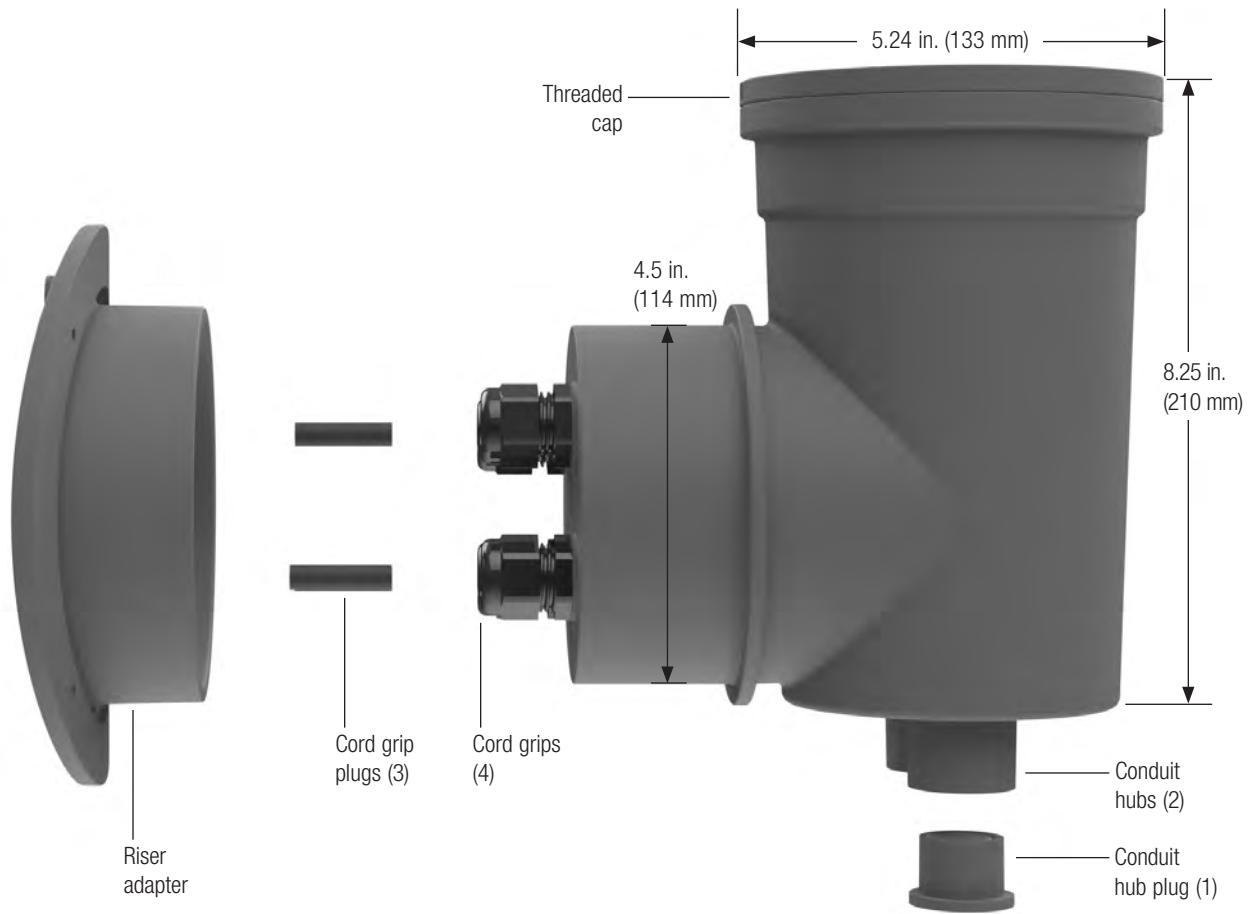


## Physical Specifications

Volume	126 in. <sup>3</sup> (2065 cm <sup>3</sup> )
Cord grips	4
Cord grip plugs	3
Cord diameters accommodated	0.170-0.470 in. (4.3-11.9 mm)
Conduit hubs	2
Conduit hub plug	1
Conduit sizes accommodated	½ in. (with fitting or bell end) ¾ in. 1 in. (with coupling)
Dia. of hole into riser	5 in. (127 mm); hole-cutting template included

## Materials of Construction

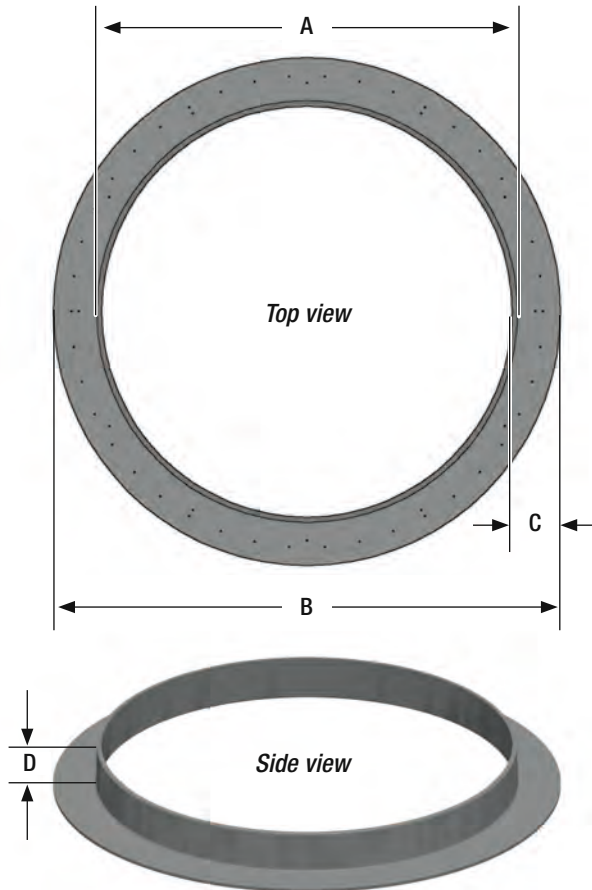
Splice box	PVC
Cord grips	Nylon
Cord grip plugs	EPDM rubber
O-rings	Buna rubber
Conduit hub plug	PVC
Riser adapter	ABS



# PRTA ABS Tank Adapters

## Applications

PRTA tank adapters are used to provide a structural, watertight method of installing a 24- or 30-inch (600- or 750-mm) access riser over a tank opening.



## General

Orenco's PRTA tank adapters are molded plastic products and therefore have excellent part-quality and consistency. PRTA tank adapters can be cast into a tank or fastened to the top of the tank with a bolt-down kit. The bolt-down kit consists of either six or twelve (depending on model) stainless steel concrete anchors and a roll of butyl tape.

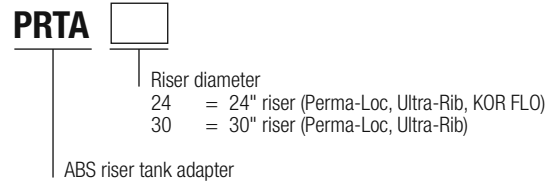
The O.D. of the vertical flange matches the I.D. of Orenco's ribbed risers, which provides a suitable joint to seal with MA320 or ADH200 adhesive.

## Standard Models

PRTA24, PRTA30

PRTA24BDKIT (6 anchors), PRTA30BDKIT (12 anchors)

## Product Code Diagram



## Materials of Construction

Tank adapter	ABS
Concrete anchors	Stainless steel anchor bolts
Sealant	Butyl tape

## Specifications

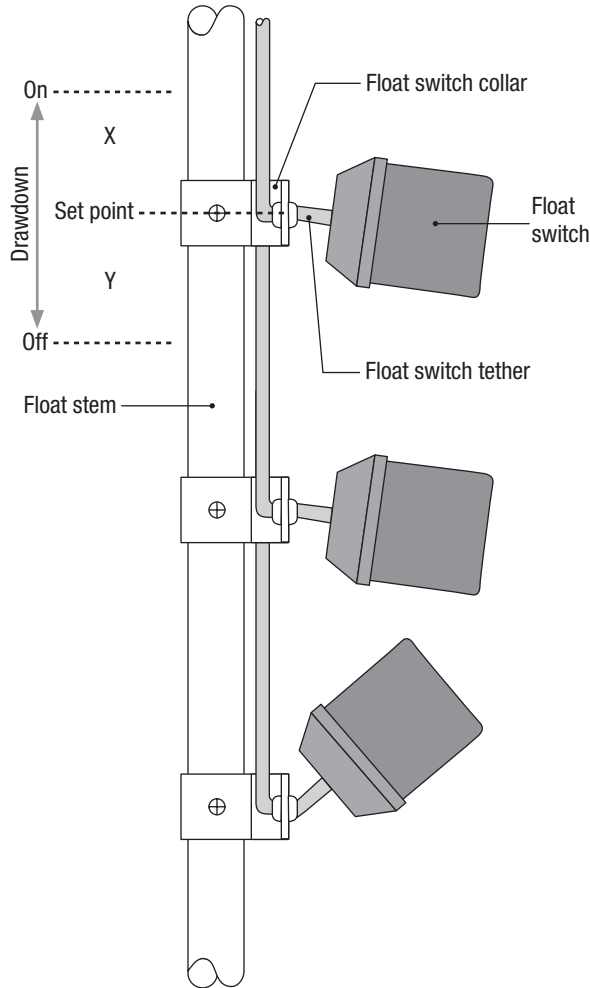
Dimensions*	PRTA24	PRTA30
A - Outside dia., in. (mm)	23.38 (594)	29.25 (743)
B - Flange dia., in. (mm)	26.75 (679)	34.25 (870)
C - Horizontal flange width, in. (mm)	2.00 (51)	2.50 (64)
D - Vertical flange height, in. (mm)	3.50 (89)	3.25 (83)

\*The tank adapter has a nominal 0.25 inch (6 mm) thickness.

# Float Switch Assemblies

## Applications

Float switches are used to signal liquid level positions for alarm and pump control applications. Orenco float switch assemblies can be mounted in pump vaults, effluent screens, pump basins, and risers.



“On” and “Off” positions shown describe normally open float switches; “On” and “Off” positions are reversed for normally closed float switches

## General

All models except “J” are UL listed and CSA certified for use in water or sewage; “J” switches are a CSA-certified direct alternative to “P” switches. Non-mercury float switches (models B, C, J, N, and P) are used where components containing mercury are prohibited.

Float switches are typically ordered in assemblies that include one or more switches mounted on a 1 in PVC float stem. ABS float collars are used to provide secure mounting that is easily adjustable.

Normally-open “P” float switches have a blue cap for easy identification; normally-closed “N” float switches have a red cap.

When ordering float switch assemblies, remember to list float switches from the top of the float stem down. An “MFPBN-” product code indicates one “P” switch at the top of the stem, one “B” in the middle of the stem, and one “N” switch at the bottom of the stem; an “MF2PN-” indicates “P” switches at the top and middle of the stem, and one “N” switch at the bottom of the stem.

## Standard Models

B, C, G, J, N, P

## Product Code Diagram

MF  -  -  -  -

Cord length option:  
Blank = 10ft (3m), standard  
20 = 20ft (6m)  
30 = 30ft (9m)  
50 = 50ft (15m)

Application:  
FS = field set  
FTL = elbow-style (base-inlet filters only)  
PB = pump basin  
V = pump vault (standard float settings)  
STEP = standard float switch settings for STEP  
STEPRO = standard float switch settings for STEP with redundant off  
SVCOM = standard float switch settings for VCOM simplex

Float stem length:  
Blank = no float stem (float switches and float switch collars only)  
19, 21, 27, 33, 37, 39, 45, 51, 57, 66 = stem length, inches  
5, 11 = stem length, inches (for elbow-style float brackets)

Float switch models (listed in order from the top of the float stem down):  
B, C, G, J\*, N, P

Number of float switches (when using multiples of the same float switch model):  
Blank = no multiples of the same float switch model

Float switch assembly

\* CSA-certified, direct alternative to “P” float switch

**Note: Not all product configurations are available as standard products**

## Signal- and Motor-Rated Float Switch Matrix

Model	State <sup>1</sup>	Type	IR <sup>2</sup>	Volts	Amps	hp	Tether	X	Y	Drawdown <sup>3</sup>
<b>Signal-rated mechanical float switches<sup>4</sup> (for control switch applications)</b>										
<b>J<sup>a</sup></b>	Normally open	Mechanical	Yes	n/a	n/a	n/a	2.00in	2.00in	0.10in	2.10in
<b>N<sup>a</sup></b>	Normally closed	Mechanical	Yes	n/a	n/a	n/a	2.00in	1.50in	0.50in	2.00in
<b>P<sup>a</sup></b>	Normally open	Mechanical	Yes	n/a	n/a	n/a	2.00in	1.50in	0.50in	2.00in
<b>Motor-rated float switches<sup>4</sup> (for pump switch applications)</b>										
<b>B</b>	Normally open	Mechanical	No	120V	13A	1/2hp	2.00in <sup>b</sup>	2.50in	1.50in	4.00in
				240V	13A	1hp	3.00in	3.00in	1.50in	4.50in
							4.00in	3.25in	1.50in	4.75in
<b>C</b>	Normally open	Mechanical	No	120V	13A	1/2hp	2.00in	3.00in	2.50in	5.50in
				240V	15A	2hp	3.00in <sup>b</sup>	3.50in	3.00in	6.50in
							4.00in	4.00in	3.50in	7.50in
							5.00in	4.50in	4.00in	8.50in
							6.00in	5.25in	4.25in	9.50in
<b>G</b>	Normally open	Mercury	Yes	120V	15A	3/4hp	2.00in	1.50in	3.00in	4.50in
				240V	15A	2hp	3.00in <sup>b</sup>	1.75in	3.00in	4.75in
							4.00in	2.00in	3.50in	5.50in

<sup>a</sup> Suitable for use with VCOM and MVP

<sup>b</sup> Standard tether length

### Notes

<sup>1</sup> State: normally open or normally closed

Float switches have an internal contact. The terms "normally open" (N/O) and "normally closed" (N/C) refer to the default state of the float switch contact. The default state refers to the contact positions in the float switch when it is resting (down). A normally open float switch has an open contact (off) in the down position, and a normally closed float switch has a closed contact (on) in the down position. Different panel functions require different types of float switches. Most applications require float switches that are normally open. One notable exception is the redundant off and low-level alarm function that requires a normally closed float switch, except with MVP and VCOM panels.

<sup>2</sup> IR (intrinsically safe relay)

This indicates that the float switch is approved for use with intrinsically safe, Class I, Division 1 applications, where reliable float switch operation with very low current is required.

<sup>3</sup> Drawdown

Drawdown (in inches) refers to the difference in liquid level between a float switch's activation and deactivation points. Drawdown can be altered by adjusting the tether length of the float switch cord. When selecting float switches, keep in mind that any float switch that can directly start and stop a pump (one that has no motor contactor in the control panel) should have a drawdown capability to avoid rapid cycling of the pump.

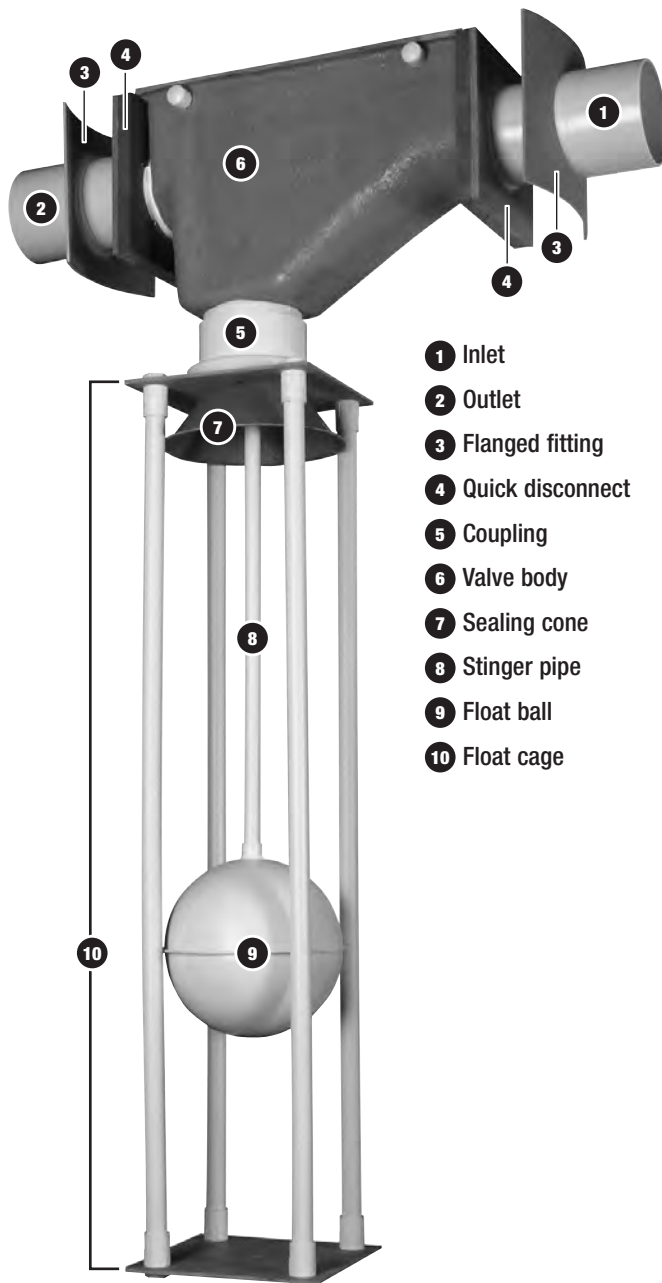
<sup>4</sup> Signal-rated or motor-rated

Every float switch has a maximum amount of current it can handle. Exceeding these limits may cause premature failure. Signal-rated or "control" float switches are used to activate pump control panels and alarms. Only low-amperage signals pass through these switches, hence the switch is "signal-rated." All Orenco panels that use motor contactors can use signal-rated float switches. In some systems, a float switch is used to directly start and stop a pump. In this application, the current running the pump passes through the switch as well, so the switch must be "motor-rated." In most instances, a motor-rated float switch can be used as a signal-rated float switch.

# MM\_-FRP Recirculating Ball Valve

## Applications

The MM\_-FRP Recirculating Ball Valve controls the circulation of filtrate from the AdvanTex pod to the recirculation tank. When the liquid in the tank rises to a predetermined maximum bypass level, the valve closes, diverting filtrate past the recirculation tank. When the liquid level is low, the valve remains open, allowing filtrate to return to the tank for recirculation. As the liquid level approaches the maximum bypass level, filtrate splits and flows both ways.



- 1 Inlet
- 2 Outlet
- 3 Flanged fitting
- 4 Quick disconnect
- 5 Coupling
- 6 Valve body
- 7 Sealing cone
- 8 Stinger pipe
- 9 Float ball
- 10 Float cage

MM\_-FRP Recirculating Ball Valve (MM6-FRP shown)

## Features

- Easy installation and removal
- Field-adjustable to maintain desired bypass level
- Corrosion-resistant construction
- Capacity for flows up to ...
  - 125 gpm (7.9 L/sec) for MM4-FRP
  - 225 gpm (14.2 L/sec) for MM6-FRP
- Design allows installation in ...
  - 24- or 30-in. (600- or 750-mm) access risers (MM4-FRP)
  - 30-in. (750-mm) access risers (MM6-FRP)

## Standard Models

MM4-FRP, MM4-FRP-Field Cut, MM6-FRP, MM6-FRP-Field Cut

## Materials of Construction

	MM4-FRP	MM6-FRP
Body and cone	Fiberglass-reinforced polyester (FRP)	Fiberglass-reinforced polyester (FRP)
Inlet and outlet	Sch. 40 PVC	Sch. 40 PVC
Float	Polyethylene	ABS
Float cage	FRP plates, PVC	FRP plates, PVC
Quick-disconnect mounting brackets	ABS	FRP, PVC
Latches	No latches	Stainless steel

## Specifications

### Approximate Dimensions, in. (mm)

	MM4-FRP	MM6-FRP
Total height	71 (1803)	77.5 (1968)
Float cage height	49 (1245)	57 (1448)
Stinger pipe length	23.0 (584)	31.5 (800)
Stinger pipe length (Field-cut option)*	36.0 (914)	40.0 (1016)
Distance between mounting brackets	17.4 (442)	25.4 (645)
Nominal inlet and outlet diameter	4 (100)	6 (150)

\*Field-cut stinger pipes are shipped unassembled.

# Adhesives and Dispensers for Orenco Products

## Applications

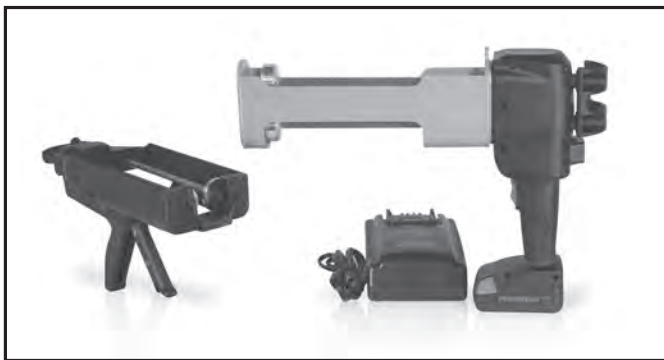
Adhesives and dispensers for Orenco products are used to create durable, watertight bonds between tanks, risers, and adapters, as well as between grommets and risers.

## General

When working with Orenco products, use only approved adhesives. Before using an adhesive not listed in this document, contact Orenco or your distributor. Also, check the expiration date on adhesive packages. If the adhesive is expired, do not use it to install Orenco components.



Adhesives



Dispensing guns:  
MA-MANUAL GUN-600ML and MA-BATT GUN-600ML

## Structural Methacrylate Adhesives

### MA8120 and SA510

MA8120 and SA510 are two-component methacrylate structural adhesives. They are used to bond ABS, DCPD, FRP, and PVC for strong, watertight joints. They will not bond to concrete. Clean, dry bonding surfaces are required for proper adhesion.

MA8120 is intended for applications requiring a long working time or for thicker adhesive bead lines; it will sag slightly in warm temperatures. SA510 is intended for applications requiring a short working time or for thinner adhesive bead lines. Both have a 1:1 mix ratio.

### MA320

MA320 is a two-component methacrylate adhesive. It is used to bond ABS, FRP, and PVC for strong, watertight joints. It will not bond to concrete. Clean, dry bonding surfaces are required for proper adhesion. MA320 requires hand mixing.

### IPS 810

IPS 810 is a self-leveling, two-component methacrylate adhesive, used to bond ABS, FRP, PVC, and concrete for strong, watertight joints. Clean, dry bonding surfaces are required for proper adhesion. IPS 810 requires hand mixing. Pint (product code ADHP10) or quart (product code ADHPQ10) quantities are available.

## Sealant/Adhesive

### ADH200

ADH200 is a moisture-curing, single-component sealant/adhesive used for sealing pipe grommets and for joining PVC or FRP risers to ABS or FRP tank adapters where joints are in shear. It is designed for applications in damp, dry, or cold climates. It is solvent free and contains no isocyanates. ADH200 will not shrink upon curing and will not discolor when exposed to UV light. Clean, dry bonding surfaces are required for proper adhesion. It is not intended for structural joints that are primarily in tension, in peel, or in bending.

**Adhesives Specifications**

	<b>MA8120</b>	<b>SA510</b>	<b>MA320</b>	<b>IPS 810</b>	<b>ADH200</b>
<b>Applications</b>	Bonds ABS, DCPD, FRP, PVC; for longer working times or thicker adhesive beads	Bonds ABS, DCPD, FRP, PVC; for shorter working times or thinner adhesive beads	Bonds ABS, FRP, PVC	Self-leveling; bonds ABS, concrete, FRP, PVC	Shear joints (PRTA-style adapters; adheres and seals pipe grommets, fasteners, etc.)
<b>Color</b>	Grey	Grey	White	White	White
<b>Working Time @ 70°F (21°C)</b>	~ 20min	10-15min	10-20min	~ 10min	n/a; 35min (+/- 10min) tack-free time
<b>Cure Time @ 70°F (21°C)</b>	< 2hr, depending on ambient temperature and adhesive bead/joint thickness	< 45min, depending on ambient temperature and adhesive bead/joint thickness	~ 1hr, depending on ambient temperature and adhesive bead/joint thickness	~ 2hr, depending on ambient temperature and adhesive bead/joint thickness	2-3 days, depending on ambient temperature and adhesive bead/joint thickness
<b>Unit Quantities</b>	300/300mL cartridge (600mL total)	300/300mL cartridge (600mL total)	7oz (200mL) packet	1pt (473mL), 1qt (946mL)	10.2oz (300mL) tube
<b>Shelf Life</b>	See "use by" date on cartridge	See "use by" date on cartridge	1yr from oldest date code shown on product	1yr from date shown on product	12mo from mfg date at 70°F (21°C) with 50% relative humidity
<b>Dispensing Guns</b>	MA-MANUAL GUN-600ML, MA-BATT GUN-600ML	MA-MANUAL GUN-600ML, MA-BATT GUN-600ML	None; hand mix in the packet	None; hand mix in the jar	Standard caulking gun

## Approximate Quantities of Adhesive Needed for Various Products

	MA8120	SA510	MA320	IPS 810	ADH200
<b>FRTA24-RVF Adapter, 24in (600mm)</b>	½ cartridge*	½ cartridge*	1-2 packets	n/a	1 tube
<b>PRTA24 Adapter, 24in (600mm)</b>	½ cartridge*	½ cartridge*	1-2 packets	n/a	1 tube
<b>PRTA24-2 Adapter, 24in (600mm)</b>	> ½ cartridge*	> ½ cartridge*	n/a	< 1pt	n/a
<b>PRTA30 Adapter, 30in (750mm)</b>	< 1 cartridge*	< 1 cartridge*	2 packets	n/a	< 2 tubes
<b>RLA24-2 Adapter, 24in (600mm)</b>	½ cartridge*	½ cartridge*	1-2 packets	n/a	1 tube
<b>RRFTA Adapter, 24in (600mm)</b>	< 1 cartridge*	n/a	n/a	1pt	n/a
<b>RRFTA30 Adapter, 30in (750mm)</b>	1 cartridge*	n/a	n/a	1qt	n/a
<b>GR24XX Grade Ring, 24in (600mm)</b>	½ cartridge*	½ cartridge*	1-2 packets	n/a	1 tube
<b>GR30XX Grade Ring, 30in (750mm)</b>	< 1 cartridge*	< 1 cartridge*	2 packets	n/a	< 2 tubes
<b>Grommets</b>	n/a	n/a	n/a	n/a	various quantities

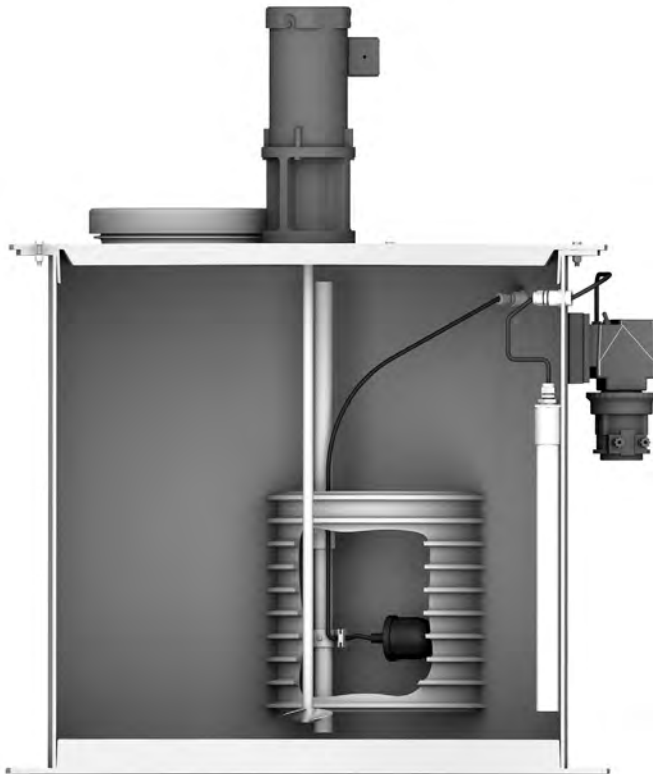
\* Preferred adhesive for this application

# Liquid Chemical Feeder

## Applications

Orenco® Liquid Chemical Feeders are designed for use with systems where chemical additives are needed to achieve target levels of wastewater contaminant removal.

In wastewater systems with insufficient alkalinity to meet nitrogen limits, Liquid Chemical Feeder are ideally suited for adding slurry mixtures of bases, such as soda ash.



Orenco LCF3636-AG, side cutaway view

## General

Orenco Liquid Chemical Feeders are manufactured from stainless steel, PVC, and fiberglass parts for durability and corrosion resistance. BG (below-ground) units are designed to withstand a wide range of temperatures and conditions. They can be partially buried or set at-grade. AG (above-ground) units are intended only for installation indoors, protected from the elements.

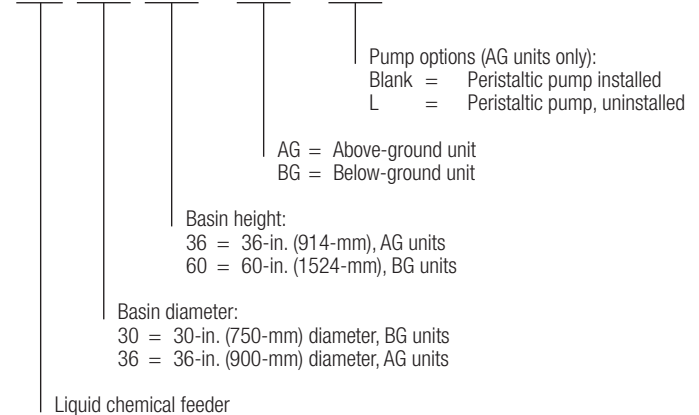
The unit features a 1/3 hp (0.25 kW), 1750 rpm, direct-drive mixer to keep slurries in suspension. The peristaltic pump transfers chemical slurries at a maximum rate of 2.19 gallons per hour (8.3 liters per hour) to an injection point.

## Standard Models

LCF3636-AG, LCF3636-AG-L, LCF3060-BG

## Product Code Diagram

LCF   -  -



## Materials of Construction

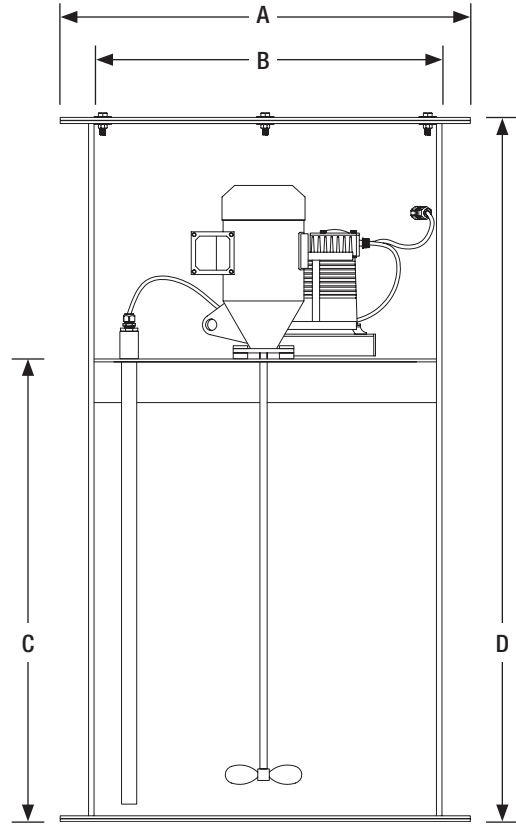
Basin lid	Fiberglass
Basin lid gasket	Urethane
Basin	Fiberglass
Basin bottom	Fiberglass
Mixer	Stainless steel
Mixer base	Fiberglass
Mixer blade	Stainless steel
Mixer shaft	Stainless steel
Pump tubing	Norprene®

**Specifications**

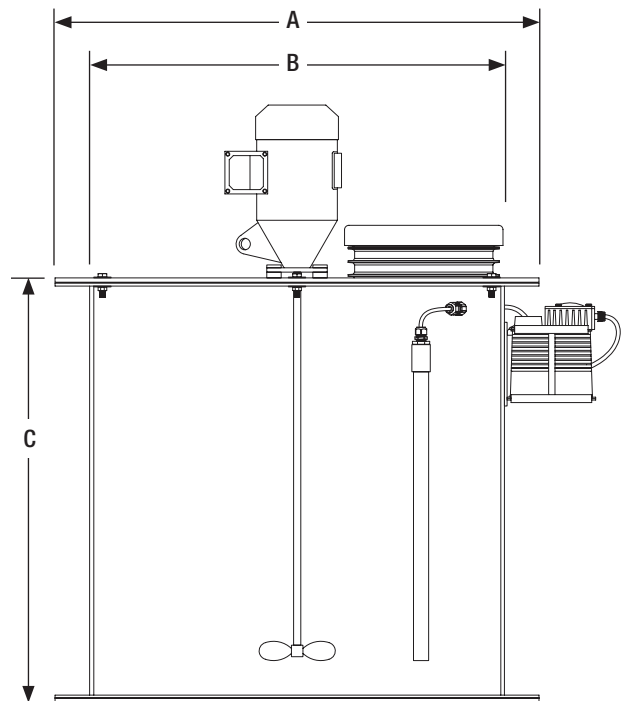
Dimensions, in. (mm)	LCF3636-AG	LCF3060-BG
A, nominal	42 (1067)	36 (914)
B, nominal	36 (914)	30 (750)
C	36 (914)	48 (1168)
D	n-a	60 (1829)
Liquid capacity, gal. (m <sup>3</sup> )	145 (0.55)	126 (0.48)
Liquid depth, in. (mm)	34 (863.6)	46 (1168)

**Performance**

Mixer motor voltage	115 VAC
Mixer amperage	2.23
Mixer horsepower (kW)	1/3 (0.25)
Peristaltic pump voltage	115 VAC
Peristaltic pump psi (bar)	50 (3.5)
Max pump flow rate, gal./hr (L/hr)	2.19 (8.3)



*Orenco LCF3060-BG, side dimensional view*



*Orenco LCF3636-AG, side dimensional view*

**15. Appendix 7 – Effluent Pump Owner’s Manual**

DRAFT



**Orenco Systems®**  
Incorporated

*Changing the Way the  
World Does Wastewater®*

# Orenco Systems® OWNER'S MANUAL

High Head Effluent Pumps  
Two and Three Wire, Single and Three Phase  
1/2 through 5 HP 50 and 60 Hz.

## PRE-INSTALLATION:

Inspect pump and motor for delivery damage.  
Report any damage immediately to the shipping  
carrier and to your dealer.

Pump performance is based on pumping clear  
water.

Warranty is void in the following conditions:

If pump has pumped excessive abrasives –  
excessive abrasives can cause premature  
pump wear.

If entrained gas or air are present in the water  
being pumped – these can reduce flow and cause  
cavitation which can damage pump.

If pump has been operated with discharge  
valve closed – severe internal damage  
will result.

All installation work on this pump should be done  
by a certified installer. All electrical connections and  
tests should be made by qualified personnel.

## Installation Record

Record the following nameplate information here for  
future reference

<b>Pump Model No:</b>
<b>Motor Serial No Date Code:</b>
<b>Liquid end Date Code:</b>
<b>Installer:</b>
<b>Installer Phone Number:</b>
<b>Date of Purchase:</b>
<b>Date of Installation:</b>

## LIMITED WARRANTY

Orenco warrants to the original consumer of the pump listed below, that it will be free from defects in material and workmanship for the Warranty Period from the date of manufacture as noted on the liquid end.


<b>Product</b>	<b>Warranty Period</b>
4" PF Series Submersible Pump	5 Year


**Orenco Systems Incorporated**  
814 Airway Avenue, Sutherlin, OR 97479-9012

106193101 (Rev. 04/09)


## GENERAL SAFETY:


**Carefully read and follow all safety instructions in this manual or on pump.** Keep this manual with pump to aid in installation and operation of the unit. Maintain all safety decals on pump.


 This Triangle is the safety alert symbol. When you see this symbol on your pump or in this manual, look for one of the following signal words and be alert to the potential for personal injury:


 **WARNING** warns about hazards that can cause serious personal injury, death or major property damage if ignored.


The word **NOTE** indicates special instructions which are important but not related to hazards.


 **WARNING** Risk of explosion or fire. Do not pump flammable or volatile liquids or gasses with this pump.


 **WARNING** Hazardous pressure. Under certain conditions, submersible pumps can develop extremely high pressure. If installing this pump in any system other than the original wastewater treatment system for which it was designed, install a pressure relief valve capable of passing entire pump flow at maximum allowable system pressure.


 **Do not allow pump, piping, or any other system component containing water to freeze. Freezing may damage system, leading to injury or flooding. Damage caused by freezing is not covered under warranty. Allowing pump or system components to freeze will void warranty.**


 **WARNING** Risk of electrical shock. Disconnect electrical power supply before installing or servicing pump.

 **Risk of electrical shock.** Do not use pump in open bodies of water such as lakes, swimming pools, etc. Pump is not designed for such use and a dangerous shock hazard could result.

 Install, ground and wire pump according to local code and National Electrical Code or Canadian Electrical Code requirements, as applicable.

 Make sure line voltage and frequency of power supply match motor nameplate voltage and frequency. Incorrect voltage can cause fire, damage motor, and will void the warranty.

 **Unexpected starts.** Disconnect the power supply before attempting to service or repair the pump. Single-phase motor is equipped with a thermal overload switch which stops the pump if the motor overheats. This switch will re-close as soon as the motor cools down and can cause injury to anybody working on the pump or motor.

 Install pump according to all applicable code requirements.

Assembled pump/motor unit is CSA® Certified to U.S. and Canadian standards.


Motor alone is UL® Recognized and CSA® Certified.


## PIPING:


Make sure that all system piping conforms to all applicable local and national plumbing codes and to good piping practice.

Pipe joint compound can cause cracking in plastics. Use a proper sealant when sealing joints in plastic pipe or connecting pipe to thermoplastic pumps.

## WIRING / GROUNDING:

 **WARNING** Hazardous voltage. Can shock, burn, or cause death. Permanently ground pump, motor and control box before connecting power supply to motor. Connect ground wire to approved ground first and then connect to equipment being installed.

 Install a disconnect switch near the pump that opens all legs of the circuit.

 Ground pump and motor in accordance with national and local codes and ordinances that apply. Use a copper ground wire at least as large as wires carrying current to motor.

Motor is supplied with a copper ground wire. Splice this ground wire to a copper conductor that matches motor wire size specified in your control panel installation instructions.

NOTE: Wire sizes must adhere to local and National Electrical Code or Canadian Electrical Code requirements, as applicable.

Do not ground to a gas supply line.

## WIRING CONNECTIONS:

All wiring must meet National Electrical Code or Canadian Electrical Code (as applicable) and local code requirements.

Use only copper wire when making connections to pump and control box.

To avoid over heating wire and excessive voltage drop at motor, be sure that wire size is at least as large as size listed in your control panel installation instructions.

Follow splice box manufacturer's instructions for a water-tight splice.


## ROTATION – (3 Phase only):

To make sure motor is running in the right direction, proceed carefully as follows:

After electrical connections have been made as outlined, and with pump supported in flow inducer, momentarily turn on then turn off the switch connecting the motor to the power supply line. Note rotation of pump as motor starts. If connections are properly made, pump will “jerk” clockwise when looking into the pump discharge when started. If “jerk” is counter-clockwise, the motor is running in the wrong direction. Interchange any two cable leads where they connect to the “lead” terminals in the magnetic starter. With connections properly made, and pump lowered into water, turn on the switch again and the pump should deliver water according to the performance charts.

Pump will pump in reverse, but performance will be poor. Continued Operation in reverse will damage the pump.

## INSTALLATION:

 **WARNING** Risk of electrical shock. Do not lift pump by the electrical cable. Lifting or carrying the pump by the cable can damage the cable and the pump, possibly causing injury or burns from electrical shock.

Install and adjust the float switches as needed for your installation. Set the float switches so that the pump will shut off before it runs dry or breaks suction.

## OPERATION:


Pump should operate automatically from float switches in system.

Do not allow pump to run dry; severe damage will result.

Do not run pump with discharge valve closed.

Be sure that air bypass hole in pump is clear and allows a small stream to run during pump operation.

**Table 1: Motor Insulation Resistance Rating**

Condition of Motor and Leads	OHM Value	Megohm Value
New motor, without power cable	20,000,000 (or more)	20.0
Used motor, which can be reinstalled in tank	10,000,000 (or More)	10.0
<b>Motor in Tank – Readings are Motor plus motor’s Power Cable</b>		
New motor	2,000,000 (or more)	2.0
Motor in reasonably good condition	500,000 to 2,000,000	0.5 - 2.0
Motor which may be damaged or have damaged power cable (Do not pull motor)	20,000 to 500,000	0.02 – 0.5
Motor definitely damaged or with damaged power cable (Pull motor and repair)	10,000 to 20,000	0.01 – 0.02
Failed motor or power cable (Pull motor and replace motor or cable)	Less than 10,000	0 – 0.01
Courtesy of Franklin Electric Company		

The table above is based on readings taken with a megohm meter with a 500 VDC output. Readings may vary using a lower voltage Ohmmeter, consult Franklin Electric if readings are in question.

**Single-Phase Motor Specifications (50 Hz) 2875 RPM, 1.0 Service Factor**

TYPE	MOTOR MODEL PREFIX	RATING				FULL LOAD WATTS	LINE TO LINE (1) RESISTANCE (OHMS)		EFFICIENCY %			POWER FACTOR %			LOCKED ROTOR AMPS	CIRCUIT BREAKERS OR FUSE AMPS	
		HP	KW	VOLTS	AMPS		MAIN	START	F.L.	3/4	1/2	F.L.	3/4	1/2		TYPICAL SUBMERSIBLES	
																NONTIME DELAY (STD.) FUSE OR CIRCUIT BREAKER	DUAL ELEMENT TIME DELAY FUSE
4-INCH 2-WIRE	244555	1/2	0.37	220	3.9	610	6.3 - 7.7	-	62	59	51	73	64	53	25.0	15	5
				230	4.1	630	6.3 - 7.7	-	59	55	47	68	60	50	26.1	15	5
	244557	3/4	0.55	220	6.0	880	3.7 - 4.6	-	63	59	52	70	62	53	30.0	20	7
				230	6.5	920	3.7 - 4.6	-	61	56	48	67	59	49	36.6	20	7
	244558	1	0.75	220	7.3	1180	3.2 - 3.9	-	65	62	55	75	66	54	42.0	20	9
				230	7.6	1200	3.2 - 3.9	-	63	59	52	71	63	52	43.9	20	9
	244559	1 1/2	1.1	220	10.6	1800	2.2 - 2.7	-	64	56	56	78	70	58	50.6	30	12
				230	10.8	1820	2.2 - 2.7	-	63	60	53	73	65	54	52.9	30	12

**Single-Phase Motor Specifications (60 Hz) 3450 RPM**

TYPE	MOTOR MODEL PREFIX	RATING					FULL LOAD		MAXIMUM (S.F. LOAD)		WINDING (1) RES. IN OHMS	EFFICIENCY %		POWER FACTOR %		LOCKED ROTOR AMPS	KVA CODE
		HP	KW	VOLTS	HZ	S.F.	(2) AMPS	WATTS	(2) AMPS	WATTS	M=MAIN RES. S=START RES.	S.F.	F.L.	S.F.	F.L.		
4-INCH 2-WIRE	244504	1/2	0.37	115	60	1.6	10.0	670	12.0	960	1.0-1.3	62	56	73	58	64.4	R
	244505	1/2	0.37	230	60	1.6	5.0	670	6.0	960	4.2-5.2	62	56	73	58	32.2	R
	244507	3/4	0.55	230	60	1.5	6.8	940	8.0	1310	3.0-3.6	64	59	74	62	40.7	N
	244508	1	0.75	230	60	1.4	8.2	1210	9.8	1600	2.2-2.7	65	62	74	63	48.7	N
	244309	1.5	1.1	230	60	1.3	10.6	1700	13.1	2180	1.5-1.9	67	66	80	73	66.6	M

**Single-Phase Motor Specifications (60 Hz) 3450 RPM**

TYPE	MOTOR MODEL PREFIX	RATING					FULL LOAD		MAXIMUM (S.F. LOAD)		WINDING (1) RES. IN OHMS	EFFICIENCY %		POWER FACTOR %		LOCKED ROTOR AMPS	KVA CODE
		HP	KW	VOLTS	HZ	S.F.	(2) AMPS	WATTS	(2) AMPS	WATTS	M=MAIN RES. S=START RES.	S.F.	F.L.	S.F.	F.L.		
4" 3-WIRE	224301	2	1.5	230	60	1.25	W10.0 B9.3 R2.6	2060	W13.2 B11.9 R2.6	2610	M1.8-2.3 S5.8-7.2	71	73	95	93	51	G
	224302 (3)	3	2.2	230	60	1.15	W14.0 B11.2 R6.1	2940	W17.0 B12.6 R6.0	3350	M1.0-1.5 S3.5-4.4	77	76	97	97	83.5	H
	224303 (4)	5	3.7	230	60	1.15	W23.0 B15.9 R11.0	4920	W27.5 B19.1 R10.8	5620	M.68-1.0 S1.8-2.2	76	76	100	100	121	F

### Three-Phase Motor Specifications (60 Hz) 3450 RPM

TYPE	MOTOR MODEL PREFIX	RATING					FULL LOAD		MAXIMUM (S.F. LOAD)		LINE TO LINE RESISTANCE OHMS	EFFICIENCY %		LOCKED ROTOR AMPS	KVA CODE
		HP	KW	VOLTS	HZ	S.F.	AMPS	WATTS	AMPS	WATTS		S.F.	F.L.		
4-INCH	234501	1/2	0.37	200	60	1.6	2.8	585	3.4	860	6.6-8.4	70	64	17.5	N
	234511			230	60	1.6	2.4	585	2.9	860	9.5-10.9	70	64	15.2	N
	234541			380	60	1.6	1.4	585	2.1	860	23.2-28.6	70	64	9.2	N
	234521			460	60	1.6	1.2	585	1.5	860	38.4-44.1	70	64	7.6	N
	234502	3/4	0.55	200	60	1.5	3.6	810	4.4	1150	4.6-5.9	73	69	23.1	M
	234512			230	60	1.5	3.1	810	3.8	1150	6.8-7.8	73	69	20.1	M
	234542			380	60	1.5	1.9	810	2.5	1150	16.6-20.3	73	69	12.2	M
	234522			460	60	1.5	1.6	810	1.9	1150	27.2-30.9	73	69	10.7	M
	234503	1	0.75	200	60	1.4	4.5	1070	5.4	1440	3.8-4.5	72	70	30.9	M
	234513			230	60	1.4	3.9	1070	4.7	1440	4.9-5.6	72	70	26.9	M
	234543			380	60	1.4	2.3	1070	2.8	1440	12.2-14.9	72	70	16.3	M
	234523			460	60	1.4	2	1070	2.4	1440	19.9-23.0	72	70	13.5	M
	234504	1.5	1.1	200	60	1.3	5.8	1460	6.8	1890	2.5-3.0	76	76	38.2	K
	234514			230	60	1.3	5	1460	5.9	1890	3.2-4.0	76	76	33.2	K
	234544			380	60	1.3	3	1460	3.6	1890	8.5-10.4	76	76	20.1	K
	234524			460	60	1.3	2.5	1460	3.1	1890	13.0-16.0	76	76	16.6	K
	234534	2	1.5	575	60	1.3	2	1460	2.4	1890	20.3-25.0	76	76	13.3	K
	234305			200	60	1.25	7.7	2150	9.3	2700	1.8-2.4	69	69	53.6	L
	234315			230	60	1.25	6.7	2150	8.1	2700	2.3-3.0	69	69	46.6	L
	234345			380	60	1.25	4.1	2150	4.9	2700	6.6-8.2	69	69	28.2	L
	234325	3	2.2	460	60	1.25	3.4	2150	4.1	2700	9.2-12.0	69	69	23.3	L
	234335			575	60	1.25	2.7	2150	3.2	2700	14.6-18.7	69	69	18.6	L
	234306			200	60	1.15	10.9	2980	12.5	3420	1.3-1.7	75	75	71.2	K
	234316			230	60	1.15	9.5	2980	10.9	3420	1.8-2.2	75	75	61.9	K
	234346	5	3.7	380	60	1.15	5.8	2980	6.6	3420	4.7-6.0	75	75	37.5	K
	234326			460	60	1.15	4.8	2980	5.5	3420	7.2-8.8	75	75	31	K
	234336			575	60	1.15	3.8	2980	4.4	3420	11.4-13.9	75	75	24.8	K
	234307			200	60	1.15	18.3	5050	20.5	5810	.74-.91	74	74	122	K
	234317	7.5	5.5	230	60	1.15	15.9	5050	17.8	5810	1.0-1.2	74	74	106	K
	234347			380	60	1.15	9.6	5050	10.8	5810	2.9-3.6	74	74	64.4	K
234327	460			60	1.15	8	5050	8.9	5810	4.0-4.9	74	74	53.2	K	
234337	575			60	1.15	6.4	5050	7.1	5810	6.4-7.8	74	74	42.6	K	
234308	10	7.5	200	60	1.15	26.5	7360	30.5	8450	.46-.57	76	76	188	K	
234318			230	60	1.15	23	7360	26.4	8450	.61-.75	76	76	164	K	
234348			380	60	1.15	13.9	7360	16	8450	1.6-2.0	76	76	99.1	K	
234328			460	60	1.15	11.5	7360	13.2	8450	2.5-3.1	76	76	81.9	K	
234338	10	7.5	575	60	1.15	9.2	7360	10.6	8450	4.0-5.0	76	76	65.5	K	
234549			380	60	1.15	19.3	10000	21	11400	1.2-1.6	75	75	140	L	
234595			460	60	1.15	15.9	10000	17.3	11400	1.8-2.3	75	75	116	L	
234598				575	60	1.15	12.5	10000	13.6	11400	2.8-3.5	75	75	92.8	L

- (1) Main winding - white to black  
Start winding - white to red
- (2) W = White lead - line amps  
B = Black lead - main winding amps  
R = Red lead - start or auxiliary winding amps
- (3) Control Boxes date coded 02C and older have **35 MFD** run capacitors. Current values should be W14.0 @ FL and W17.0 @ SF Load.  
B12.2                      B14.5  
R4.7                        R4.5
- (4) Control Boxes date coded 01M and older have **60 MFD** run capacitors and the current values on a 4" motor will be W23.0 @ FL - W27.5 @ SF Load.  
B19.1                      B23.2  
R8.0                        R7.8

TROUBLESHOOTING GUIDE	
<p><b>1. PUMP FAILS TO START</b></p> <ul style="list-style-type: none"> <li>a) Electrical trouble</li> <li>b) Drawdown protection device has pump turned off.</li> <li>c) Overload tripped.</li> </ul>	<p><b>3. PUMP GIVES REDUCED OUTPUT</b></p> <ul style="list-style-type: none"> <li>a) Insufficient supply of water.</li> <li>b) Worn pump.</li> <li>c) Clogged intake screen.</li> <li>d) Low voltage.</li> <li>e) Incorrect rotation (3-phase only)</li> </ul>
<p><b>2. PUMP FAILS TO DELIVER WATER</b></p> <ul style="list-style-type: none"> <li>a) Air lock in pump.</li> <li>b) Clogged intake screen.</li> </ul>	<p><b>4. OVERLOADS TRIP</b></p> <ul style="list-style-type: none"> <li>a) Electrical trouble</li> </ul>

**CALL INSTALLER OR SERVICE PROVIDER**

**16. Appendix 8 – UV System Owner’s Manual**

DRAFT

# SANITRON®

GERMICIDAL ULTRAVIOLET WATER PURIFIERS

Models S2400C, S5,000C–S25,000C  
High Capacity Systems



## Installation, Operation & Maintenance

Read and Follow All Safety Instructions. Save These Instructions.



**ATLANTIC ULTRAVIOLET**  
CORPORATION® SINCE 1963

*Manufacturers / Engineers / Sales / Service*  
Germicidal Ultraviolet – Equipment & Lamps

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Certified to  
NSF/ANSI 61 & 372

Our S2400C water purifier, used to build Model S5,000C and up, is certified to NSF®/ANSI Standard 61 & 372.

# Owner's Manual

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These instructions generally describe the installation, operation and maintenance of the **SANITRON®** Model S2400C line of water purifiers. Models S5,000C and S10,000C through S25,000C High-Capacity Systems utilize the Model S2400C single lamp water purifier in various configurations. Questions that are not specifically answered by these instructions should be directed to the Factory. Atlantic Ultraviolet Corporation® takes all possible precautions when packaging equipment to prevent damage. Carefully inspect and report all damages. Do not install damaged equipment. Follow all instructions on any labels or tags. Carefully inspect all packing materials before discarding to prevent the loss of accessories, mounting hardware, spare parts or instructions.


NSF®/ANSI 61 is a set of national standards that relates to water treatment and establishes stringent requirements for the control of equipment that comes in contact with either potable water or products that support the production of potable water. NSF®/ANSI 372 was set in 2011 to establish procedures to meet the 0.25% lead content requirement of the RLDWA (Reduction of Lead in Drinking Water Act) using a wetted surface area average calculation or just simply using all no-lead materials for areas in contact with drinking water. NSF®/ANSI 372 includes a broader scope of drinking water products covered by the law which may not be covered under NSF®/ANSI 61 and enables large or complex products and assemblies to achieve certification.


The information and recommendations contained in this publication are based upon data collected by the Atlantic Ultraviolet Corporation® and are believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. Specifications and information are subject to change without notice.





# SAFETY WARNINGS


- All personnel should be alerted to the potential hazards indicated by the product safety labeling on this unit.
- The following conventions are used to indicate and classify precautions in this manual and on product safety labeling. Failure to observe precautions could result in injury to people or damage to property.

 This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

 **DANGER** Danger indicates an **IMMINENTLY** hazardous situation, which, if not avoided, **WILL** result in death or serious injury.


 **WARNING** Warning indicates a **POTENTIALLY** hazardous situation, which, if not avoided, **COULD** result in death or serious injury.


 **CAUTION** Caution indicates a **POTENTIALLY** hazardous situation, which, if not avoided, **MAY** result in minor or moderate injury.


 **CAUTION** Caution used without the safety alert symbol indicates a potentially hazardous situation, which, if not avoided, may result in property damage.


 This symbol is used to identify an **ELECTRICAL SHOCK** or **ELECTROCUTION** hazard.

 This symbol is used to identify a **GERMICIDAL ULTRAVIOLET LIGHT** hazard.

 This symbol is used to identify the need to wear approved germicidal ultraviolet blocking eyewear.









 This symbol is used to identify the need to wear approved germicidal ultraviolet blocking face shield.

 This symbol is used to identify the need to wear protective gloves.

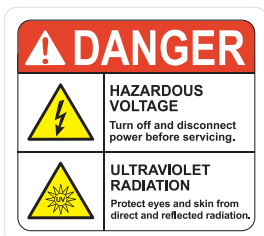
 This symbol is used to identify components which must not be disposed of in trash

# SAFETY INSTRUCTIONS

 **WARNING** To guard against injury, basic safety precautions should be observed, including the following:

1. Read and follow **ALL** safety instructions.
2. Do not use this water purifier for other than its intended purpose as described in this manual.
3. Do not alter design or construction.
4. Do not remove any labels or devices.
5.   **DANGER** To prevent the risk of severe or fatal electrical shock, special precautions must be taken since water is present near electrical equipment. **Always disconnect power before performing any service or maintenance.**
6.   **WARNING** Avoid exposure to direct or reflected germicidal ultraviolet rays. Germicidal ultraviolet rays are harmful to the eyes and skin.
7. Intended for indoor use only. The water purifier should be protected from the elements and from temperatures below freezing.
8. Do not operate water purifier if lamp cable, lamp connection, power cord and/or plug are damaged, or if any other damage to the water purifier is visible or suspected
9. Electrical power supplied, to the water purifier, **MUST** match power requirements listed on the water purifier.
10.   **WARNING** Plug the water purifier only into an approved ground fault circuit interrupt (GFCI) receptacle.
11.   **WARNING** Do not operate without proper electrical ground.
12. Do not exceed water purifier's maximum rated flow capacity.
13. Do not exceed maximum operating pressure of 100 PSI.
14. Read and follow all notices and warnings on the water purifier.
15. **SAVE THESE INSTRUCTIONS.**

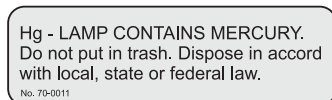
# SAFETY LABELS



Danger Label: Hazardous Voltage and Ultraviolet Radiation (70-0036)



Location of Danger Label (70-0036)



Hg - Lamp Contains Mercury (70-0011)

# CAUTION

It is the user's responsibility to determine and validate the suitability of this equipment for use in the user's system or process. No warranty or representation is made by the manufacturer with respect to suitability or performance of this equipment or to the results that may be expected from its use. The user should periodically inspect, clean as necessary and confirm the presence and good legibility of the product safety labels. Contact the factory for replacement labels in the event that any of the labels are missing or illegible.

# PRODUCT APPLICATION

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## CONSTRUCTION

---

- The water purifier is designed to mount horizontally.
- The water purifier's dual heads are removable and may be rotated independently. (See **Figure 3 – Recommended Positions of Inlet/Outlet Fittings** in the “**Installation**” section.) facilitates ease of installation, maintenance or the retrofitting of an existing system. A drain port on the chamber aids in draining of the purifier.
- The water purifier's chamber and chamber heads are passivated and electropolished type 316 Stainless Steel.
- The ballast housing is a combination of Stainless Steel Type 304 and Aluminum Alloy.
- The dual-action wiper mechanism allows for quick and easy quartz sleeve cleaning, without interrupting service.
- **EASY-OFF™** End Caps enable quick and easy lamp change, without disconnecting from the water supply or draining the purifier. No tools are required. **Always disconnect electrical power when changing lamp.**

## PRINCIPLE OF OPERATION

---

The **SANITRON®** design has been carefully conceived to provide adequate germicidal dosage throughout the disinfection chamber. The dosage, as it applies to germicidal ultraviolet disinfection, is a function of time and the intensity of germicidal ultraviolet radiation to which the water is exposed. The exposure time, in seconds, is the total time it takes the water to flow through the disinfection chamber exposing it to the germicidal lamp. Exposure time is related to the flow rate; the higher the flow rate, the lower the exposure time or the lower the flow rate, the higher the exposure time. The ultraviolet intensity is the amount of energy, per unit time, emitted by the germicidal lamp. The dosage is the product of ultraviolet intensity and the exposure time. The operation of the **SANITRON®** is as follows:

- Water enters the purifier and flows into the annular space between the quartz sleeve and the chamber wall.
- Suspended microorganisms are exposed to the germicidal ultraviolet rays emitted by the germicidal lamp.
- The translucent sight port, or optional germicidal ultraviolet monitor, provides visual indication of germicidal lamp operation.
- The dual action wiper mechanism facilitates periodic cleaning of the quartz sleeve without disassembly or interruption of purifier operation.
- Water leaving the purifier is instantly ready for use, no further contact time is required.

## LIMITATION OF USE

---

The water purifier is intended for the use with visually clear water, not colored, cloudy or turbid. See “**Water Quality**” section below. The water purifier is **NOT** intended for the treatment of water that has an obvious contamination or intentional source, such as raw sewage; nor is the purifier intended to convert wastewater to microbiologically safe drinking water.

## WATER QUALITY

---

Water quality plays a major role in the transmission of germicidal ultraviolet rays. It is recommended that the water does not exceed the following maximum concentration levels:

**Table 1 – Maximum Concentration Levels**

Turbidity	< 1 NTU
Manganese	0.05 mg/l
Total Suspended Solids	10 mg /l
pH:	6.5 - 9.5
Color:	None
Hardness	6 GPG or 102.6 PPM
Iron	0.3 mg/l
Tannins:	< 0.1 ppm (0.1 mg/l)
UV Transmission	>85% per cm*

Effectively treating water with higher concentration levels than listed on **Table 1** can be accomplished, but may require added measures to improve water quality to treatable levels. If, for any reason, it is believed the germicidal ultraviolet transmission is not satisfactory, contact the factory.

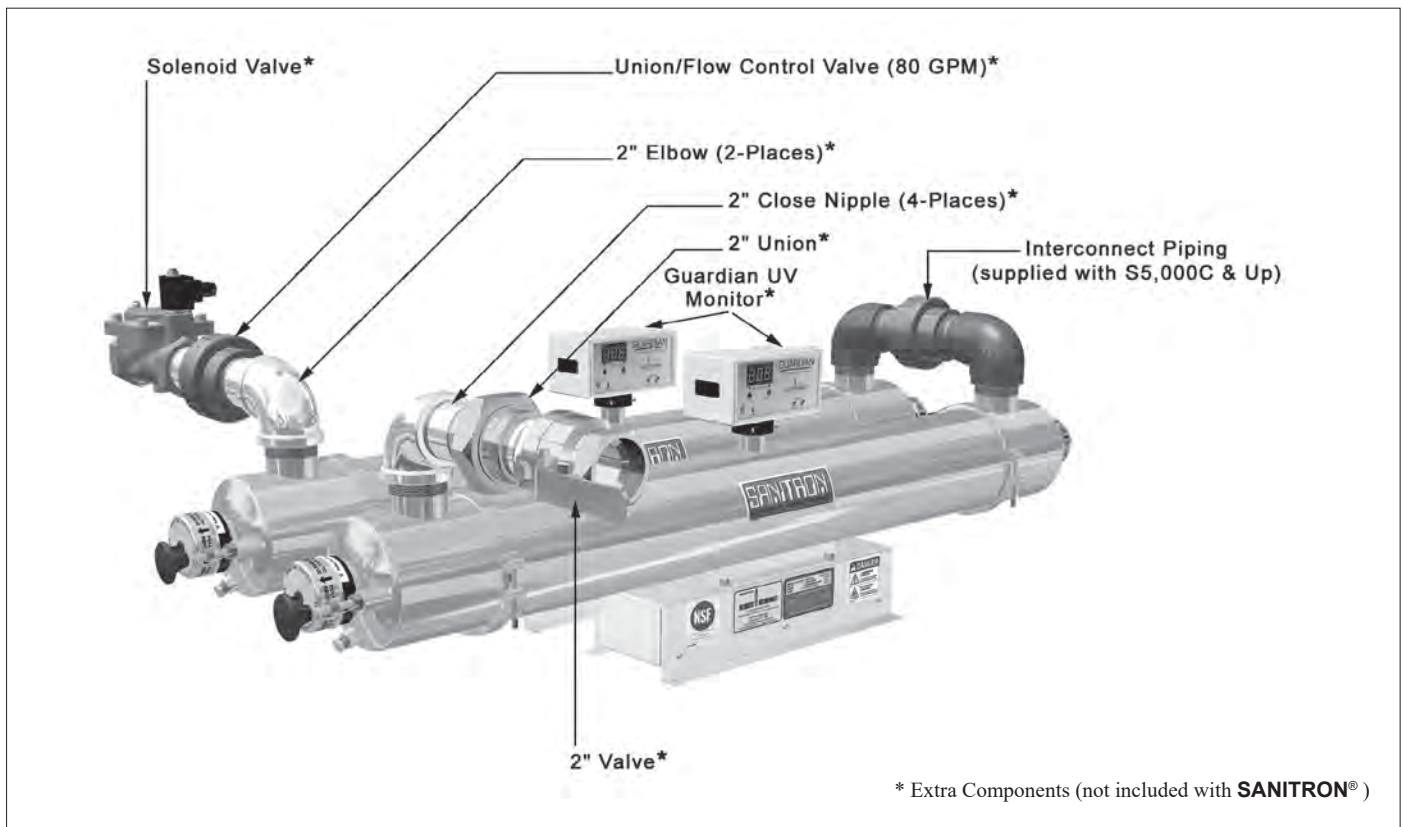
\* Contact Factory for recommendations on applications where UV transmission is < 85%

# INSTALLATION

## LOCATION

1. The water purifier is intended for indoor use only. The water purifier is designed to mount horizontally. The water purifier should be protected from the elements and from temperatures below freezing. The ambient temperature, in the area surrounding the water purifier, should be between 35°F and 100°F.
2. Electrical power supplied to the water purifier **MUST** match power requirements listed on the water purifier. Use of a voltage surge protector is recommended.
3. **CAUTION** Plug water purifier only into an approved ground fault circuit interrupt (GFCI) receptacle.
4. The water purifier should be located in a dry, well-lit area, which provides enough room to perform routine maintenance. This includes a minimum distance of one chamber length from the wiper end, to allow for cleaning and/or the changing of the lamp and quartz sleeve as well as a minimum of 6" on the opposite end of the water purifier. Minimum clearance to floor 18".
5. The water purifier should always be located closest to the point of use. This reduces the chance of the purified water being re-contaminated by bacteria in the water distribution system after the water purifier.
6. **CAUTION** As with any water handling device, the water purifier should be located in an area where any possible condensation or leakage from the water purifier, any purifier accessory and/or plumbing will not result in damage to the area surrounding the water purifier. **For added protection, it is recommended that a suitable drain pan be installed under the purifier. The drain pan must be plumbed to an adequate, free flowing drain to prevent water damage in event of a leak. There are numerous leak detection/flood stop devices, available on the market today, designed to stop flow of water, reducing the chance of water damage due to leakage. For more details regarding leak prevention and/or limiting damages due to leaks please contact factory.**
7. The water purifier should be located after all other water devices, such as De-ionizers, Water Softeners, Carbon Filters, Pre-Filters, Reverse Osmosis, Pressure Tanks, and Pumps. This eliminates the possibility of the purified water being re-contaminated by bacteria in any of these purifiers.

Figure 1 – SANITRON® Drawing (S5,000C shown) with options and extra components



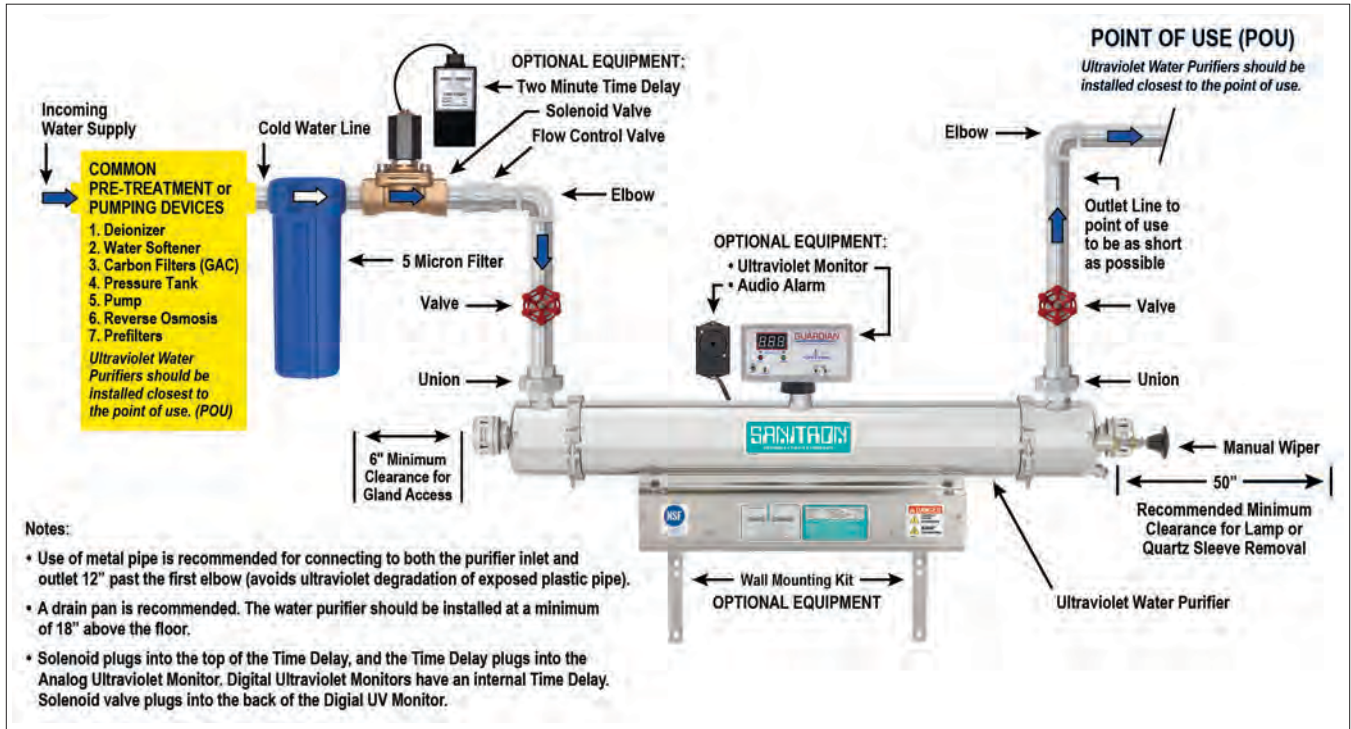
## RECOMMENDED INSTALLATION



IN ORDER TO PERFORM THIS TASK, BE SURE TO WEAR THE FOLLOWING SAFETY EQUIPMENT: SAFETY GLASSES OR A FACE SHIELD, AS WELL AS GLOVES.

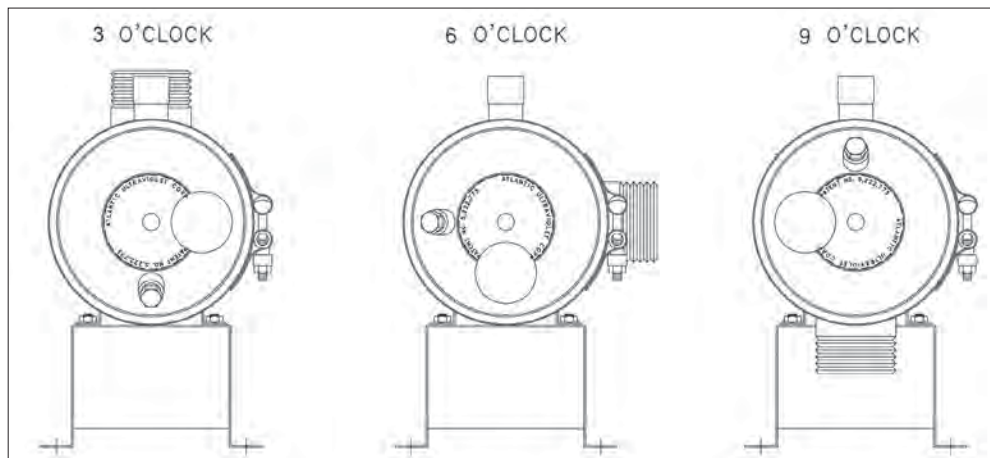
1. Remove water purifier from shipping carton. Inspect water purifier, power cord and plug for damage. Do not operate if there is any damage to the purifier, power cord or plug. **SANITRON®** Model S2400C is shipped with the lamp packed separately. Keep the lamp aside for installation once the purifier has been properly installed.
2. Purifiers occasionally experience damage in shipment due to the fragility of the quartz sleeve. It is, therefore, recommended to inspect the water purifier for damage to the quartz sleeve after it has been removed from the shipping carton. Each end of the purifier as well as the inlet and outlet should be viewed to see if the quartz sleeve has experienced damage. If the quartz sleeve shows signs of damage it should be replaced before the purifier is pressurized. See **“Quartz Sleeve Installation or Replacement”** in the **“Maintenance”** section for the proper method of replacing the quartz sleeve in your water purifier.

Figure 2 – Recommended Installation



3. The water purifier’s dual chamber heads are removable and may be rotated independently, which aids in the installation, maintenance or the retrofitting of an existing system.

Figure 3 – Recommended Installation



**Note: DO NOT rotate head so wiper knob is at 12 o'clock position**

4. The water purifier should be mounted horizontally on a flat dry surface. Secure the water purifier using the mounting holes in the ballast housing or with the optional wall mounting kit. The purifier should not be solely supported by its plumbing connections.

5. The water purifier must be connected to the cold water line only. Inlet water temperature should not exceed 100°F.
6. Installation requires that a 5-micron sediment filter or finer be installed, in line, prior to the water purifier. The sediment filter will stop or trap large particulates from entering the water purifier. Particulates may cause deposits on the quartz sleeve, as well as interfere with the purifier's ability to disinfect the water. The sediment filter may also help to reduce the amount of routine cleanings of the quartz sleeve.
7. Shut off valves should be installed on both the inlet and outlet sides of the water purifier. **The use of bypass valves is not recommended.** The shut off valves allow the purifier to be isolated from the water supply, which is required when removing the quartz sleeve.
8. Unions should be installed on both the inlet and outlet of the water purifier; this will allow easy removal of the water purifier from the plumbing, if required. Apply Teflon® tape to threads of inlet and outlet ports to ensure a tight seal.
9. When all plumbing connections are complete, allow water to enter the water purifier at a low flow rate, until the purifier is full. **NOTE: Close the purifier outlet valve to pressurize the chamber.** With the purifier pressurized, it should be checked for leaks. Once it is determined that there are no leaks, the inlet valve can be fully opened.
10. For Models with lamps packed separately, install lamp following the steps in **“Lamp Installation or Replacement”** section.

**⚠ CAUTION** Lamp and quartz sleeve are easily damaged. Exercise care when handling.

11. **⚠ WARNING** Plug water purifier into approved ground fault circuit interrupt (GFCI) receptacle. Confirm lamp operation indication at sight port.
12. Once the plumbing hook ups are made, it is a good practice to disinfect the “downstream” plumbing between the purifier and point of use. This is done by introducing chlorine or other disinfectant solution into the purifier chamber, a 100-ppm of chlorine is suggested. With the disinfectant in the purifier chamber, turn the germicidal ultraviolet purifier on. Open the “downstream” outlet until a chlorine or disinfectant solution odor is noticed. Close the outlet and allow the disinfectant to remain in the plumbing for three (3) hours. Flush the plumbing with germicidal ultraviolet purified water; allow the water to run for a minimum of 5 minutes prior to use (to ensure no chlorine or disinfectant smell can be detected). This will allow the chlorine or disinfectant solution to be flushed from the pipes.

## **RECOMMENDED OPTIONS**

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1. **GUARDIAN™ Germicidal Ultraviolet Monitor\***: Visually indicates the level of germicidal ultraviolet energy that penetrates the quartz sleeve and the water within the water purifier. The ultraviolet monitor is capable of operating an optional **Promate™** Audio Alarm and/or **Promate™** Solenoid Valve. The ultraviolet monitor will detect reduction of ultraviolet levels due to:
  - Fouling or deposits on the quartz sleeve.
  - Poor germicidal ultraviolet transmission through the water; color, turbidity, and organic or other impurities in the water can reduce or interfere with the transmission of ultraviolet rays.
  - Lamp outage or component failure. (Monitor will not function in power outage.)
  - Depreciation of the lamp output due to usage or other cause. Lamp output gradually depreciates with use. Lamp replacement is recommended once each year.
2. **GUARDIAN™ ASSIST Germicidal Ultraviolet Monitor Extension (30-1014)**: Designed to remotely indicate the intensity level displayed on the **GUARDIAN™** Germicidal Ultraviolet Monitor.
  - The **GUARDIAN™ ASSIST** converts a 4–20mA signal from the **GUARDIAN™** Germicidal Ultraviolet Monitor to an intensity level displayed on the top panel. A 4 mA signal would read 0 and a 20mA signal would read 102.
  - The **GUARDIAN™ ASSIST** intensity reading will be the same as the **GUARDIAN™** Ultraviolet Monitor +/- 2%.
3. **SENTRY™ Safety Sensor (30-0170 or 30-0171)**: Indicators provide constant visual monitoring of normal operation. In the event of ballast or lamp failure the safety sensor indicates an alarm condition. The safety sensor is capable of operating an optional **Promate™** Audio Alarm and/or **Promate™** Solenoid Valve.
4. **STERALERT™ Germicidal Ultraviolet Lamp Status Alarm (30-0090C or 30-0085B)**: Produces a high pitched, pulsed tone when the water purifier is no longer functioning when visible light fails.
5. **SureFLO™ Flow Control Valve\***: Limits water flow to the rated capacity of the purifier. The flow control valve is located in line prior to the water purifier, and should be protected from germicidal ultraviolet exposure by the use of a 90-degree elbow fitting between the flow control valve and the water purifier.
6. **Promate™ Audio Alarm (30-0173A or 35-2099)\***: Activated by the Ultraviolet Monitor or Safety Sensor, alerts the user to any malfunction detected.
7. **Promate™ Solenoid Valve\***: Operated in conjunction with the Germicidal Ultraviolet Monitor, Safety Sensor or Time Delay Mechanism, this valve prevents water flow through the water purifier when an abnormal condition is detected or in the event of power failure. (**“Recommended Options” Continued on Page 8**)

8. **Promate™ Elapsed Time Indicator (30-1008A):** A non-resettable display of the water purifier operating hours. Useful for scheduling and recording maintenance and lamp replacement.
9. **Promate™ Time Delay Mechanism (30-1369B or 30-0012B)\*:** Provides a 2-minute warm up period during which the germicidal ultraviolet lamp achieves its full germicidal output before the water is allowed to flow through the water purifier. The time delay mechanism is used in conjunction with, and is electrically connected to the Solenoid Valve.
10. **Promate™ Wall Mount Kit (25-1467A):** Model S2400C Stainless steel wall brackets provide quick and easy installation and professional finish. Pre-drilled and ready to install. Optimizes free air circulation to cool ballast housing.
11. **QUANTUM™ Thermal Optimizer (27-1101, 27-1105, or 27-1106):** Thermal relief valve used to help regulate the water temperature inside the water purifier’s disinfection chamber. Since the relative germicidal ultraviolet output of a germicidal lamp is affected by temperature, it is important to keep the lamp’s temperature within the peak output temperature range.
12. **Promate™ Safety Glasses (00-1299):** Safety eyewear **MUST** be used as general-purpose safety protection and for additional shielding from germicidal ultraviolet rays.
13. **Promate™ Face Shield (00-0126):** Adjustable headgear and lightweight visor provides eye and face protection from germicidal ultraviolet rays.

\* Use of this option is recommended by U.S. Public Health Service “Criteria for Acceptability of an Ultraviolet Disinfection Unit.” Originally issued April, 1966.

**NOTE:** The recommended options above are available from Atlantic Ultraviolet Corporation® or a distributor of their products. For the other devices that may be required for your application, please contact your local water treatment dealer, plumber or plumbing supplier. If you have any questions, please contact Atlantic Ultraviolet Corporation® by phone or email: (631) 273-0500 – Sales@AtlanticUV.com

## MAINTENANCE

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The water purifier is designed to operate with a minimal amount of maintenance, providing the water quality does not exceed maximum concentration levels, see “Water Quality” in the “Product Application” section. Ordinary maintenance consists of:

- Lamp replacement is recommended every 10,000 hours of operation, approximately 12 months of continuous service.
- Cleaning of the quartz sleeve, when conditions warrant. It is recommended that the inspection of quartz sleeve be performed after one month of use. If quartz sleeve is found to be coated (not clear), then frequency of cleaning must be done more often. Deposits or discoloration on the surface of quartz sleeve are caused by excessive levels of the subject contaminant within the water that is in contact with the quartz sleeve. Most deposits on the quartz sleeve are caused by an excess of calcium (hardness), iron or manganese. **Table 1 on Page 4** lists the maximum recommended concentration of these minerals in the water that passes through the germicidal ultraviolet purifier. If you encounter difficulty due to deposits on the quartz sleeve, your dealer will be able to recommend suitable pretreatment to reduce or eliminate the offending contaminant. If quartz sleeve is clean (clear) then frequency of cleaning may be extended. **NOTE: SANITRON® Germicidal Ultraviolet water purifiers are equipped with a manual wiping mechanism making the process of routine cleaning easier and therefore, recommended weekly or at the very least monthly to insure your performance. NOTE: The use of optional GUARDIAN™ Germicidal Ultraviolet Monitor will detect loss of transmission due to coating on the quartz sleeve.**
- Always disconnect the water supply and completely drain the water purifier if it will be subjected to temperatures below freezing.
- Contact factory with questions.

## INSPECTION

---

1. Regularly inspect the water purifier to ensure that the germicidal lamp is still in operation.
  - On purifiers not equipped with the Germicidal Ultraviolet Monitor, lamp operation can be verified by a visible glow through the translucent sight port. This provides an indication of lamp operation and does not indicate the level of ultraviolet intensity or transmission through the water.
  - On purifiers so equipped, the **GUARDIAN™** Germicidal Ultraviolet Monitor provides visual indication of the ultraviolet intensity through the quartz sleeve and water in the purifier chamber.
2. To ensure proper operation of the water purifier, regular biological testing of the purifier output water should be performed on a schedule recommended by local public health authorities, or at minimum; at installation, quarterly for the first year of service and annually, at lamp replacement, for the life of the water purifier.
3. Additional testing should be performed whenever modifications, change, or additions are made to plumbing system, pumps, well source water etc. to ensure adequate disinfection under new condition.
4. As with any water purifier installation, routine maintenance is necessary to ensure you equipment is operating correctly. Regular inspection must also include confirmation that approved ground fault circuit interrupt (GFCI) receptacle is still operational and that water purifier is plugged into this GFCI. Any components which are damaged or broken should be replaced.

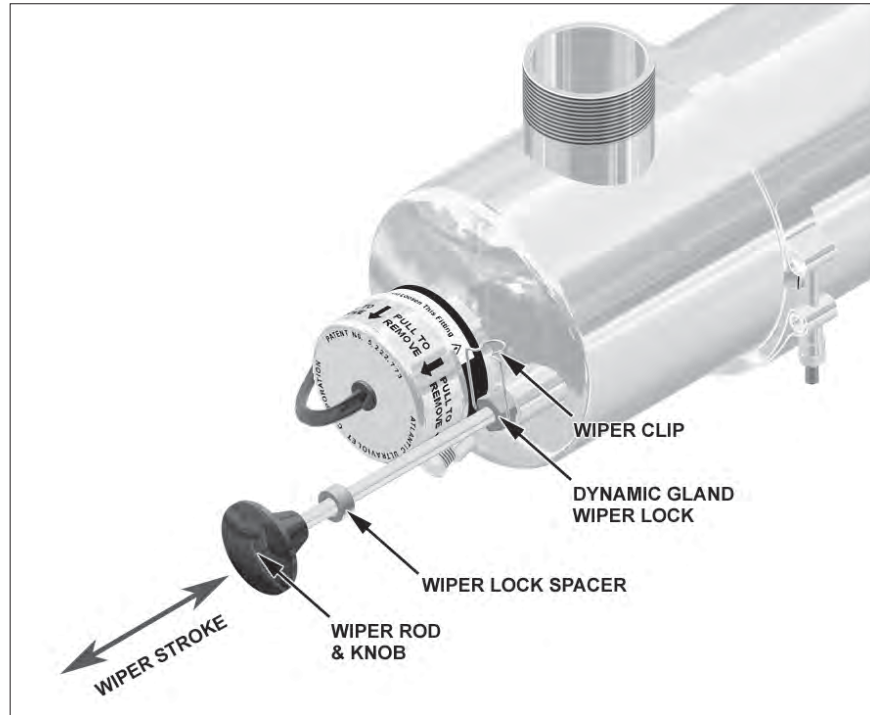
## ***DISPOSAL OF MERCURY ADDED LAMPS***



Germicidal ultraviolet lamps, like standard fluorescent lamps contain small amounts of mercury. Mercury added lamps should not be placed in the trash. Dispose of properly. For further information regarding the disposal and recycling of lamps containing mercury, along with Federal and State requirements visit [LampRecycle.org](http://LampRecycle.org). For more information on **STER-L-RAY®** Germicidal Ultraviolet Lamps, visit [AtlanticUltraviolet.com](http://AtlanticUltraviolet.com) or [Ultraviolet.com](http://Ultraviolet.com).

## ***QUARTZ SLEEVE CLEANING USING WIPER MECHANISM***

Figure 4 – Quartz Sleeve Cleaning



Step 1 – Lift wiper clip up



Step 2 – Gently pull wiper knob out



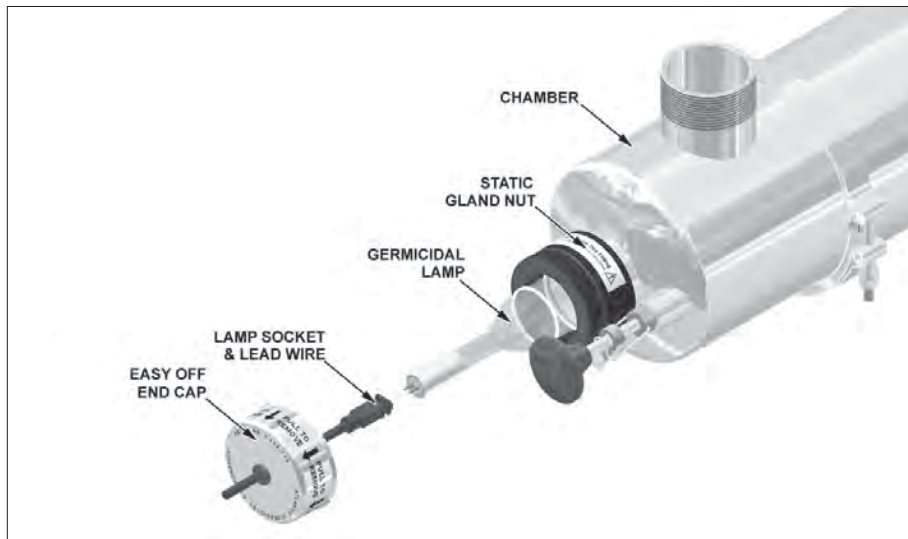
Step 3 – Push wiper back in

Routine cleaning of the quartz sleeve is easily accomplished, using the dual action wiper mechanism.

1. Lift wiper clip up and away from wiper rod.
2. Grasp wiper knob and gently pull out, away, from the purifier until it reaches its stop.
3. Push wiper back in, toward the purifier until it reaches its second stop.
4. Repeat steps 2 and 3 as necessary.
5. Holding wiper in place, return wiper clip and snap over wiper rod, in front of the wiper lock spacer.

## LAMP INSTALLATION OR REPLACEMENT

Figure 5 – Lamp Replacement



Step 2 – Remove End Cap



Step 3 – Withdraw Lamp



Steps 4 & 5 – Remove Sockets



Step 6 – Remove Lamp



**IN ORDER TO PERFORM THIS TASK, BE SURE TO WEAR THE FOLLOWING SAFETY EQUIPMENT: SAFETY GLASSES OR A FACE SHIELD, AS WELL AS GLOVES.**

1. **⚠ WARNING** Disconnect power to water purifier.
2. Remove both **EASY-OFF™** End Caps by pulling each cap off static gland nut. Slide each end cap along the wire away from the socket.
3. Carefully withdraw lamp approximately 2 inches from chamber while feeding lamp socket and lead wire on opposite end of chamber.
4. While holding lamp end, carefully remove lamp socket on end now exposed.
5. Next, carefully slide lamp back into chamber, until approximately 2 inches of the lamp is exposed on the opposite end. Hold lamp and remove lamp socket.
6. Lamp should now be disconnected on both ends. Carefully remove lamp from chamber. Be sure to withdraw lamp straight out without angling until completely clear of quartz sleeve.

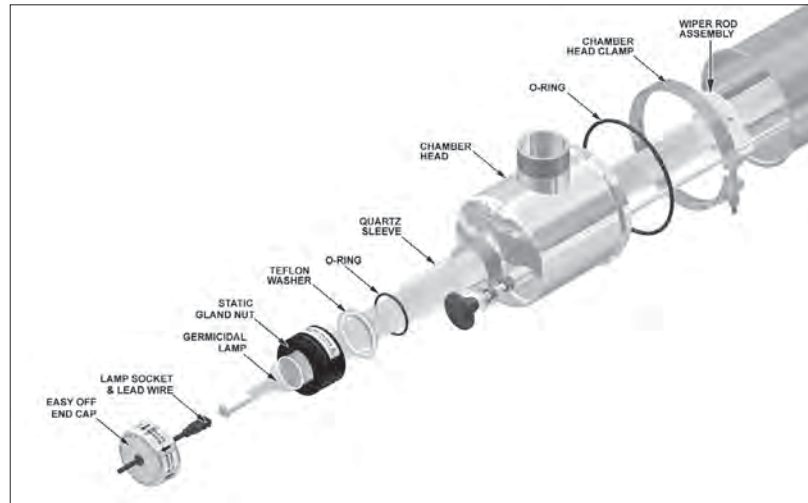
**⚠ CAUTION** Lamp and quartz sleeve are easily damaged. Exercise care when handling.

7. Reinstall lamp in reverse order.

**⚠ WARNING** Germicidal ultraviolet rays are harmful to eyes and skin. Do not restore power to water purifier until lamp and both **EASY-OFF™** End Caps have been properly reinstalled.

## QUARTZ SLEEVE INSTALLATION OR REPLACEMENT

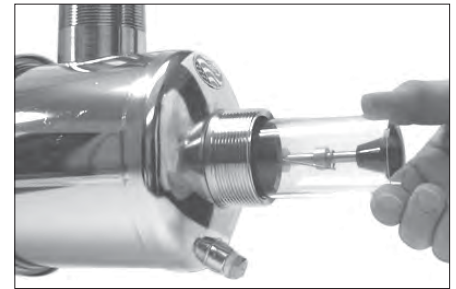
Figure 6 – Quartz Sleeve Installation or Replacement



Step 4 – Remove Gland Nuts



Step 5 – Remove Washer & O-Ring



Step 6 – Remove Quartz Sleeve

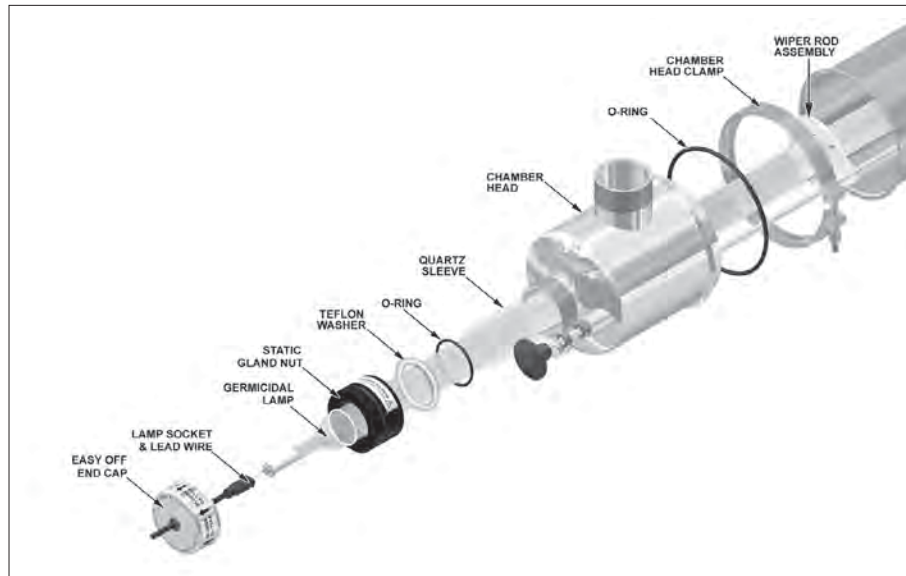


**IN ORDER TO PERFORM THIS TASK, BE SURE TO WEAR THE FOLLOWING SAFETY EQUIPMENT: SAFETY GLASSES OR A FACE SHIELD, AS WELL AS GLOVES.**

1. **⚠️ WARNING** Disconnect power to water purifier.
2. Shut off water supply to water purifier via inlet and outlet shut off valves. Drain chamber. Once the chamber is completely drained, remove any old sealing tape from the threads of the drain plug, rewrap with 1/2" wide Teflon® thread sealing tape, reinstall and tighten the drain plug.
3. Follow the steps in “**Lamp Installation or Replacement**” to remove lamp.  
**⚠️ CAUTION** Lamp and quartz sleeve are easily damaged. Exercise care when handling.
4. Unscrew static gland nuts from each end of the chamber. Avoid striking quartz sleeve with static gland nut.
5. Remove Teflon® washer and O-Ring from both ends of quartz sleeve. Teflon® washer will sometimes remain within the static gland nut. If so, remove Teflon® washer from static gland nut before proceeding.
6. Carefully remove quartz sleeve from chamber. **NOTE: It is advisable to support the quartz sleeve on the opposite end with your finger so that it does not drop to the bottom of the chamber as it slides into the chamber.**
7. Once the quartz sleeve is removed, clean with alcohol or a mild, non-abrasive detergent. Stubborn stains usually can be removed with a dilute hydrochloric acid. **NOTE: Follow all manufacturer’s instructions and precautions when handling chemicals.**
8. Reassemble in reverse order. Make sure the quartz sleeve protrudes an equal distance past each threaded nipple. Be sure O-Rings are placed on quartz sleeve before Teflon® washer.
9. Tighten static gland nuts firmly by hand only, **DO NOT USE HAND TOOLS**. Tightening with hand tools is likely to cause quartz sleeve to break.
10. **Slowly** restore water supply to water purifier and check for leaks.
11. If no leaks occur, reinstall lamp, following the steps in “**Lamp Installation or Replacement**” section.  
**⚠️ WARNING** Germicidal ultraviolet rays are harmful to eyes and skin. Do not restore power to water purifier until lamp and both EASY-OFF™ End Caps have been properly reinstalled.

## REPLACEMENT OF BROKEN QUARTZ SLEEVE

Figure 7 – Quartz Sleeve



**IN ORDER TO PERFORM THIS TASK, BE SURE TO WEAR THE FOLLOWING SAFETY EQUIPMENT: SAFETY GLASSES OR A FACE SHIELD, AS WELL AS GLOVES.**

**CAUTION** Broken Quartz is SHARP. It is recommended that protective glasses and gloves are worn when handling.

**WARNING** Disconnect power to water purifier. Shut off water supply to water purifier via inlet and outlet shut-off valves. Completely drain chamber.

Follow the steps in “**Quartz Sleeve Installation or Replacement**” to remove lamp and quartz sleeve.

1. To prevent damage to the electrical components, it is necessary to separate the ballast housing from the purifier chamber.
  - On **SANITRON**® Model S2400C the ballast housing is mounted to the purifier chamber using four (4) 1/4"-20 x 3/8" long hex head bolts. Using a 7/16" wrench or an adjustable wrench, carefully remove the four (4) bolts with the lock and flat washers, from along the top of the ballast housing, and set aside. Separate the housing from the chamber.
  - Keep ballast housing and mounting hardware in a clean, dry area.
2. **CAUTION** Carefully remove as much of the broken quartz sleeve as possible, from each end of the chamber.
3. Remove chamber head clamp, by using a 7/16" wrench to loosen and remove the 1/4" nut from the head clamp.
4. Withdraw chamber head and wiper assembly, from the chamber.
5. Any broken pieces of the quartz sleeve can now be removed through the open end of the purifier chamber. Flush water through chamber being careful to remove all quartz fragments from the interior of the chamber.
6. **Carefully** discard all pieces of the broken quartz sleeve.
7. Inspect the large O-Ring used to seal the chamber and the chamber head. Make sure the O-Ring is seated properly between the chamber head ring and the flare of the chamber head.
8. Insert replacement quartz sleeve through each Teflon® wiper segment, starting from the furthest segment working towards the chamber head. Twisting the quartz sleeve will help work the quartz sleeve through the Teflon® segments. Align the end of the quartz sleeve with the threaded gland nipple of the chamber head, and pass the quartz sleeve through the chamber head.
9. To re-install, carefully slide the chamber head and wiper rod assembly, into the chamber, with drain port pointing down; using your finger, support the far end of the quartz sleeve when passing it through the gland fitting of the chamber. Push chamber head flange into the chamber until flared end, of the chamber and the head, mate against the O-Ring.
10. Replace the head clamp around the flared end of the head and chamber. Install the 1/4" nut and tighten, using a 7/16" wrench, until approximately 3/4" to 7/8" of the bolt protrudes past the nut.
11. Center the quartz sleeve in the chamber, making sure the quartz sleeve protrudes an equal distance past each threaded gland fitting, of the chamber. **(Continued on Page 13)**

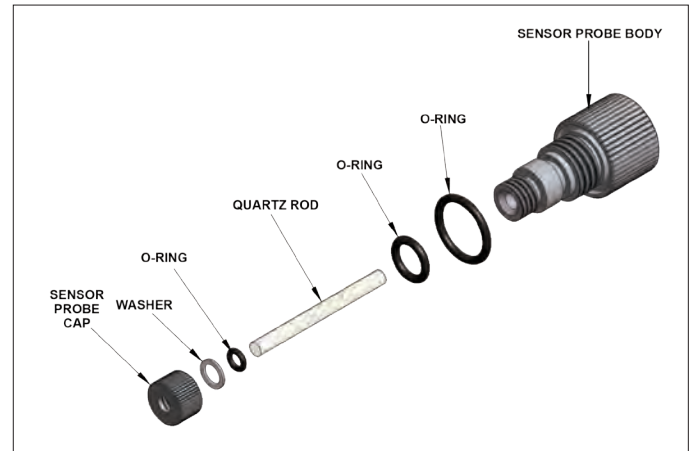
12. Re-install O-Rings, Teflon® washers, and static gland nuts. Be sure O-Rings are placed on quartz sleeve before Teflon® washer. Tighten static gland nuts firmly by hand only, **DO NOT USE HAND TOOLS**. Tightening with hand tools is likely to cause quartz sleeve to break.
13. Re-assemble ballast housing to purifier chamber, using hardware removed in Step 1. **NOTE:** When re-assembling ballast housing to purifier chamber, electrical power cord should exit ballast housing from the end mounted opposite the drain plug.
14. When all connections are complete, allow water to enter the water purifier at a low flow rate until the purifier is pressurized. With the purifier pressurized, it should be checked for leaks.
15. See “**Lamp Installation or Replacement**” section on **Page 10** to properly re-install the lamp into the water purifier.

## ***CLEANING OF OPTIONAL GUARDIAN™ GERMICIDAL UV MONITOR SENSOR PROBE***


**Figure 8 – Ultraviolet Monitor and Sensor Probe**



**Figure 9 – Sensor Probe**



If, after cleaning the quartz sleeve, there is no significant improvement in the germicidal ultraviolet intensity, as shown on the intensity meter, it may be necessary to clean the Germicidal Ultraviolet Monitor’s sensor probe. The sensor probe body mounts in a fitting, located in the center of the disinfection chamber, and protrudes into the chamber.

1.  **WARNING** Disconnect power to water purifier.
2. Shut off water supply to the water purifier via the inlet and outlet shut off valves. Remove drain plug and drain the chamber. Once the chamber is drained, remove any old sealing tape from the threads of the drain plug, rewrap with 1/2" wide Teflon® thread sealing tape, reinstall and tighten the drain plug.
3. Disconnect power to the Germicidal Ultraviolet Monitor; remove from chamber by loosening the two set screws on the aluminum collar and lifting it free from probe body.
4. Unscrew the sensor probe and remove from the chamber.
5. Remove the quartz rod sensor probe cap, from the probe body. Take care not to damage the quartz rod, O-Ring or the threads of the probe body. **NOTE:** It is recommended, when servicing the sensor probe, to work in a clean, dry area.
6. Once the quartz rod is removed, clean with alcohol or a mild detergent, and rinse with clean water. Stubborn stains usually can be removed with a dilute hydrochloric acid. **NOTE:** Follow all manufacturer’s instructions and precautions when handling chemicals. Once the quartz rod has been cleaned, handle the rod by the sides, to avoid getting fingerprints on the quartz rod faces.
7. Clean the probe body, by removing any dirt or deposits on all surfaces. O-Rings should be inspected and can be replaced if worn or damaged.
8. Reassemble, replacing the O-Rings, quartz rod and securing in place with the quartz rod sensor probe cap. Tighten the quartz rod sensor probe cap by hand only, **DO NOT USE HAND TOOLS**. Tightening with hand tools may damage the quartz rod or O-Ring seal.
9. Reinstall sensor probe into the center fitting of the chamber and hand tighten.
10. **Slowly** restore water supply to the water purifier, pressurize, and check for leaks. Once it is determined that there are no leaks, inlet valve can be fully opened.
11. Reposition Germicidal Ultraviolet Monitor on probe body and tighten set screws.
12. Restore power to the water purifier and ultraviolet monitor. If after the cleaning of the quartz rod, there is still no significant improvement in the ultraviolet intensity, as shown on the intensity meter, proceed to the “**Troubleshooting**” section.

# TROUBLESHOOTING

**⚠️ WARNING** Always disconnect power to the water purifier before performing any service or maintenance.  
**IMPORTANT:** This purifier is to be serviced **ONLY** by qualified, and appropriately licensed, personnel.

**Table 2 – Troubleshooting**

Problem	Possible Cause	Corrective Action
Purifier not operating	No electrical power	Verify that the purifier is connected to a live power source.
Water leaking from purifier	Cracked or broken quartz sleeve	Shut down purifier, drain, and replace quartz sleeve. See “ <b>Quartz Sleeve Installation or Replacement</b> ” in the “ <b>Maintenance</b> ” section.
	Quartz sleeve sealing O-Ring(s) worn, damaged	Shut down purifier, drain, and remove static gland nut, replace sealing O-Ring. See “ <b>Quartz Sleeve Installation or Replacement</b> ” in the “ <b>Maintenance</b> ” section.
	Poor, or loose, connections or fittings	Tighten suspect connection or fitting; or shut down purifier, drain, and remove fitting or connection. Clean threads; reapply thread sealing tape and reinstall.
Poor purifier disinfection performance AND/OR Low UV intensity (As indicated on optional <b>GUARDIAN™</b> Germicidal Ultraviolet Monitor)	Quartz sleeve fouled	Clean quartz sleeve, see “ <b>Quartz Sleeve Cleaning</b> ” in the “ <b>Maintenance</b> ” Section.
	Sensor Probe, if equipped, lens or quartz rod fouled	Clean lens or Quartz Rod, see “ <b>Optional Germicidal Ultraviolet Monitor Sensor Probe Cleaning</b> ” in the “ <b>Maintenance</b> ” section.
	Germicidal lamp output depreciating	Replace lamp, as it nears its end of life (EOL). See “ <b>Lamp Installation or Replacement</b> ” in the “ <b>Maintenance</b> ” section.
	Germicidal lamp not functioning	Replace lamp. See “ <b>Lamp Installation or Replacement</b> ” in the “ <b>Maintenance</b> ” section.
	Low input voltage	Verify input voltage to purifier.
	Change in water quality	Have water tested to confirm that it does not exceed maximum recommended concentration levels for use with this purifier.

# OPTIONAL ACCESSORIES

**Table 3 – Optional Accessories**

Optional Accessories	Available For:
<b>GUARDIAN™</b> Germicidal Ultraviolet Monitor - Analog/Digital	S2400C, S5,000C–S25,000C
<b>GUARDIAN™ ASSIST</b> Germicidal Ultraviolet Monitor Extension	S2400C, S5,000C–S25,000C
<b>SENTRY™</b> Safety Sensor	S2400C, S5,000C–S25,000C
<b>STERALERT™</b> Germicidal Ultraviolet Lamp Status Alarm	S2400C, S5,000C–S25,000C
<b>Promate™</b> Audio Alarm	S2400C, S5,000C–S25,000C
<b>Promate™</b> Elapsed Time Indicator Universal Input	S2400C, S5,000C–S25,000C
<b>Promate™</b> Time Delay Mechanism	S2400C, S5,000C–S25,000C
<b>Promate™</b> Wall Mounting Kit	S2400C
<b>Promate™</b> Solenoid Valve - (1-1/2") ①	S2400C
<b>Promate™</b> Solenoid Valve - (2") ①	S5,000C–S25,000C
<b>SureFLO™</b> Flow Control - PVC (2") ②	S2400C
<b>SureFLO™</b> Flow Control Valve - Stainless Steel (2") ②	S2400C
<b>SureFLO™</b> Flow Control Valve - PVC (2" Union) ②	S5,000C–S25,000C

Most options are available for operation at 120v 60Hz or 220v 50Hz. Please specify.

Not all options may be available for all models, consult factory for availability.

- ① Solenoid requires 2–150 PSI for satisfactory operation.
- ② Unless otherwise specified, PVC flow control valves are supplied. All PVC and Stainless Steel flow control valves are male NPT. Consult Factory for other flow control valves.

# TECHNICAL SPECIFICATIONS


Table 4 – Technical Specifications

Model:	S2400C 	*\$5,000C	*\$10,000C	*\$15,000C	*\$20,000C	*\$25,000C	
<b>Flow Rate (GPM):</b>	40	83	166	250	333	416	
<b>Flow Rate (GPH):</b>	2400	5000	10000	15000	20000	25000	
<b>Inlet/Outlet Size:</b>	2" MNPT	2" MNPT	2" MNPT	2" MNPT	2" MNPT	2" MNPT	
<b>Number of Lamps:</b>	1	2	4	6	8	10	
<b>Lamp Model No.:</b>	05-1311-R	05-1311-R	05-1311-R	05-1311-R	05-1311-R	05-1311-R	
<b>Length:</b>	52-1/8"	52-1/8"	52-1/8"	52-1/8"	52-1/8"	52-1/8"	
<b>Width:</b>	6-9/16"	17"	17"	21-1/8"	21-1/8"	21-1/8"	
<b>Height:</b>	11-1/8"	15"	34-3/4"	53-1/4"	71-3/4"	90-1/4"	
<b>Chamber Diameter:</b>	5-1/2"	5-1/2"	5-1/2"	5-1/2"	5-1/2"	5-1/2"	
<b>Shipping Weight:</b>	49 lbs.	116 lbs.	267 lbs.	400 lbs.	534 lbs.	670 lbs.	
<b>120v</b>	<b>Voltage:</b>	120v	120v	120v	120v	120v	120v
	<b>Amps:</b>	1.17A	2.34A	4.68A	7.02A	9.36A	11.7A
<b>220v</b>	<b>Voltage:</b>	220v	220v	220v	220v	220v	220v
	<b>Amps:</b>	.7A	1.4A	2.8A	4.2A	5.6A	7.0A
<b>Frequency:</b>	60Hz	60Hz	60Hz	60Hz	60Hz	60Hz	
<b>Power Consumption: ②</b>	140 Watts	280 Watts	560 Watts	840 Watts	1120 Watts	1400 Watts	
<b>Lamp Watts:</b>	110 Watts	220 Watts	440 Watts	660 Watts	880 Watts	1100 Watts	
<b>Max Operating Pressure:</b>	100 PSI	100 PSI	100 PSI	100 PSI	100 PSI	100 PSI	
<b>Ambient Temperature:</b>	35–100°F	35–100°F	35–100°F	35–100°F	35–100°F	35–100°F	
<b>Quartz Sleeve:</b>	1	2	4	6	8	10	
<b>Drain Plug:</b>	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT	
<b>Lamp Out Indicator:</b>	Translucent Sight Port	Translucent Sight Port	Translucent Sight Port	Translucent Sight Port	Translucent Sight Port	Translucent Sight Port	
<b>Germicidal Ultraviolet Monitor: ①</b>	Optional	Optional	Optional	Optional	Optional	Optional	
<b>Flow Control Valve: ①</b>	Optional	Optional	Optional	Optional	Optional	Optional	
<b>Audio Alarm: ①</b>	Optional	Optional	Optional	Optional	Optional	Optional	
<b>Solenoid Valve: ①</b>	Optional	Optional	Optional	Optional	Optional	Optional	
<b>Time Delay Mechanism: ①</b>	Optional	Optional	Optional	Optional	Optional	Optional	
<b>Elapsed Time Indicator:</b>	Optional	Optional	Optional	Optional	Optional	Optional	

① Use of this option is recommended by U.S. Public Health Service "Criteria for Acceptability of an Ultraviolet Disinfection Unit." Originally issued April, 1966.

② Total power consumption, including ballast loss (based on 120v purifier).

All specifications, dimensional data, etc. are approximate and subject to change without notice.

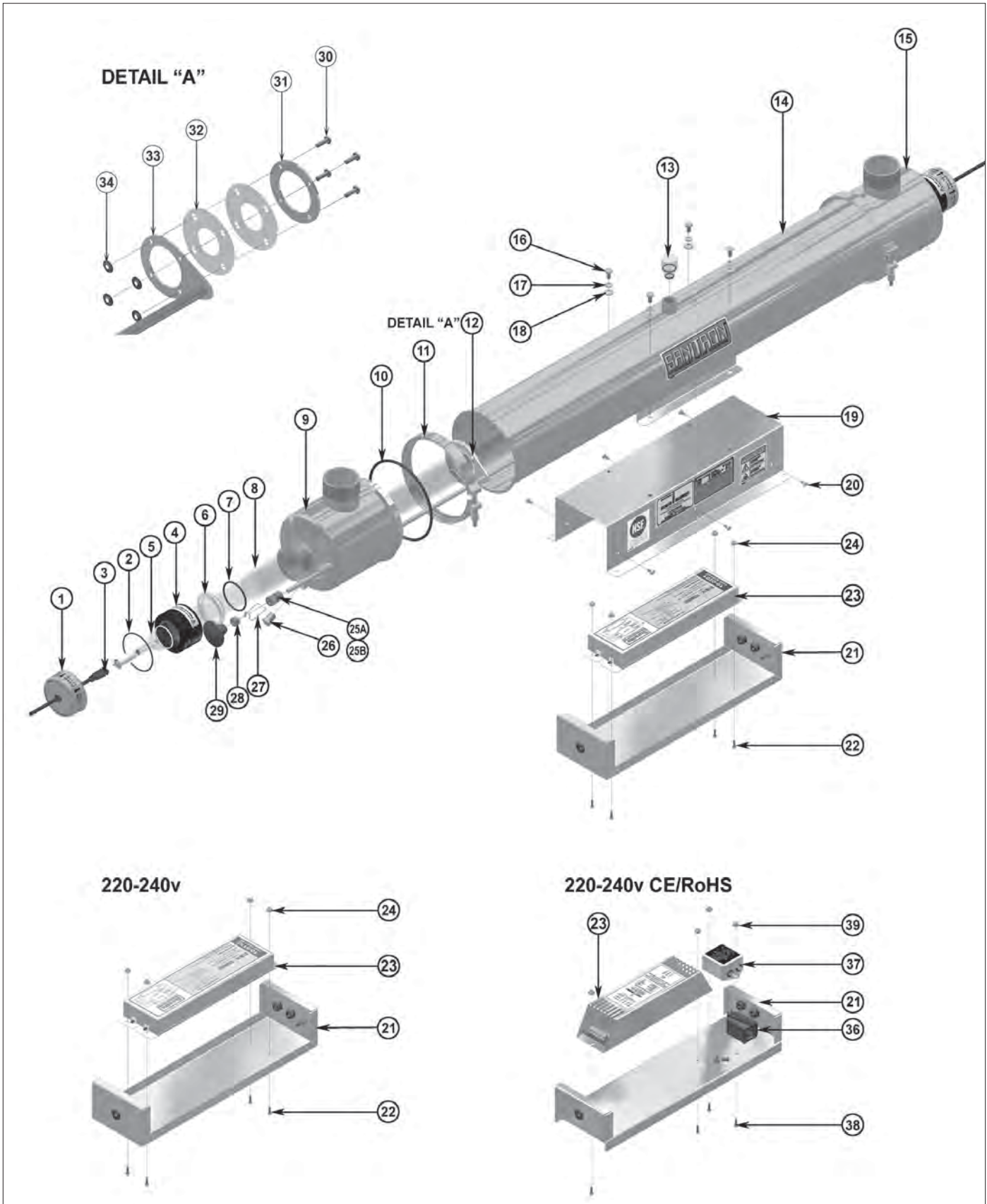
\*Our S2400C water purifier, used to build this model, is certified to /ANSI Standard 61 & 372.

All above models are available with alternate inlet/outlet fittings.

# REPLACEMENT PARTS

## SANITRON® Model S2400C

Figure 10 – Exploded View S2400C



**Table 5 – Replacement Parts S2400C**

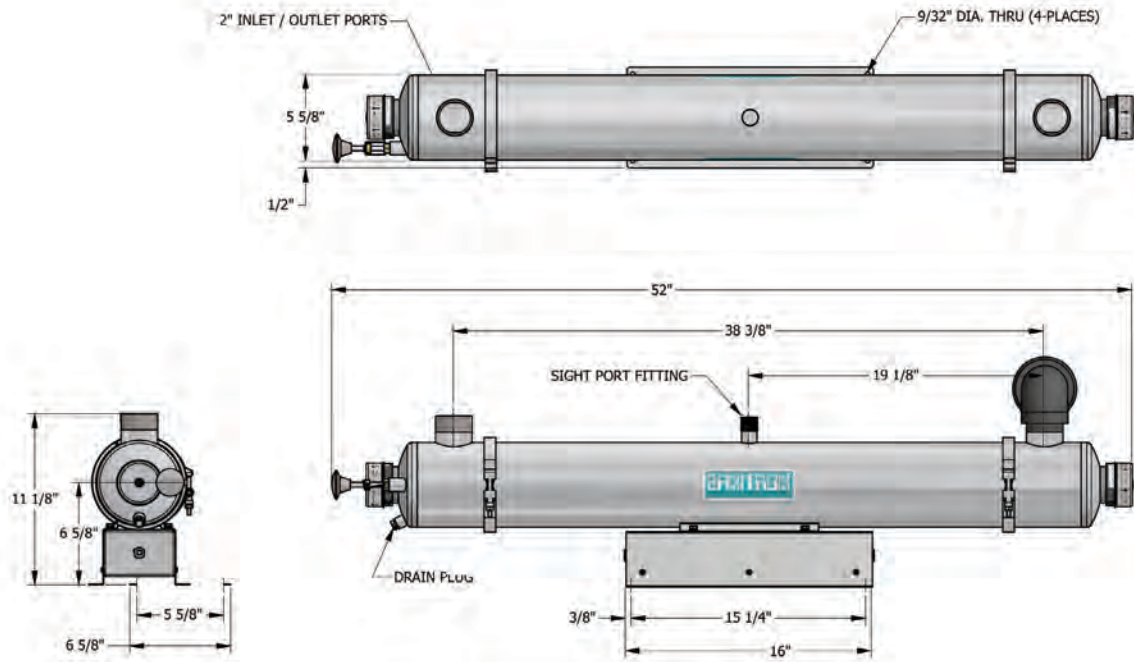
Item No.	Description	120v/60Hz		220-240v/50Hz		RoHS 220-240v	
		Qty	Part Number	Qty	Part Number	Qty	Part Number
1	<b>EASY-OFF™</b> End Cap	2	25-0389A	2	25-0389A	2	25-0389A
2	Rubber O-Ring, Static Gland	2	00-0085A	2	00-0085A	2	00-0085A
3	<b>Steadfast™</b> Lead Wire & Socket	2	05-2400A	2	05-2400A	2	05-2400A
4	<b>Promate™</b> Static Gland Nut	2	25-1232C	2	25-1232C	2	25-1232C
5	<b>STER-L-RAY®</b> Lamp	1	05-1311-R	1	05-1311-R	1	05-1311-R
6	Teflon® Washer	2	25-1236A	2	25-1236A	2	25-1236A
7	Rubber O-Ring, Quartz Sleeve	2	00-1239A	2	00-1239A	2	00-1239A
8	<b>CRYSTAL CLEAR™</b> Quartz Sleeve	1	15-1082A	1	15-1082A	1	15-1082A
9	Head, Flared	1	25-0763A1	1	25-0763A1	1	25-0763A1
10	Rubber O-Ring, Flared Head	2	00-0020A	2	00-0020A	2	00-0020A
11	Chamber Head Clamp	2	25-4002A	2	25-4002A	2	25-4002A
12	Wiper Rod Assembly	1	25-0427A	1	25-0427A	1	25-0427A
13	Sight Port Plug	1	30-1075	1	30-1075	1	30-1075
14	Chamber	1	25-7060	1	25-7060	1	25-7060
15	Head, Flared	1	25-0764A1	1	25-0764A1	1	25-0764A1
16	Screw, ¼"-20 x 3/8" long	4	50-1034	4	50-1034	4	50-1034
17	Lock Washer, ¼"	4	50-1321	4	50-1321	4	50-1321
18	Flat Washer ¼"	4	50-1317	4	50-1317	4	50-1317
19	Ballast Housing Cover	1	25-0417A	1	25-0417A	1	25-0417A
20	Screw, No. 8 x 3/8" long	6	50-0082	6	50-0082	6	50-0082
21	Ballast Housing	1	25-0418D	1	25-0125A	1	25-0125B
22	Screw, 6-32 x ½" long	4	50-0155	2	50-0155	2	50-0155
23	<b>Surelite™</b> Ballast	1	10-0201	1	10-0155	1	10-0116
24	Speed Nut, 6-32	4	50-1314	2	50-1314	2	50-1314
25A	Dynamic Gland, Wiper Lock	1	25-1510C1	1	25-1510C1	1	25-1510C1
25B	Dynamic Gland, Wiper Lock	1	25-4041A	1	25-4041A	1	25-4041A
26	Drain Plug	1	27-1216	1	27-1216	1	27-1216
27	Wiper Clip	1	25-1507C1	1	25-1507C1	1	25-1507C1
28	Wiper Lock Spacer	1	25-1512A1	1	25-1512A1	1	25-1512A1
29	Wiper Knob	1	25-1222	1	25-1222	1	25-1222
30	Rivet	16	50-1300A	16	50-1300A	16	50-1300A
31	Wiper Backup Ring	4	25-1379A1	4	25-1379A1	4	25-1379A1
32	Teflon® Wiper Segment	8	25-1242A	8	25-1242A	8	25-1242A
33	Welded Wiper Rod	1	25-0425A	1	25-0425A	1	25-0425A
34	Push Nut	16	50-1223A	16	50-1223A	16	50-1223A
35	Lead Cord	1	35-1100	1	35-1452	1	35-1452
36	Ferrite: Broadband Clamp-on	—	—	—	—	1	35-1766
37	Filter: Power Multi-Stage	—	—	—	—	1	35-1765
38	Screw, 6-32 x 5/16" long	—	—	—	—	2	50-0087
39	Nut, 6-32 Tinnerman	—	—	—	—	2	50-0163

All specifications, dimensional data, etc. are approximate and subject to change without notice.

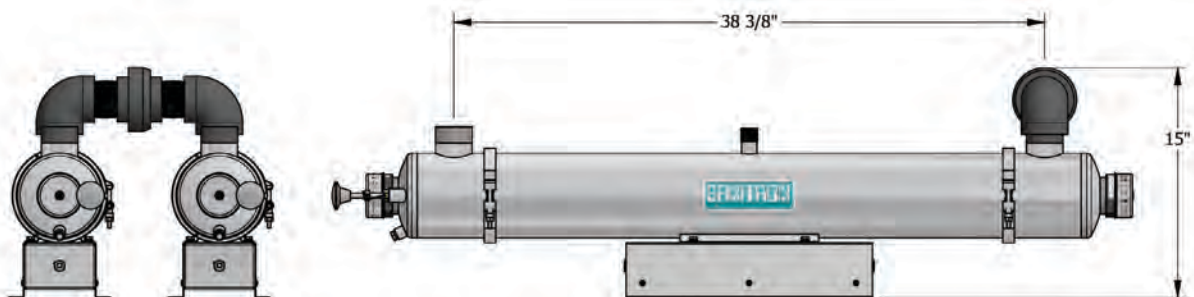
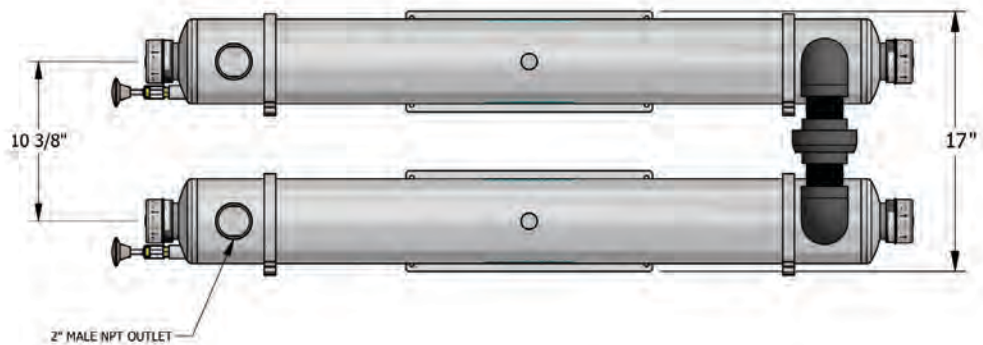
# SANITRON® HIGH CAPACITY SYSTEMS

## DIMENSIONAL DATA

Figure 11 – S2400C & S5,000C Dimensional Data



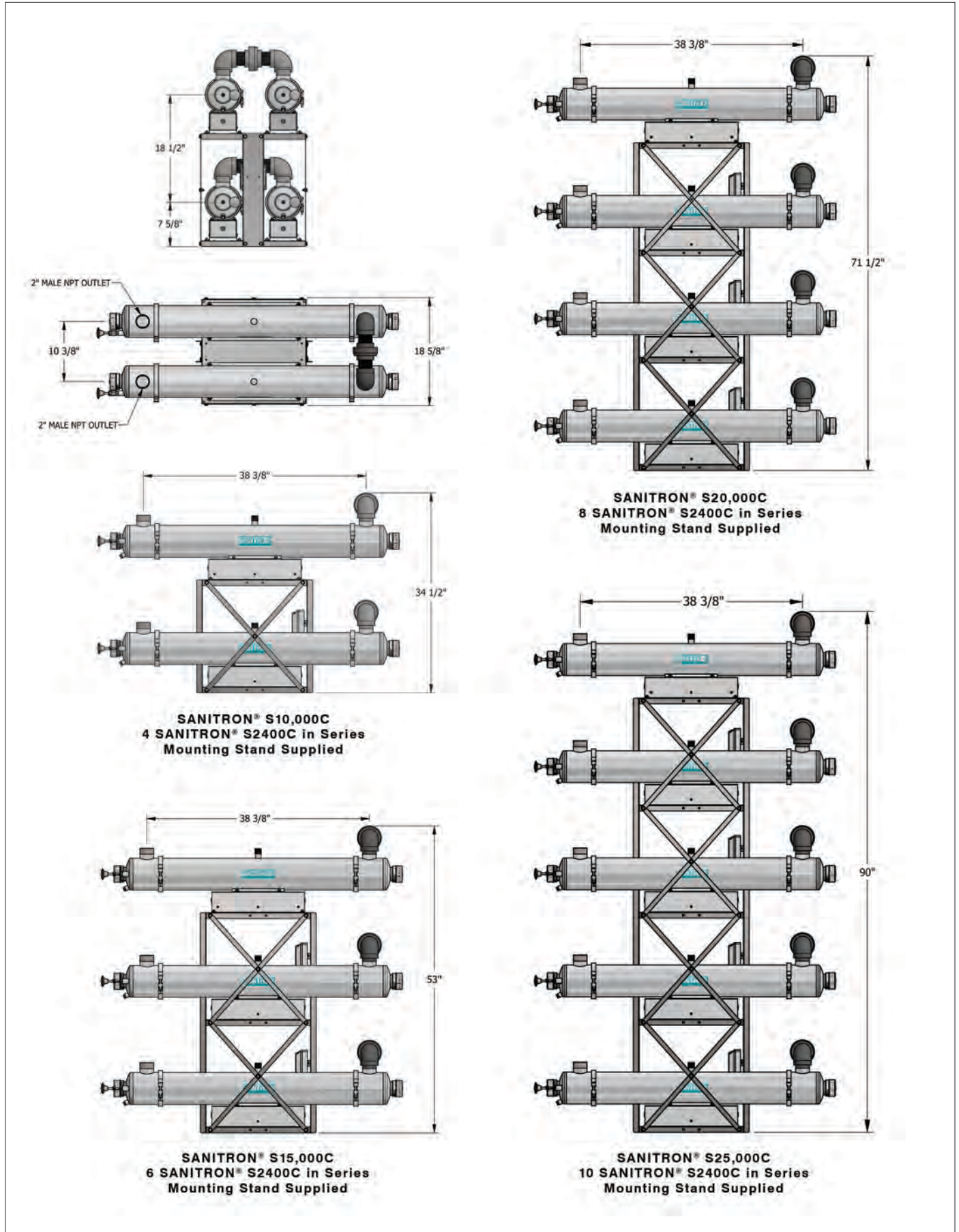
**SANITRON® S2400C**



**SANITRON® S5,000C (2 SANITRON® S2400C in Series. Interconnecting Piping Supplied.)**

***DIMENSIONAL DATA***

**Figure 12 – S10,000C, S15,000C, S20,000C, S25,000C Dimensional Data**



# ***MAINTENANCE NOTES***

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# ***MAINTENANCE NOTES***

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# ***MAINTENANCE NOTES***

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# ***MAINTENANCE NOTES***

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# USER ASSISTANCE

Atlantic Ultraviolet Corporation® makes every effort to ensure that the **SANITRON®** Germicidal Ultraviolet Water Purifier is a product of superior quality and workmanship. This manual describes the installation, operation and maintenance of the **SANITRON®** Germicidal Ultraviolet Water Purifier.

Please read and become familiar with the contents of this manual before installing or using this purifier. If after reading the manual you still have questions, or concerns, regarding the installation or use of this purifier, contact our offices, weekdays between 8:30 am and 5:00 pm Eastern Time, at:

Atlantic Ultraviolet Corporation®  
375 Marcus Boulevard  
Hauppauge, New York, 11788  
Tel: (631) 273-0500  
Fax: (631) 273-0771  
Email: Sales@AtlanticUV.com  
Shop: AtlanticUltraviolet.com  
Learn More: Ultraviolet.com

## PATENT NOTICE

No attempt has been made to determine the patent status of applications illustrated or described in this publication. Inclusion in this publication of any design or method of use, which may be patented, is not to be construed as promoting or sanctioning unauthorized use.

## NSF®/ANSI

NSF®/ANSI 61 is a set of national standards that relates to water treatment and establishes stringent requirements for the control of equipment that comes in contact with either potable water or products that support the production of potable water. NSF®/ANSI 372 was set in 2011 to establish procedures to meet the 0.25% lead content requirement of the RLDWA (Reduction of Lead in Drinking Water Act) using a wetted surface area average calculation or just simply using all no-lead materials for areas in contact with drinking water. NSF®/ANSI 372 includes a broader scope of drinking water products covered by the law which may not be covered under NSF®/ANSI 61 and enables large or complex products and assemblies to achieve certification.

# WARRANTY & PRODUCT REGISTRATION

We warrant this product to the original owner to be free from defects in material and workmanship when installed in accordance with Atlantic Ultraviolet Corporation® specifications for a period of time as follows:

**UV Water Purifier Chambers** – Type 316 stainless steel chambers will have a Twelve (12) year Limited Warranty on the stainless steel chamber, from the date of original purchase while the Type 304 stainless steel chambers will have a Six (6) year Limited Warranty on the stainless steel chamber.

**UV Air Disinfection Housing** – Three (3) year Limited Warranty on the metal housing, from the date of original purchase.

**Ballasts** – Three (3) year Limited Warranty, from the date of original purchase.

**UV Lamps, Monitoring Devices, Optional Accessories, and Other Parts** – One (1) year Limited Warranty from the date of original purchase.

Within the warranty period we shall repair or replace such products, which are returned to us with shipping charges prepaid and which are determined by us to be defective. This warranty will not apply to any product, which has been subjected to misuse, negligence or accident; or misapplied; or modified; or repaired by unauthorized person; or improperly installed. Warranty will be null and void if any of the product’s original labels are removed. This Limited warranty excludes the cost of labor.

The Buyer shall inspect the product promptly after receipt and shall notify us at our main office in writing of claims, including claims of breach of warranty, within thirty (30) days after the Buyer discovers or should have discovered the facts upon which the claim is based. Failure of the Buyer to give written notice of a claim within the time period shall be deemed to be a waiver of such claim.

The provisions of the above warranty are our sole obligation and exclude all other remedies or warranties, expressed or implied, including warranties of merchantability and fitness for a particular purpose, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to the customer, or to any person for injury to person, damage to, or loss of property or value caused by any product which has been subjected to misuse, negligence, accident; or modified or repaired by unauthorized persons; or improperly installed.

Under no circumstances shall the Company be liable for any incidental, consequential or special damages; losses or expenses arising from the contract for this product, or in connection with the use of, or inability to use, our product for any purpose whatsoever.

Be sure to register your product and validate purchase within 30 days — registration is simple and will take less than 2 minutes to do.

**NOTE** – failure to register your purchase may jeopardize warranty.

Go to AtlanticUltraviolet.com and scroll down to the bottom of the page, under “Trust” click the “Warranty Registration Form”, complete and click “Submit”. Or click on “Warranty Registration PDF” to download the warranty registration card as a PDF, complete and mail to us at 375 Marcus Boulevard, Hauppauge, NY 11788, or simply fax to (631) 273-0771. If you prefer to register by phone, please call (631) 273-0500 and our customer service staff will be glad to assist you.

For your convenience, record the following information below. The model and serial number can be found on a label located on the **SANITRON®** Germicidal UV Water Purifier. Keep this manual, along with proof of purchase, handy when contacting our offices.

Purchased From:	Date:
Model:	Serial No.:

## 17. Appendix 9 – Microfiltration Owner’s Manual

DRAFT

# HARMSCO®

# HCP

## Premium Hurricane® Polyester Cartridges

Maximum Surface Area

Designed for Hurricane® and WaterBetter® Filter Housings

High Flow Performance

Lower Operation Cost with Hurricane® Cartridges

- High flow capability
- Lower overall operating cost
- Reduced waste disposal
- Longer filter runs for fewer change-outs
- Increased contaminant removal
- Operator friendly



Certified to  
NSF/ANSI Standard 61



Premium Hurricane®  
Polyester Cartridges

### Features

- ▶ Fewer cartridges for fewer change-outs and lower maintenance cost
- ▶ Pleated Polyester-Plus™ filter media provides higher flow rates and lower initial pressure drop
- ▶ Pleated surface area provides higher loading capacity for longer filter life and increased particle removal
- ▶ End cap, center tube and media are thermally bonded as one integral component for added strength
- ▶ Offered in three sizes (40, 90 and 170) and eight micron ratings (0.35, 1, 5, 10, 20, 50, 100 and 150) to meet all your high flow requirements

### Applications

- ▶ Reverse Osmosis Pre-filtration
- ▶ Municipal Drinking Water Filtration
- ▶ Commercial/Residential Drinking Water Filtration
- ▶ Desalination Pre-filtration
- ▶ Industrial Water Filtration
- ▶ Cooling Tower Filtration
- ▶ Chill Water Loop Filtration
- ▶ Food & Beverage Filtration
- ▶ Marine/Aquatic Filtration
- ▶ Industrial Coolant Filtration



HARMSCO® Filtration Products



Made in USA

# Premium Hurricane® Polyester Cartridges

## Specifications

- ▶ **Micron Ratings:** Nominal micron ratings of 0.35, 1, 5, 10, 20, 50, 100, 150
- ▶ **Filter Media:** nominal pleated Polyester-Plus™
- ▶ **End Caps:** Pliable PVC with sealing surface built-in
- ▶ **Center Tubes:** ABS or PVC
- ▶ **Temperature:** 140°F (60°C) temperature limit\*  
\* Temperature limits vary and depend on pressure and time under load.

**Cleanable/Reusable** in most filtration applications and micron ratings.

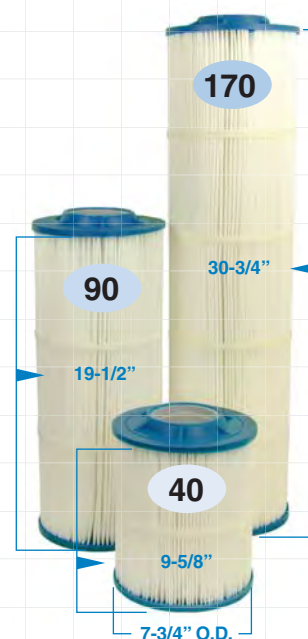
## Cartridge Selection/Sizing Guide

**7-3/4" O.D.** For Harmsco® Hurricane® and WaterBetter® Single-cartridge Filter Housings



Certified to NSF/ANSI Standard 61

Cartridge Length	Product Code	Nominal Micron Rating	Media (sq ft)	Recommended Flow Rate* (GPM)	Max Flow Rate* (GPM)	Max Flow Rate* (LPM)	Max Flow Rate* (M <sup>3</sup> /HR)	No./ Carton	Carton Size	
<b>Premium Hurricane® Polyester Cartridges</b> - rated up to 140°F (60°C).										
9-5/8"	HC/40-0.35	0.35	40	35	50	189	12	1	9x9x11	
	HC/40-1	1	40	35	50	189	12	1	9x9x11	
	HC/40-5	5	40	35	50	189	12	1	9x9x11	
	HC/40-10	10	40	35	50	189	12	1	9x9x11	
	HC/40-20	20	40	35	50	189	12	1	9x9x11	
	HC/40-50	50	40	35	50	189	12	1	9x9x11	
	HC/40-100	100	40	35	50	189	12	1	9x9x11	
	HC/40-150	150	40	35	50	189	12	1	9x9x11	
	19-1/2"	HC/90-0.35	0.35	90	70	100	378	24	1	9x9x21
		HC/90-1	1	90	70	100	378	24	1	9x9x21
HC/90-5		5	90	70	100	378	24	1	9x9x21	
HC/90-10		10	90	70	100	378	24	1	9x9x21	
HC/90-20		20	90	70	100	378	24	1	9x9x21	
HC/90-50		50	90	70	100	378	24	1	9x9x21	
HC/90-100		100	90	70	100	378	24	1	9x9x21	
HC/90-150		150	90	70	100	378	24	1	9x9x21	
30-3/4"		HC/170-0.35	0.35	170	105	150	568	36	1	9x9x32
		HC/170-1	1	170	105	150	568	36	1	9x9x32
	HC/170-5	5	170	105	150	568	36	1	9x9x32	
	HC/170-10	10	170	105	150	568	36	1	9x9x32	
	HC/170-20	20	170	105	150	568	36	1	9x9x32	
	HC/170-50	50	170	105	150	568	36	1	9x9x32	
	HC/170-100	100	170	105	150	568	36	1	9x9x32	
	HC/170-150	150	170	105	150	568	36	1	9x9x32	



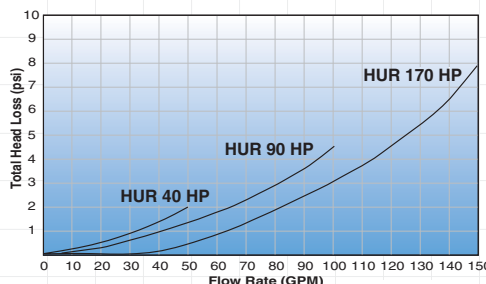
**Premium Hurricane® Polyester Cartridges**

Length and O.D.

\*Harmsco® recommends operation at 70% of maximum flow rate for optimum performance.

## Pressure Drop

Pressure drop shown at right is for filter housing and 20 micron filter cartridge in clean water.



**Note:** This publication is to be used as a guide. The data within has been obtained from many sources and is considered to be accurate. Harmsco does not assume liability for the accuracy and/or completeness of this data. Changes to the data can be made without notification. Temperature, Pressure, Flow Rates, Differential Pressures, Chemical Combinations and other unknown factors can affect performance in unknown ways. **Limited Warranty:** Harmsco warrants their products to be free of material and workmanship defects. Determination of suitability of Harmsco products for uses and applications contemplated by Buyer shall be the sole responsibility of Buyer. The end user/installer/buyer shall be liable for the product's performance and suitability regarding their specific intended applications. End users should perform their own tests to determine suitability for each application.



**HARMSCO® Filtration Products**

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(561) 848-9628 • Toll-free: (800) 327-3248 • Fax: (561) 845-2474 • E-mail: sales@harmsco.com

[www.harmsco.com](http://www.harmsco.com)



Made in USA

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12/18

## 18. Appendix 10 – AdvanTex O&M Manual

DRAFT



**Start-Up and Maintenance of  
AdvanTex® AX100 & AX20 Commercial  
Wastewater Treatment Systems**

**COMMERCIAL  
O&M  
MANUAL**

**Orenco®**

800-348-9843 • 541-459-4449  
[www.orenco.com](http://www.orenco.com)  
[www.vericomm.net](http://www.vericomm.net)

## Introduction

### About Orenco

Since 1981, Orenco Systems®, Inc. has researched, designed, and manufactured leading-edge onsite and decentralized wastewater treatment technologies. We are one of the nation's leading manufacturers and suppliers of equipment for the collection and treatment of wastewater. At Orenco, we specialize in the manufacture of complete treatment systems for residential, commercial and community applications. Wastewater collection and treatment is our only job. When you purchase an Orenco system, you can be confident you have chosen the best equipment available.

### Assistance

In addition to providing quality equipment, Orenco prides itself on its outstanding customer service and technical assistance. Should you have any questions regarding your system, components, instructions, or this O&M Manual, please contact us for assistance. Please include the name and location of your project or system with any correspondence, so we can quickly respond to your request.

### When Your Equipment Arrives

Inspect your order for completeness and inspect each component for shipping damage. Check to be sure that the instructions and items supplied comply with your state and local regulations. Carefully read and follow all instructions. Be aware that improper system or component installation may void warranties.

*All product and performance assertions are based on proper design, installation, operation, and maintenance according to Orenco's current published documentation.*

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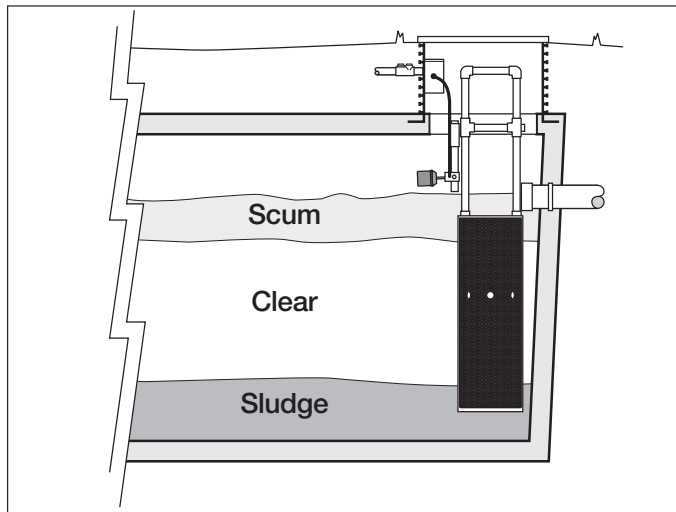
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## About the AdvanTex Treatment System

### Primary Tank

The primary tank provides passive primary wastewater treatment. There can be one or more primary tanks in parallel or series, depending on the size of the system. In certain applications, the primary tank may be preceded by a grease interceptor tank.



The primary tank is an enclosed, watertight receptacle designed to collect wastewater; segregate settleable and floatable solids (sludge and scum); accumulate, consolidate, and store solids; digest organic matter; and discharge treated effluent. BOD (biochemical oxygen demand) removals of greater than 65% and TSS (total suspended solids) removals of greater than 70% are easily accomplished. In the primary tank, wastewater separates into three distinct layers: a floating scum layer, a bottom sludge layer, and a clear zone in between, which is relatively free of large solids. An effluent filter or pump vault allows liquid effluent from the clear zone to be transported to the recirculation/blend or recirculation/blend and anoxic tank.

### Anoxic Tank (if applicable)

The anoxic (low oxygen) tank enhances the denitrification of AdvanTex® filtrate. It is sized based on the design flow of the system. In systems that use an anoxic tank, it is generally located between the primary tank, flow splitter basin, and recirculation/blend tank in the treatment train.

The anoxic tank provides the ideal environment for carbonaceous microbes that reduce nitrates to nitrogen gas (denitrification) from AdvanTex filtrate returning from the flow splitter basin. The harmless nitrogen gas is released freely back into the atmosphere.

### Recirculation/Blend Tank

The recirculation/blend tank reduces the strength of the effluent being applied to the AdvanTex filter. It is sized at 80 to 100% of the design flow. It is located after the primary treatment tank and before the AdvanTex textile filter.

The reduction in effluent strength is achieved by mixing treated filtrate from the AdvanTex filter with primary treated effluent at the recirc valve, located at the inlet of the recirculation/blend tank. A timer-controlled pump at the outlet end of the tank then sends the blended effluent to the AdvanTex filter.

### AdvanTex® Textile Filter

The AdvanTex textile filter pod provides secondary wastewater treatment. There can be one or more AdvanTex pods, depending on the size of the system.



The filter is a sturdy, watertight fiberglass basin filled with an engineered textile material. The textile media has a very large surface area and void volume (for free flow of oxygen). Wastewater percolates both through and between the textile media. A visible biological film normally develops on the filter media within a few days of system start-up. Within the filter, aerobic conditions exist that are ideal for microbes that convert ammonia to nitrate (nitrification). BOD and TSS reductions occur almost immediately. Nitrification may take four to six weeks, depending on ambient temperature.

After percolating through the filter media, the effluent gravity-flows to the recirculating valve. On systems designed for enhanced nitrogen removal, the effluent first flows to a flow splitter basin where a percentage of the effluent is diverted to the inlet side of a primary tank or anoxic tank. The remainder flows to the recirc valve, where it is directed either into the recirculation/blend tank or discharged.

## Start-up & Operation

### Introduction

This section covers the start-up of an AdvanTex®-AX100 Treatment System in a commercial application. The formal start-up of an AdvanTex Treatment System should only be performed by trained personnel. As a trained member of the team performing the system start-up, you play a critical role in the operation of the system. The decisions made at the time of the start-up will determine the long-term maintenance needs of the system. Regulators, manufacturers, dealers, property owners, neighbors, and service providers all rely on a thorough start-up.

Before you start your system, please read this entire manual, as well as the engineering plans, and contact your Dealer if you have any questions. You'll save yourself time and money, and you'll reduce the potential for follow-up work. For information specific to your system, refer to your detailed engineering plans.

We recommend following the flow path through the treatment train, if possible, when performing the system start-up, beginning at the building outlets and ending at the final discharge point. By following this start-up sequence, the treatment train can be effectively inspected for proper operation and each step in the process can be given systematic attention.

### Roles and Responsibilities

Prior to start-up, the Orenco Representative or AdvanTex Dealer will contact the Designer, Installer, and Service Provider to coordinate a start-up date. The date will be based on a status report provided by the Orenco Representative and the availability of all parties. The status report will include, but will not be limited to, verification of leak testing performed by the Installer, installation of all equipment, and the availability of power, phone line, and water at the site.

- The **AdvanTex Dealer** is expected to be on site and is either performing the start-up or acting as a coordinator and general resource during the installation and start-up of the system.
- The **Designer** is required at the site during start-up to answer questions concerning site-specific issues not covered in the plans, timer settings, and float settings.
- The **Installer** is required at the site during start-up to address any installation issues that arise.
- The **Service Provider** is required at the site during start-up to become familiar with the system, receive training on control panel and treatment system operation, and to learn correct sampling techniques for the system.

### Safety Precautions

Before starting up, maintaining, or servicing any wastewater treatment system, observe the following precautions for the safety and health of all service personnel working with or around wastewater, effluent, and its associated equipment:

- Wear proper clothing that covers all parts of the body that will be exposed to wastewater or effluent.
- Wear personal protection equipment (PPE) such as rubber gloves and eye protection when handling or touching any equipment components that come in contact with wastewater or effluent.
- Turn off system power at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions before removing any system components. If the control panel or service entrance panel is not within eyesight of the pumping system, use Lock Out/Tag Out tags to ensure safety.
- Avoid driving over any part of the wastewater treatment system unless it's been equipped to withstand vehicle traffic. If the system is subject to possible traffic, put a barricade up to protect the system.
- Do not enter any tank access. Any work performed on the tank should be done from the outside. Gases and/or oxygen depletion in the tank can be fatal.
- Secure all tank access lids properly to the riser after all work is complete.
- Practice proper personal hygiene at all times.

## Start-up & Operation (continued)

### Recommended Tools and Equipment – Start-up

The following items are recommended for a smooth and successful start-up:

- A tool kit containing common tools and these additional items:
  - A cordless power drill with 1/2" nut driver and 3/16" hex-head bit
  - Voltmeter
  - Small electronics screwdrivers
  - Wire strippers/cutters
  - Cable ties
  - Tape measure
  - Adjustable pliers
- A laptop computer with Hyperterminal (PC) or ZTERM (MAC), to interface with the control panel if the control panel doesn't have a touch screen.
- A copy of the layout and a start-up checklist for the person performing the system start-up.
- Appropriate personal protection equipment (PPE) for each person involved in the start-up.

### Pre-start-up Inspection

- **Site drainage:** Verify that all riser lids, external splice box lids, and AX pod lids are level and above grade.



- **Serviceability:** Verify that there is a minimum of two feet of space between AX pods. Check for a useable water source within hose distance of the system.
- **System layout:** Verify that the component layout in the plans or the system diagram matches the installed system and note any differences between the plans and the installed system.

- **Landscaping:** Check for landscape features that may cause long-term maintenance issues:
  - Trees planted on top of tanks
  - Trees that could shed snow onto critical components, such as control panels
  - Risers, external splice boxes, and pods covered in bark or other landscaping materials

- **Circuit breakers:**

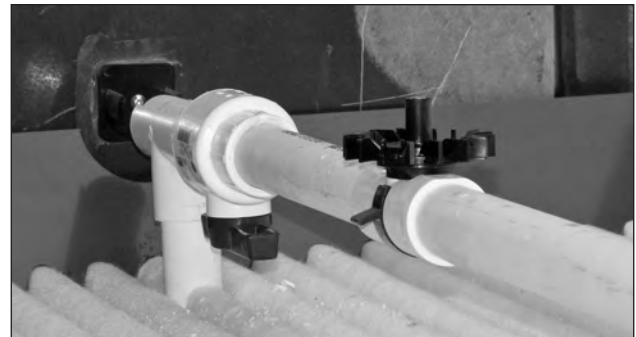
Open the control panel and verify that all of the circuit breakers are off.

- **System access:**

Remove lid bolts and open all lids.

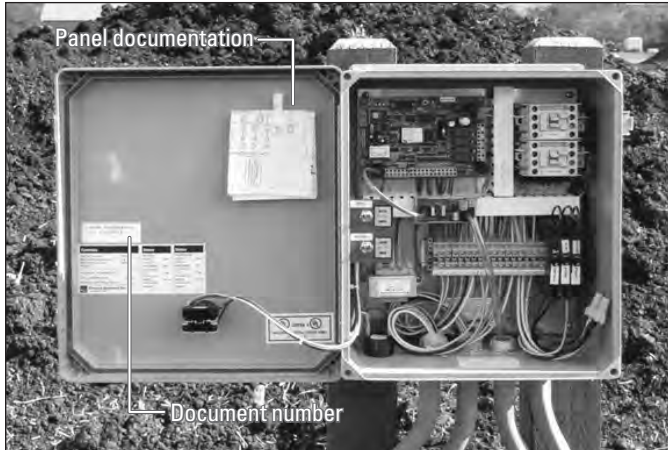
- **AX100:** Verify that the lid bolt boxes and pressure gauges have been removed from the AX pods.

If not, remove them at this time. Verify that the lateral inlet valves in the pods are open and the spray nozzle turbines are pointed up, as shown below.



## Inspection Points

### Inspection Points – Control Panels



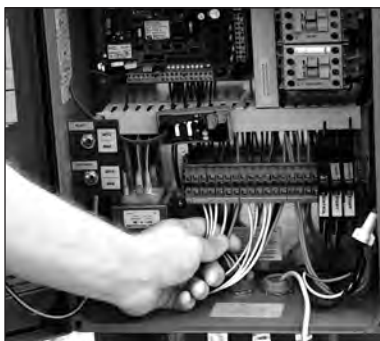
The system may have multiple control panels. Identify if there are control panels on the section of the system that you are about to start-up.

If the tank or basin has associated controls, perform the following start-up steps:

1. **Panel documentation:** Locate the panel-wiring diagram inside the panel and verify the document matches the document number found on the inside of the front panel door. If you can't find the wiring diagram, contact Orenco at (800) 348-9843 or (541) 459-4449 to have a copy e-mailed or faxed to you.

2. **Wiring installation:**

Verify all of the main breakers are in the "OFF" position. Inspect the wire terminations in the panel by giving a light tug to all of the float wires, pump wires, pump power lines, and main power lines in the panel. If a wire comes loose, reattach the wire correctly.



**WARNING:** Failure to identify a loose wire may cause intermittent failures, inconsistent panel operation and over-current conditions on the pumps.

3. **Conduit seal installation:** Check for conduit seals on all conduit connections to the control panel.

**WARNING:** Failing to seal the conduit may allow corrosive gasses to corrode major components. Orenco recommends conduit seals for all connections to the control panel to assure proper system operation and component longevity.

4. **Power supply voltage:** Make sure the panel breakers are switched off, and check the power supply voltage at the panel.

- On 120 V panels, measure voltage between L1 and ground. The voltage should be within ten percent of nominal.
- On 230 V panels, measure the voltage between L1 and ground, and between L2 and ground. The voltage of each leg should be approximately 115 volts. Measure the voltage between L1 and L2. The voltage should be within ten percent of nominal.
- On 208 V, 230 V, and 460 V 3-phase panels, measure the voltage between L1 & L2, L2 & L3, and L3 & L1. The voltage between each leg should be 208, 230 or 460 volts, respectively. If there is a voltage difference between line legs, it is an indication that the power source may be undersized. The voltage between each leg and ground on 208 volts should be approximately 120 volts. The voltage between each leg and ground on 460 volts should be approximately 277 volts. (Due to the variability in the ways 230 V, 3-phase power can be wired, there is not a standard test method.)

5. **Neutral and ground voltage:** Check for any voltage difference between each neutral (N) wire in the panel and ground. If there is a difference in voltage, use the wiring diagram to track down the source of the difference and correct it.

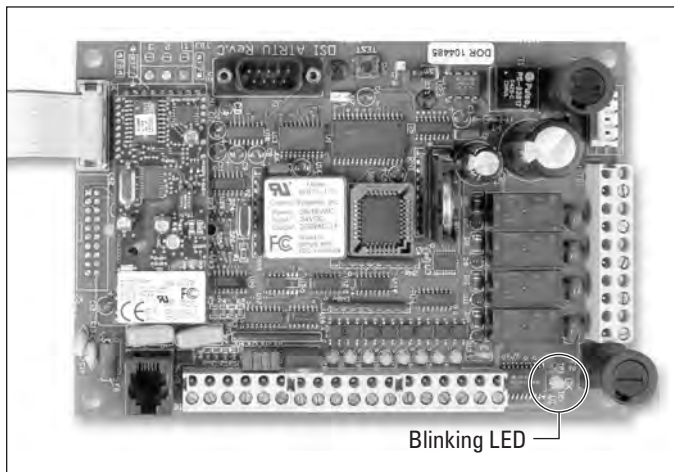
6. **Controls circuit:** Connect the controls circuit if it is not already connected. The controls circuit is now ready to be turned on. Do not turn on the pump circuit at this time.

**WARNING:** Turning the pump circuit on at this time can damage the panel or the pump if the pumps and floats are miswired or if there isn't sufficient liquid in the tank.

## Inspection Points (continued)

7. **Panel operation:** Verify that the panel is powered up.

- On TCOM and VCOM panels, an LED will light up indicating the board is operational. If the blinking light does not turn on, refer to the wiring diagram and verify the connections on the control circuit were properly terminated.



- On MVP, Simplex, and Duplex panels, turn on the control circuit, then toggle the pump “AUTO-OFF-MAN” switch to “MAN.” The motor contactor will visibly and audibly engage at this point. If the motor contactor does not engage and there are no alarm conditions, refer to the wiring diagram and verify the connections on the control circuit were properly terminated.

**NOTE:** For VCOM-equipped systems, place VCOM in test mode at this point.

## Inspection Points – Tanks and Basins

Not all tanks and basins have associated components as described below. Check the system plans to identify if there are associated components — such as splice boxes, floats, filters, or pump vaults — on each section of the system as you start it up.

1. **Tank:** Confirm with the installer that all tanks have passed watertightness testing. Verify the inlet and outlet of the tank and riser are properly installed.
2. **Basin:** Verify the inlet and outlet of the basin are properly installed and the effluent flows through in the correct direction.
3. **Riser:** Inspect the riser attachment and rubber grommets for a watertight seal.

4. **Splice box:** Inspect the splice box for correct wiring and the use of waterproof splice nuts. If there is water in the splice box, use a baster or sponge to remove the water.



**WARNING:** Failure to use waterproof wire nuts can cause intermittent or permanent float failure.

5. **Effluent filter and float:** Verify the effluent filter cartridge and float assembly are easy to remove for service and maintenance. The ability to easily remove these components is essential and depends upon careful installation in accordance with the instructions provided in Appendix B. Set components on a plastic tarp or plastic sheeting when they are out of the tank.
  - a. Detach the float assembly from the housing, remove it from the tank, and lay it aside. Verify there is enough slack in the cord for easy removal.
  - b. Pull the effluent filter cartridge out of the housing, and remove it from the tank. There should be ample clearance to allow unhindered removal of the cartridge from the housing and tank.
  - c. Slide the filter housing out of the slide rail and remove the housing from the tank. (Slide rail models only.)
  - d. Raise the high-level alarm float to simulate a high-level condition. Verify that the high-level signal is on by the audible alarm or the high-level alarm input LED on the circuit board in the panel.

**NOTE:** The audible alarm is delayed for 2 hours in TCOM control panels.

  - e. When the floats and filter cartridge are out of the tank, verify the handles are long enough for easy access. If they are not, adjust them to the necessary length.
  - f. Reinstall the cartridge into the effluent filter housing and install the float assembly.

## Inspection Points (continued)

6. **Biotube® pump vault filter and floats:** Verify the pump vault filter cartridge and float assembly are easy to remove for service and maintenance. The ability to easily remove these components is essential and depends upon careful installation in accordance with the instructions provided in Appendix B. Set components on a plastic tarp or sheeting when they are out of the tank.

- Detach the float assembly from the housing, remove it from the tank, and lay it aside. Verify there is enough slack in the cord for easy removal.
- Pull the filter cartridge out of the pump vault and remove the filter cartridge from the tank. There should be ample clearance to allow unhindered removal of the cartridge.

- Test the floats, starting with the lowest float on the assembly. Raise each float to the “up” position and verify that the signal is on for the correct float by the audible alarm and the alarm input LED on the circuit board in the panel. If your panel does not have alarm input LEDs, check voltage coming into the panel from the float you believe is activated.

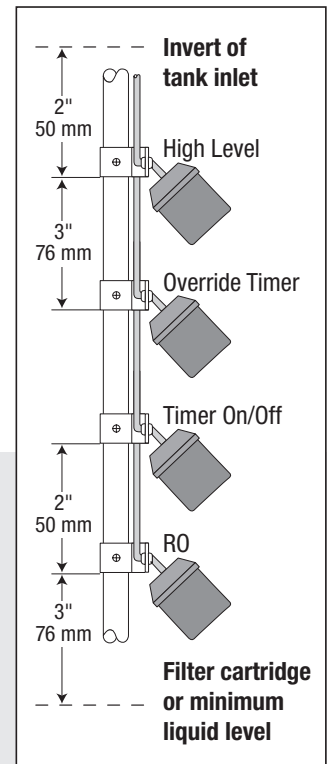


**NOTE:** The audible alarm is delayed for 2 hours in TCOM control panels.

- Check the float settings provided in the plans against the actual float settings. If the plans don't provide float settings and the engineer or system designer is unable to provide settings, set the floats based on the following rules:



- Demand Dose:
  - “Redundant Off” (RO) float is set 3 inches (76 mm) above the filter cartridge or the minimum liquid level of the pump, whichever is higher.
  - “Pump Off” float is set 2 inches (50 mm) above the “RO” float.
  - To calculate the “Pump On” float distance from the “Pump Off” float, divide the desired dose volume by the gallons per in. or liters per mm of the tank. Place the “Pump On” float that many inches above the “Pump Off” float.
  - “High Level” or “High Level/Lag Pump Enable” float is set at 2 inches (50 mm) below the invert of the tank inlet.
- Timed Dose:
  - “RO” float is set 3 inches (76 mm) above the filter cartridge.
  - “Timer On/Off” float is set 2 inches (50 mm) above the “RO” float.
  - “Override Timer” float is set 3 inches (76 mm) below “High Level” float.
  - “High Level” or “High Level/Lag Pump Enable” float is set at 2 inches (50 mm) below the invert of the tank inlet.



**WARNING:** Pumps have a 30-second minimum run time. We recommend a drawdown differential of at least 30 seconds between the “Pump Off” float and “RO” float or the pumps may continue to run, resulting in a false low-level alarm.

**NOTE:** If you use the general float settings, you may need to return at a later time and adjust float settings after the system is in operation.

## Inspection Points (continued)

- e. When the floats and filter cartridge are out of the tank, verify the handles are long enough for easy access. If they are not, adjust them to the necessary length.
- f. Reinstall the cartridge in the pump vault. Leave the float assembly out of the tank or basin for use during pump run testing.

**7. Effluent pump:** Verify the pump is easy to remove for service and maintenance and that the pump flow rate and voltage are correct. The ability to easily remove the pump is essential and depends upon careful installation in accordance with the instructions provided in Appendix B. Set components on a plastic tarp or plastic sheeting when they are out of the tank.

- a. Switch the pump breaker(s) in the control panel to the "OFF" position.
- b. Verify the ball valve and cam-lock fitting or union on the discharge assembly is within 24 inches (610 mm) of the top of the riser.



- c. Close the ball valve on the discharge assembly if there is one and disconnect the discharge assembly at the union or cam-lock fitting.
- d. Verify there is enough slack in the pump cord for easy removal.
- e. Pull the pump out of the vault by the discharge assembly and remove the pump from the tank.

**WARNING:** Lifting or lowering the pump by the cord can damage the pump and cord.

- f. Check the voltage and phase values on the pump nameplate. Write them down in the start-up report. If there are pump motor stickers on the inside of the control panel door, check to see if they match the pump nameplate.

**WARNING:** If the pump does not match the panel voltage and phase requirements, do not turn on the pump breakers.

- g. Reinstall the pump if the pump matches the panel voltage and phase requirements.
- h. Reconnect the discharge assembly at the union or cam-lock fitting and open the discharge assembly ball valve.
- i. Switch the pump breaker(s) in the control panel to the "ON" position when finished.

## Inspection Points – Pumps

When the panel has been inspected and powered up, the float inputs have been tested, and all pump voltage and phase information has been verified, the pump(s) can be powered up and tested.

### 1. Manual pump operation:

- a. Switch the pump breaker(s) in the control panel to the "ON" position.
- b. Measure the static voltage of the pump(s) and enter the value(s) on the start-up checklist.



- c. Toggle the pump "AUTO-OFF-MAN" switch to "MAN." The motor contactor will visibly and audibly engage at this point. If the motor contactor does not engage, check for an "RO" alarm condition. If there is no alarm condition, refer to the wiring diagram and verify the connections on the control circuit were properly terminated.

**WARNING:** There is no motor protection in TCOM panels and panels without "RO" alarms. Before running a pump, always verify that there is sufficient liquid in the tank or basin.

**NOTE:** Refer to the "General Operating Instructions" section of the VCOM control panel documents to perform the "Manual Test" if you are starting up a pump controlled by a VCOM panel.

- d. Verify pump motor operation by checking the discharge plumbing assembly for vibration.
  - No vibration in the discharge plumbing assembly indicates a pump wiring issue. Check the pump voltage and pump wiring terminations in the panel and in the splice box. Wires may be incorrectly terminated or wire insulation may be causing faulty contact between the wire and terminal lug.
  - Vibration in the discharge plumbing assembly with low or no flow from the pump indicates closed valves or line breakages. On duplex pumping systems with two discharge plumbing assemblies connected together to a single line, verify that there are check valves on both pumps and that they are operating correctly. On three-phase systems, verify L1, L2 and L3 are wired correctly. A quick way to identify if the pump is wired correctly is to watch for clockwise torsion in the discharge plumbing assembly when the pump is first turned on.

## Inspection Points (continued)

- e. Measure and compare the dynamic (running) voltage of the pumps to the measured static (resting) voltage. Voltage drops indicate connection problems in the splice box or wiring that is too small for the pump.
- f. Use an ammeter to measure the pump amperage. Make sure the amperage is within the range specified in the table below or listed on the pump nameplate. For non-Orengo pumps, consult the manufacturer's literature.

**NOTE:** On TCOM panels with a current sensor option, pump amperage should match the value listed in the panel. If it does not match, inspect the three-position switch on the current sensor for the correct scaling factor.

- g. Set the high and low amperage ranges based on the reading.

## Pump Amperage Chart

Pump Model	Low Amp Reading	High Amp Reading
PF100511	11.9	12.6
PF100512	6.0	6.4
PF10053200	3.5	3.9
PF100552	3.6	3.8
PF100712	7.8	8.4
PF10073200	4.9	5.2
PF100752	5.8	6.2
PF101012	9.0	9.8
PF10103200	5.1	5.6
PF101552	9.4	11.4
PF102012	10.0	12.2
PF102032	6.4	7.6
PF10203200	7.5	8.7
PF200511	11.0	12.5
PF200512	5.8	6.5
PF200532	2.5	2.9
PF20053200	3.3	3.8
PF201012	9.6	10.5
PF300511	10.7	11.8
PF20103200	5.0	5.9
PF20153200	6.0	7.2
PF201512	10.5	12.6
PF300512	5.6	6.2
PF30053200	3.3	3.7
PF300552	3.5	4.2
PF300712	7.4	8.6
PF300752	5.5	6.1
PF30073200	4.1	4.9
PF301012	9.3	10.4
PF301052	6.4	7.4
PF30103200	4.9	5.8
PF301512	10.1	12.6
PF30153200	5.5	6.9
PF301534	2.3	2.8
PF301552	8.1	9.3
PF302012	7.4	11.0
PF30203200	7.7	9.3
PF303012	12.6	16.8
PF303032	8.2	10.1
PF305012	20.1	25.8
PF305032	14.0	16.6

Pump Model	Low Amp Reading	High Amp Reading
PF30503200	15.4	18.6
PF500511	10.5	12.1
PF500512	5.4	6.2
PF500532	2.6	3.0
PF50053200	3.2	3.7
PF500534	1.3	1.5
PF500552	3.3	3.9
PF500712	7.3	8.5
PF500732	3.1	3.9
PF50073200	3.9	4.9
PF500734	1.4	1.8
PF501012	8.8	10.1
PF50103200	4.6	5.7
PF501034	1.8	2.2
PF501512	9.6	12.6
PF50153200	5.4	7.0
PF501552	8.0	9.1
PF503012	12.6	17.7
PF503032	8	10.4
PF50303200	10.1	13.1
PF503034	4.2	5.3
PF505012	17.3	26.4
PF505032	13.1	16.5
PF751512	11.4	12.3
P200511	12.6	13.8
P200512	6.1	7.1
P201512	11.2	12.2
P300512	5.8	6.5
P300712	7.4	8.3
P301012	9.1	10.3
P500511	11.2	12.7
P500512	5.8	6.5
P50053200	3.4	3.8
P500712	7.7	8.8
P50073200	3.8	4.8
P501012	9.4	11.2
P501512	10.6	13.1
P50153200	6.0	7.6
PEF3311	6.9	7.8

## Inspection Points (continued)

2. **Drawdown test:** Perform a drawdown test to set the pump flow rate in the control panel.
  - a. Measure and record the distance from the top of the tank to the liquid level in the tank.
  - b. Toggle the pump "AUTO-OFF-MAN" switch to the "MAN" position for sixty seconds.
  - c. Toggle the pump "AUTO-OFF-MAN" switch to the "OFF" position; then measure and compare the difference in elevations. The difference in elevation in inches or millimeters, multiplied by the gallons per inch or liters per millimeter of the tank or basin will provide the correct flow rate in gallons per minute (gpm) or liters per minute (L/min). Follow the instructions provided with the control panel for entering the measured pump flow rate.

**NOTE:** *This method will not work on recirculation/blend tanks if the flow is returning to the tank through the recirc valve or for dose tanks with transport lines that drain back.*
3. **Automatic pump operation:** Test the system using the floats to drive pump operation.
  - Demand dose:
    - a. Toggle the "AUTO-OFF-MAN" switch to the "AUTO" position.
    - b. Unclip the float assembly and remove it from the tank if it is not out already.
    - c. Verify the automatic operation of the pumps by incrementally lifting the floats to simulate normal raising and lowering of the tank liquid level. The pumps should cycle on when you lift them and cycle off when you release them. On duplex systems, the pumps should alternate between lead and lag pumps and cycle off when the floats are dropped.

**NOTE:** *An "On/Off" float works differently than a pair of "On" and "Off" floats. Verify the type of floats in your system before testing.*

    - d. Lower the float assembly into the tank and clip the float assembly into the float bracket.
  - Timed dose:
    - a. Toggle the "AUTO-OFF-MAN" switch to the "AUTO" position.
    - b. Record the timer settings, then reduce the timer settings to 0.5 minutes "OFF," 0.5 minutes "ON," and 1.0 minutes "OVR OFF."
    - c. Let the pump run through several cycles to confirm that the timers are operating correctly.
    - d. Change the timer settings back to the settings specified by the engineer.

## Inspection Points – System Timer Settings

1. **Recirc Timer Settings:** The method for calculating Recirculation/ Blend Tank timer settings is provided below. Newer AX100 panels have the ability to adjust the timer setting based on actual flow data. See the instructions included with the control panel for setting information.

- Pump On Time = 1.5 Minutes

**NOTE:** *The standard Pump On Time for AX100 units is 1.5 minutes. Your system's needs may differ. Consult your site plans, engineer/designer, or Orenco for more details.*

- Pump Off time = (1440 ÷ Cycles per Day) - Pump On Time
- Calculate Cycles per Day using the equation below:

$$\frac{(\text{Average Daily Flow}) \times (\text{Recirc Ratio})}{(\text{Pump Flow Rate}) \times (\text{Pumps per Dose}) \times (\text{Pump On Time})}$$

**NOTES:**

- 1440 is the number of available minutes in a 24-hour period.
- The standard Recirc Ratio for AX100 units is 4 but it can range from 2 to 6, depending on the needs of the system.
- The Pump Flow Rate is 48 gallons per minute (3 L/sec) when nozzle pressure measures 3.0 psi (20.6 kPa).

2. **Discharge Timer Settings (Timed Dose Systems) :** The timer settings for the system are calculated based on the actual and expected flow. Equations are provided below.

- a. Identify Dose Volume

- Dose Volume = Number of gallons desired per dose  
or
- Dose Volume = (Number of Orifices) × (Loading Rate per Orifice)

- b. Identify Doses per Day

- Number of doses per day = (Design Flow) ÷ (Dose Volume)

- c. Identify Time Interval Between Starts, in hours

- Time Interval Between Starts = (Hours per Day) ÷ (Doses per Day)

- d. Identify Time On, in minutes

- Time On = (Dose Volume) ÷ (Measured Pump gpm)

## Inspection Points (continued)

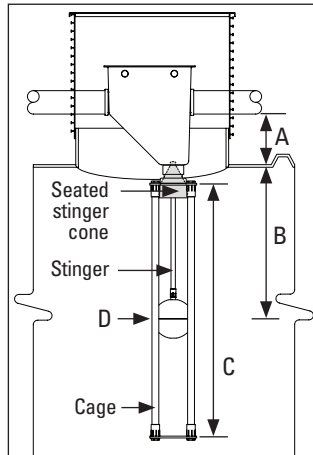
### Inspection Points – Recirculation/ Blend Tank

Complete all of the inspections and checks described in the “Inspection Points – Tanks and Basins” section of this manual and then verify that the inspection points below are as follows:

1. **Recirc valve:** Verify the recirc valve is set so that the maximum water level in the tank matches the maximum liquid level as specified by the engineer. If the maximum liquid level is not on the plans, a general rule is to set it at 80% of the tank depth for straight-walled tanks or 80% of tank volume for curve-walled tanks.

2. **Stinger length:** Adjust the length of the recirc valve stinger based on installation instructions.

- a. Calculate the necessary stinger length adjustment using the equation  $(A+B)-16"$  or  $(A+B)-406$  mm, where A is the distance from the MM valve invert to the top of the tank and B is the distance from the top of the tank to the 100% discharge level. If the stinger needs to be lengthened to near or beyond the length of the cage, the cage will also need lengthening.



- b. Stinger Adjustment Dimensions:

- A = Distance from invert of MM valve to top of tank
- B = Distance from top of tank to the liquid level where 100% bypass is desired, typically 80% of the tank's volume
- C = Standard cage length: MM4 49 inches (1245 mm), fits stingers up to 36 inches (914 mm); MM6 57 inches (1448 mm), fits stingers up to 40 inches (1016 mm)
- D = Middle of ball (at the 100% discharge level)

**NOTE:** There should be a minimum of 9 inches (229 mm) from the normal liquid level to the “RO” float.

### Inspection Points – AdvanTex® Filter Pods

Your system may include AX100 filter pods (shown) or AX20 filter pods. For AX20 inspection points, see the residential *Installation Manual* and residential *AdvanTex O&M Manual*, provided in Appendix B.

#### 1. Installation

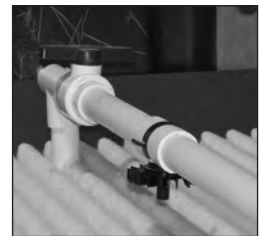
**inspection:** Verify the AX100 pod has been properly installed. Improper installation is usually indicated by the conditions listed below:



- **Sidewall bowing** — Check for any sidewall bowing in the pod. The bowing may cause excessive spacing between media sheets. If the spacing between the media sheets exceeds ½-inch (13 mm), cut the fiberglass rods for the correct media sheet spacing.
- **Lid misalignment** — Lid bolts will only go into the holes if the lid is lifted slightly and the bolts are partially inserted prior to closing the lid.

2. **Manifolds and Laterals:** Flush the manifolds and laterals. See the *AX100 Treatment Systems Installation Manual and Field Maintenance Report Form* in Appendix B for more information.

For proper operation after flushing the manifolds and laterals, turn the ball valves to their correct positions and turn the spray nozzle turbines to point down.



3. **System Pressure:** Verify the pressure gauge is set to zero. If it is not, open the seal at the top and let the pressure equalize with atmosphere. Install the pressure gauge, turn on the recirc pumps, and set to 3.0 psi (20.6 kPa).

**NOTE:** On systems plumbed in parallel, adjust the pressure in all three pods at the same time to 3.0 psi (20.6 kPa) using the gate valve on the pod manifold.

4. **Pod drainage:** Verify that the pod drains easily. If the pod does not drain, check to see if the shipping plug has been removed from the pod outlet.

5. **Lid bolt installation:** When you have finished inspecting all pods, remove the pressure gauge and secure the lids on the pods with the included lid bolts.

## Inspection Points (continued)

### Inspection Points – Vent Fan Assembly

A current sensor monitors the vent fan operation. If the fan fails, this sensor will open and activate an alarm. Some vent fan assemblies are equipped with optional heater units for reliable performance in cold weather. Check your system plans to determine if your vent fan assembly includes a heater.



1. **Current sensor operation:** To test the current sensor, switch off the power to the fan and verify the visual alarm on the control panel is activated.

**NOTE:** TCOM control panels have a 12-hour delay in the audible alarm for the current sensor.

2. **Optional heater unit:** There are two types of heater unit controls available for vent fan assemblies: a single set-point style and a multiple set-point style. If your system is equipped with an optional heater unit, check your system plans to determine the type of heater included in the vent fan assembly.
  - Single set point — Locate the heater inside the vent fan assembly enclosure, remove the heater cover in the vent fan assembly, and set the thermostat to 43° F (6° C).
  - Multiple set points — In the control panel, set the “Heater On” point at 35° F (1.6 °C), “Heater Off” point to 45° F (7.2 °C), “Fan On” point to 35° F (1.6 °C), and “Fan Off” point to 25° F (-3.8 °C).

### Inspection Points – Distribution Valve

To verify that the distribution valve is operational, the valve must be hydraulically loaded with the conditions under which it will operate. Use the system plans to find the location of all distribution valves in the system.

1. **Verify liquid level:** Make sure that the tank or basin that you are pumping from has sufficient liquid to perform the test.

**WARNING:** There is no motor protection in TCOM panels and panels without “RO” alarms. Before running a pump, always verify that there is sufficient liquid in the tank or basin.

2. **Turn on pump:** Toggle the “AUTO-OFF-MAN” switch for the pump that pressurizes the distribution valve to “MAN.”

3. **Leak inspection:** Once the distribution valve is pressurized, inspect the unions on the distribution valve for leaks. Tighten any unions that are leaking.

4. **Operation inspection:** Open and close the ball valve to test the operation of the distribution valve.
  - When the valve is closed and opened, the flow should transition from one leg of the valve to another. Observe the clear section of the leg to verify this transition. There may be flow in more than one leg, but there should only be full flow in one leg at any time.
  - When the ball valve is fully closed, the system will fully pressurize (deadhead condition). Incorrectly installed connections in the line may separate and require reinstallation before testing can be completed.
  - If the distribution valve does not rotate correctly, open the distribution valve and inspect for debris or breakage. If the problem is not a mechanical issue, review the plans for potential installation issues, including elevation.



### Housekeeping

1. Verify that all control panels are turned on and all “AUTO-OFF-MAN” switches are toggled to “AUTO.”
2. Close all control panels.
3. Close and bolt down all tank access lids and riser lids.

**WARNING:** AN UNBOLTED RISER LID OR OPEN TANK IS A SAFETY HAZARD! Tank and riser access lids must be properly secured at all times. If bolts are lost or damaged, contact Orenco immediately for replacements.

4. Police the area for debris and tools.



## Maintenance

### Tools, Equipment, and Spare Parts List

Many of the recommended maintenance and troubleshooting procedures require specialized tools, equipment, and spare parts. Refer to the residential *AdvanTex O&M Manual*, provided in Appendix B, for a list of items to have on hand.

### Record Keeping

Maintain a written log describing all activities relating to the AdvanTex system. This information is very valuable for analysis and trouble shooting if problems should occur. A *Field Service Report Form* and a *Field Maintenance Report Form* are provided in Appendix B for your convenience.



### Maintenance Equipment

#### Safety and Hygiene

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Plastic tarp
- Protective clothing
- Rags
- Rubber gloves
- Trash bags

#### Routine Inspection and Maintenance

- Biotube® filter cradle (OM-BIOTUBE CRADLE)
- Beakers or bottles
- Calculator
- Channel lock pliers
- Dissolved oxygen (DO) meter or colorimetric ampoules
- 3/16" hex head drill bit
- Drill
- Electrical tester (voltage and amperage)
- Extension cord
- Extra lid bolts
- Laptop with null modem cable (TCOM & VCOM only)

- Hook for raising floats to test them
- pH meter or pH test strips
- Pressure gauge
- Sample bottles
- Sludge and scum measuring device (e.g. Nasco Sludge Judge®) for sludge and Orenco SMUG for scum
- Tape measure
- Telephone for testing dial tone – (TCOM & VCOM only)
- Test strips for nitrate, ammonia, alkalinity
- Turbidity meter
- Watch or stopwatch

#### Repairs

- Adhesive
- Backflow prevention device
- Extension cord
- Flashlight with spare batteries/bulb
- Float switches
- Hacksaw with spare blades
- Hammer
- Hand tools
- Heat gun (torch)
- Hole saw (vari-bits: 3/4" and 1-3/8")
- Hose with nozzle
- Inspection mirror (e.g. Prototek™ "Mirror on a Stick")
- PVC cement and primer
- PVC fittings
- PVC pipe
- Screwdriver set
- Shovel Snake (building sewer)
- Spare parts for downstream components
- Waterproof wire nuts
- Wire stripping/crimping tool (10 to 22 AWG)
- Wrench (24" or 600 mm pipe wrench)
- Wrench (lid bolt)

## Maintenance (continued)

### Preventive Maintenance

As with any engineered system, such as a car or heat pump, your wastewater treatment system will work better and last longer if it is regularly maintained by a qualified service provider. The service provider should be present during installation, so he or she is familiar with the system, especially those service lines, conduits, and connections that get buried.

Your system will work better and last longer if you learn what not to put into the treatment system. There should be no disposal of toxics or chemicals into the system, such as restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo and its waste products, and other toxics. As a general rule, nothing should go into any wastewater treatment system that hasn't been ingested, other than toilet tissue, mild detergents, and wash water. Every system user and qualified service provider should be familiar with the basic guidelines below:

- No septic additives
- No flammable or toxic products
- No excessive use of household cleaners or chlorine bleach
- No pool or spa products
- No disposing of pharmaceuticals
- No pesticides, herbicides, or agricultural chemicals or fertilizers
- No RV waste (unless the system is specifically designed and engineered to treat such waste)
- No surface runoff and storm water
- No excessive amounts of fats, oils and grease (FOG)
- No food byproducts
- No cigarette butts
- No paper towels, newspapers, sanitary napkins, diapers, disposable wipes, floss, gum or candy wrappers, etc.
- No chlorides or water softener backwash

Preventive maintenance should start with facility user and/or homeowner education. Orenco Systems®, Inc. can provide a manual of Do's and Don'ts to distribute upon request. To request multiple copies of this manual, contact Orenco Systems, Inc. at 1-800-348-9843.

With preventive maintenance and periodic inspections, the wastewater treatment system will function for decades.

### Scheduled Maintenance

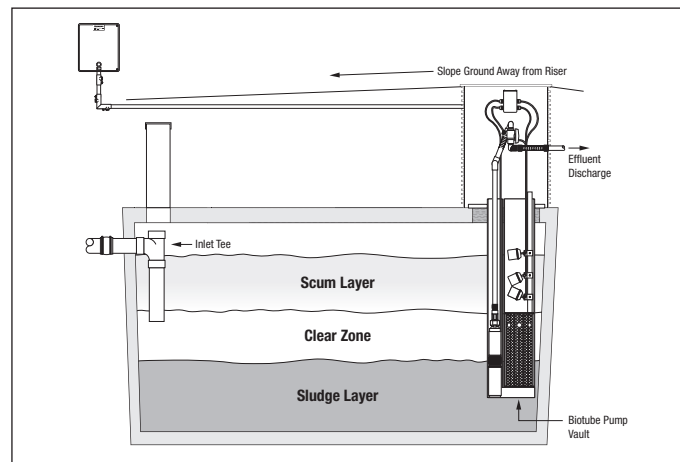
Scheduled maintenance should be performed in the time frames described in this section. A chart showing scheduled maintenance activities and times is included at the end of this section, for your convenience.

### Monthly Maintenance

Once a month, during the first year of operation, make a visual inspection of the liquid levels in the septic, recirculation/blend, and dosing tanks. The liquid level should never be lower than the "Redundant Off" float. If liquid leaks out of the tank, the scum layer can drop to the level of the perimeter holes in the pump vaults and cause the screen to plug. A watertight tank is important and any leakage must be corrected.

During the first year of operation, check the Biotube® filter in the septic tank every month and clean when necessary. Follow the applicable instructions found in Appendix B for cleaning Biotube filters.

Once a month, during the first year of operation, the Biotube Pump



Vaults should be examined to determine if cleaning of the Biotube filter is necessary. If the liquid level inside the vault is discernibly different from the level outside the pump vault while the pump is running, cleaning is required. Remove the filter cartridge and clean it following the applicable instructions in Appendix B.

Once a month, read the hour meters and event counters for the recirculating/blend and dosing tank's pumps. Each pump should run approximately the same number of hours and turn on approximately the same number of times as their operating counterpart. If the run times or cycle times differ significantly between pumps, determine the cause of the discrepancy and take corrective measures.

If there is a distributing valve, manually cycle the valve through every outlet to confirm proper operation.

## Maintenance (continued)

### Quarterly Maintenance

Testing for Biochemical Oxygen Demand (BOD<sub>5</sub>); Total Suspended Solids (TSS); Fats, Oils, and Grease (FOG); Ammonia (NH<sub>3</sub>); Nitrate (NO<sub>3</sub>); and pH should be done according to regulatory requirements. If testing is not required by the regulatory jurisdiction, samples should be taken quarterly for the first year to establish a baseline. Subsequent testing after the first year may be reduced based on the establishment of this baseline. Regular samples will provide valuable information for ongoing maintenance and troubleshooting. Effluent testing procedures may be found in the residential *AdvanTex O&M Manual* in Appendix B. All results obtained should be reported to the appropriate people, including Orenco's Engineered Systems Department.

For the first year only, check voltages and amperages of all pumps and record them on the *Field Maintenance Report Form* provided in Appendix B. Refer to the start-up voltages and amperages recorded in the "Start-up & Operation" section of this document. If the voltage drop or the amperage exceeds National Electric Code (NEC) requirements (see chart provided in "Inspection Points —Pumps" section of this document), have an electrician verify the service line and check the pump windings. If there is no discernible difference in voltage or amperage, this procedure may be performed annually.

### Semi-Annual Maintenance

Inspect the spray of the nozzles in the AdvanTex pods. Look for reduced or uneven spray patterns as well as clogged spray nozzles or biological growth on the spray nozzles. Observe and measure the residual pressure. Refer back to the Start-up & Operation section for initial



measurements of residual pressure. If the observed residual pressure exceeds the initial residual pressure (3 psi) more than 15-20%, it can be assumed that some of the nozzles are plugged and the laterals require flushing. To flush the laterals, open the ball valves at the end of one lateral. At the control panel, toggle the "AUTO-OFF-MAN" switch to "MAN" and let the pump run to flush any material from the lateral. Repeat for each lateral until all of the laterals have been flushed. Recheck the residual pressure to ensure the laterals have been sufficiently cleared.

If there is still a significant difference in initial and current residual pressure, use an Orenco AX lateral cleaning brush or a high-pressure washer to clean the laterals.

To clean out the spray nozzles, turning the laterals so the spray nozzle turbines are pointed up and then hosing each turbine off. For excessive buildup in the spray nozzles, remove the nozzles and replace them with clean nozzles. Soak the plugged nozzle in TSP or any other approved cleaning agent for 30 minutes. When a spray nozzle is clear, you can see the spray nozzle turbine spin freely and the spray distribute evenly across the textile media. If the nozzles are substantially plugged after six months, then it may be prudent to inspect the residual pressure every three months and adjust scheduled testing and flushing of the laterals accordingly.

Visually inspect the recirculating valve and verify that the liquid level in the tank is within the normal range. Consult the design plans for proper operating level. If the liquid level is low, the ball mechanism could be jammed in the seated position. Remove, disassemble, and inspect. If the liquid level is high, the valve may require cleaning because it is not making a tight seal when seated. Remove, disassemble, and inspect.

## Maintenance (continued)

### Annual Maintenance

Measure the scum and sludge accumulation in all tanks annually. Record scum and sludge measurements on a *Field Maintenance Report Form*.

**1. Measuring the scum layer:** Using a scum utility measuring gauge or similar tool, measure the thickness of the scum layer. With this measurement, determine if the distance from the bottom of the scum layer at the liquid's lowest normal level to the bottom of the outlet tee or to the top of the inlet holes for the pump vault is 3 inches (76 mm) or less. If so, it's time to pump out the contents from the tank (scum, sludge, and liquid) completely. After removing the septage contents from the tank, refill it with water to its normal operating level.

**2. Measuring the sludge layer:** Using a Sludge Judge® or similar tool, measure the thickness of the sludge layer. With this measurement, determine if the distance from the top surface of the sludge to the bottom of the outlet tee or inlet holes for the pump vault (PVU) is 6 inches (152 mm) or less. If so, again, it's time to pump out the contents from the tank (scum, sludge, and liquid) completely. If the tank is fitted with a pump vault or effluent filter discharge assembly, take the measurement from the top surface of the sludge layer to the bottom of the vault's inlet ports. After removing the septage from the tank, refill it with water to its normal operating level.



**NOTE:** Turn the laterals in the AdvanTex® treatment unit 180 degrees (so the spray nozzle turbines face up) prior to flushing to prevent nozzle clogging while material is being pushed along the lateral to the flushing valve.

Once a year, send copies of the complete activity log to the appropriate person. This information is very valuable for analysis and troubleshooting if problems should occur.

Check voltages and amperages of all pumps and record them on a *Field Maintenance Report Form*. Refer to the start-up voltages and amperages recorded in the "Start-up & Operation" section of this document. If the voltage drop or amperage exceeds NEC requirements, have an electrician verify the service line and check pump windings.

The pumping system should be inspected annually to ensure it is operating properly. Unscrew the stainless steel bolts that fasten the fiberglass lid over the pumping equipment. Remove the fiberglass lid for an inspection that includes these steps:

- a. Verify there are no obvious holes or leaks in the riser or around the perimeter of the riser connection to the tank. Wetness or watermarks may be an indication of weeping.
- b. Inspect the splice box to ensure it is free of water. Ensure the lid and connections are secure.
- c. Verify the floats are in good condition and properly secured to the float tree. Verify the float cords are neatly wrapped inside the riser so that they cannot interfere with the operation of the floats.
- d. Verify float operation. Refer to the float tests in the "Start-up & Operation" section of this document.

All TCOM control panels contain a lithium battery for backup. For good measure, we recommend you replace the battery every two years. Refer to "Battery Replacement" in the *Custom TCOM Control Panels and HyperTerminal Access Manual*, provided in Appendix F.

## Maintenance (continued)

### Scheduled Maintenance Reference Chart

**NOTE:** All designer specifications and local regulatory requirements should be followed. This table provides Orenco's minimum recommended guidelines.

Scheduled Maintenance Reference Chart		Recommended Activity Period				
		Monthly	Quarterly	Semi-annually	Annually	Biannually
<b>Activity</b>	Visual Inspection of Tank Liquid Levels	• <sup>1</sup>	•			
	Check Biotube® Effluent Filters; Clean as Required	• <sup>1</sup>	•			
	Check Biotube® Pump Vault Filters; Clean as Required	• <sup>1</sup>	•			
	Record Elapsed Time Meters and Event Counters for All Pumps	•				
	Confirm Proper Operation of Automatic Distributing Valve (if applicable)	•				
	Sample Influent and Effluent Quality Parameters <sup>2</sup>		• <sup>1</sup>	•		
	Confirm and Record Pump Voltages and Amperages		• <sup>1</sup>		•	
	Inspect Distribution of Effluent in AdvanTex Pods; Clean as Required			•		
	Measure Inlet or Residual Pressures to AdvanTex Pods; Clean as Required			•		
	Inspect Recirculating Valve			•		
	Record Scum and Sludge Accumulation in Tanks				•	
	Flush Distribution Laterals in AdvanTex Pods				•	
	Inspect Pumping System Components; Clean as Required				•	
	Replace Lithium Battery in TCOM Control Panel (if applicable)					•

<sup>1</sup> This maintenance schedule is only required during the first year of system operation.

<sup>2</sup> Recommended guidelines only. Sampling should be scheduled according to regulatory requirements.

## Maintenance (continued)

### Corrective Maintenance

An alarm is triggered when the liquid in the tank reaches a level that is either higher or lower than it should be, under normal operating conditions.

When responding to an alarm, first discern the type of alarm being activated. If it is due to pump failure, test each pump manually and locate the failed pump. To replace the pump, see the “Removing & Replacing Inoperative Pumps” section of this document. Remove the access riser lid and visually inspect the liquid level. If a high liquid level or low liquid level has caused the alarm, follow the appropriate procedures below.

### High Liquid Level Alarm

1. Determine if the high water alarm is from higher than expected usage (i.e., special event, etc.). If there is a long-term increase in flows, then timer settings need to be adjusted accordingly.
2. When a high liquid level condition exists, the source of the problem is likely to be one of the following:
  - a. Poor valve seal – Consult the design plans for proper operating level and visually inspect the recirculating valve to verify the liquid level in the tank is within the normal range. If the liquid level is high, the valve may require cleaning because it is not making a tight seal when seated. Remove, disassemble, and inspect.
  - b. Control panel breakers tripped – Check the circuit breakers, switches, and fuses in the system control panel. If separate breakers in the main panel were used for the pumps and controls, also check these breakers. If a breaker is found to be tripped, reset the breaker. If the breaker trips immediately, check the wiring for a short or bad breaker. If the breaker or breakers don't trip again, then the problem has probably been found or has corrected itself. Test the automatic function of the system as shown in the “Start-up & Operation” section of this manual to verify proper operation.

- c. Faulty floats – If, after checking the circuit breakers, fuses, and switches, the pump still does not operate, toggle the “AUTO-OFF-MAN” switch to “MAN.” If the pump engages, the problem is likely to be in the float system. (If the motor contactor engages but the pump doesn't run, go to step g, “Water in splice box or loose wires.”) Pump the tank down to a level below the “Override Timer On/Off” float. Cycle the pump to simulate the timer on and off periods so the effluent is dosed to different zones of the AdvanTex® system. Toggle the “AUTO-OFF-MAN” switch to “AUTO.” Do not leave a pump in the “MAN” position unattended. If you do, the pump can continue to operate without liquid, possibly drawing solids into the filter and causing potential failures. Isolate the float switches and check to ensure all floats are operating properly. If a float is found to be faulty, refer to the “Removing & Replacing Inoperative Floats” section in this document.

**IMPORTANT!** Before doing any work on either the wiring to the level control floats and pump or inside the pump control panel, switch off the power to the system at the service entrance panel and set the circuit breakers in the panel to their “OFF” positions.

- d. Pump clogged or not clean – Check the pump for discharge flow. Close the ball valve, disconnect the union in the discharge plumbing assembly and turn the union so it is facing down. Engage the pump and visually inspect the approximate flow rate being discharged. If you are unsure of the discharge rate, measure the time it takes to fill a five-gallon bucket with the discharge. Check this value against the appropriate pump curve. If the flow rate is insufficient, the pump may need to be cleaned. Refer to the *Pump Repair Manual* provided in Appendix D.
- e. Valves closed – If the pump operates in the proper flow range, check all downstream valves to ensure that they are in the open position. If the valves are all open, test the discharge pressure of the pump. For proper pump testing methods, refer to the *Pump Repair Manual* provided in Appendix D.

## Maintenance (continued)

- f. Pump failure or bad electrical connection – Check the panel to verify the motor contactor engages. If it engages but the pump doesn't operate, then it is either a pump failure or a bad electrical connection.
- g. Water in splice box or loose wires – Remove the access riser lid and the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove the water with a baster, sponge, or other appropriate method. Carefully check the splices to ensure they are intact and remain watertight. If all splices are found to be watertight, replace the splice box lid. In the control panel, carefully tug on each wire going to the splice box. Correct any wires that are loose. Reactivate and retest the system.
- h. Leaks in tank or system – If the system operates but can't keep up with the flow, check the system for watertightness. A leaking tank can infiltrate enough water to overcome the pump. Also check for leaking fixtures in the facility or home, though it is unlikely a leaky fixture could provide enough liquid to overcome the pump.
- c. Tank leaks – If the hydraulics of the system do not allow for siphoning, it is likely that the tank is leaking. Fill the tank to a normal operating level and return to inspect the tank at a later time. If the liquid level is below the normal operating level, the tank is leaking and needs to be repaired or replaced.
- d. Clogged pump vault cartridge – If the pump vault cartridge is clogged, the pump may be high cycling, causing the liquid level in the vault to drop faster than the liquid level in the tank. Remove the filter cartridge and clean it in accordance with the instructions provided in Appendix B.

### Low Liquid Level Alarm

1. Determine the actual flows in the system. If the flows are considerably less than the timer is set for, then adjust the timer settings to match current flows. If a low level exists in the drainfield pump basin, then ensure the minimum run time is appropriately set.
2. When a low liquid level condition exists, the source of the problem is likely to be one of the following:
  - a. Ball valve mechanism jammed – Visually inspect the recirculating valve and verify the liquid level in the tank is within the normal range. Consult the design plans for proper operating level. If low, the ball mechanism could be jammed in the seated position. Remove, disassemble, and inspect.
  - b. Tank siphoning – Inspect the liquid level in the tank. If the liquid level is below the "Redundant Off/Low Level Alarm" float, then it is likely that the problem is either a leaky tank or siphoning. Siphoning typically occurs when the system is pumping downhill. A system will not necessarily siphon every time it operates. It is dependent on the system design. A siphoning system can be retrofitted with an anti-siphon valve. Most siphoning problems will manifest in the first months of operation.

### Removing & Replacing Inoperative Floats

**IMPORTANT!** *Before doing any work on either the wiring to the level control floats and pump or inside the control panel, switch off the power to the system at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions.*

1. Remove the float assembly from the vault. There is no need to move the settings of the floats to remove and replace a float. After noting the tether length, snap the inoperative float out of the holding collar.
2. Remove the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove water with a baster, sponge, or other appropriate method. Loosen the cord grip at the splice box and identify the appropriate splice for the float. Cut out the splice and, if using a watertight wire nut for the common wires, remove the appropriate common wire.
3. Remove the inoperative float and replace it with a new one. Push the float cable through the watertight cord grip into the electrical splice box. Leave an adequate length of electrical cord coiled inside the riser to allow for easy removal of the float assembly. Do not remove the colored markers or the paper tags from the float cords, and do not try to thread the markers and tag through the cord grip. Tighten the cord grip by hand, then test the tightness of the cord grip by tugging on the cord. A cord is secure when the cord grip is tight enough to prevent slippage. An adequate length of cord should be left within the splice box to allow for future disconnecting and re-splicing.

## Maintenance (continued)

4. Splice the float wires to the wires from the control panel following the wiring schematics provided in Appendix F. Attach the common wire with the other commons using the waterproof wire nut. It may be necessary to replace this wire nut with a new watertight wire nut. Always use watertight wire nuts or heat shrink splice kits for all connections!
5. Replace the float in the collar, using the same tether length, and return the assembly to the pump vault.
6. Reconnect power and test the unit per the instructions provided in the "Start-up & Operation" section of this manual.

### Removing & Replacing Inoperative Pumps

**IMPORTANT!** *Before doing any work on either the wiring to the level control floats and pump or inside the control panel, switch off the power to the system at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions.*

1. Close the ball valve on the discharge plumbing assembly, disconnect the union, and carefully remove the pump and attached plumbing from the tank. Disconnect the pump from the discharge plumbing assembly.
2. Remove the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove the water with a baster, sponge, or other appropriate method. Loosen the cord grip at the splice box and identify the appropriate splice for the pump. Cut out the splices and label the wires.
3. Remove the inoperative pump and replace it with a new one of the same type. Push the pump cable through the watertight cord grip into the electrical splice box. Leave an adequate length of electrical cord coiled inside the riser to allow for easy removal of the pump. Tighten the cord grip by hand, not by tool; then test the tightness of the cord grip by tugging on the cord. A cable is secure when the cord grip is tight enough to prevent slippage. An adequate length of cord should be left within the splice box to allow for easy removal for future disconnecting and re-splicing.
4. Splice the pump wires to the appropriate wires from the control panel following the wiring schematics provided in Appendix F. Always use watertight wire nuts or heat shrink splice kits for all connections!
5. Reattach the discharge plumbing assembly and carefully lower the pump into the flow inducer alongside the Biotube® pump vault. Be careful not to lower the pump by the cable or to pinch the cable when lowering it into the flow inducer. Reconnect the union and open the ball valve.
6. Reconnect power and test the unit per the instructions provided in the "Start-up & Operation" section of this manual.





## 19. Appendix 11 – AdvanTex Troubleshooting Guide

DRAFT

# AdvanTex® O&M MANUAL

PART 2: ADVANCED SERVICE TIPS AND TROUBLESHOOTING GUIDE



## Part 2: Advanced Service Tips and Troubleshooting Guide

# O&M MANUAL



**Orenco Systems®**  
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*Changing the Way the  
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### Introduction

As an authorized AdvanTex® Service Provider, you play a crucial role in Orenco's AdvanTex Program.

Orenco has always advocated regular, professional servicing of all onsite systems ... not just during the warranty period but for the life of the system. Regular servicing optimizes the treatment process and protects the property owner's investment. It also ensures that onsite systems protect public health, protect the environment, and are viewed as a reliable, sustainable technology.



Orenco relies on you to perform the AdvanTex system start-up, do routine (scheduled) maintenance, and respond to calls for unscheduled maintenance (alarm calls). We also rely on you to keep in contact with the homeowners or property owners, review the *Homeowner's Manual* with them, advise them on preventive maintenance, and work to keep the system under a continuous service contract. Equally important, we rely on you to keep good service records on the system, creating a "history" of its performance.

To make your job easier, Orenco has created one of the most service-friendly and trouble-free onsite systems on the market. AdvanTex is a packed bed (media) filter. And media filters are the most suitable technology for onsite wastewater treatment because they are reliable and provide consistent, high-quality effluent. We then paired our media filter with a remote telemetry control panel, to allow you to "view" the system right from your computer. And we've provided a Web-based business tool — [advantextservice.com](http://advantextservice.com) — to help you file and retrieve system data automatically, schedule service events, and manage service technicians.

Finally, we've provided classroom and field training, as well as support materials, like this O&M Manual. Please read it thoroughly, and refer to it often.

We're very proud of our AdvanTex Treatment System. Like all our products, it has gone through extensive research, development, and field-testing. Then each component is built to written specifications and subjected to quality review, before shipping. In addition, our AXN models meet the requirements of NSF-ANSI Standard 40 for Class I Systems.

Thank you, in advance, for your knowledge, your conscientiousness, and your good work.



*All product and performance assertions are based on proper design, installation, operation, and maintenance according to Orenco's current published documentation.*

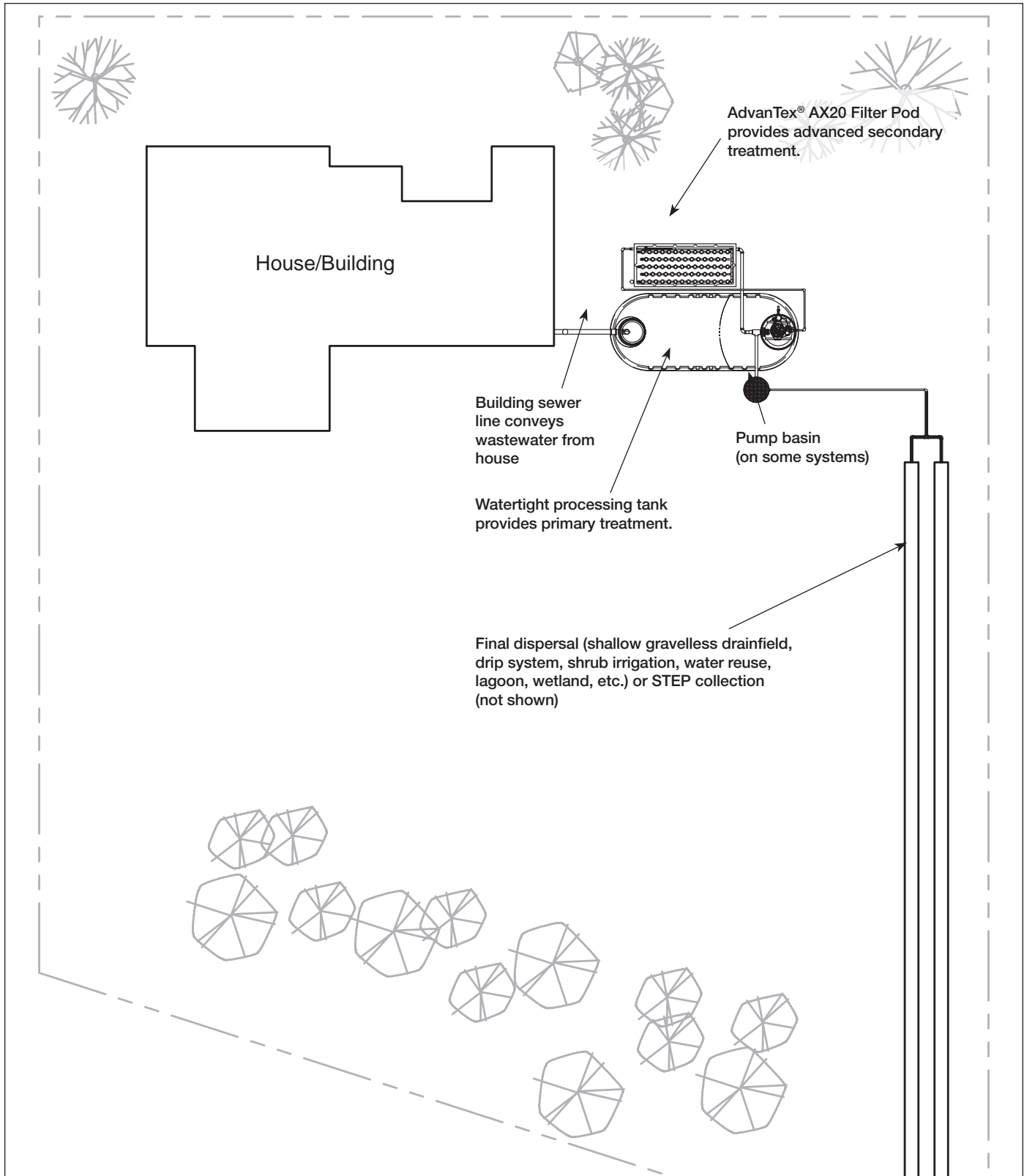
# AdvanTex® O&M MANUAL

## PART 2: ADVANCED SERVICE TIPS AND TROUBLESHOOTING GUIDE

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### Typical Site Plan for an AdvanTex® Treatment System



### How the AdvanTex Treatment System Works

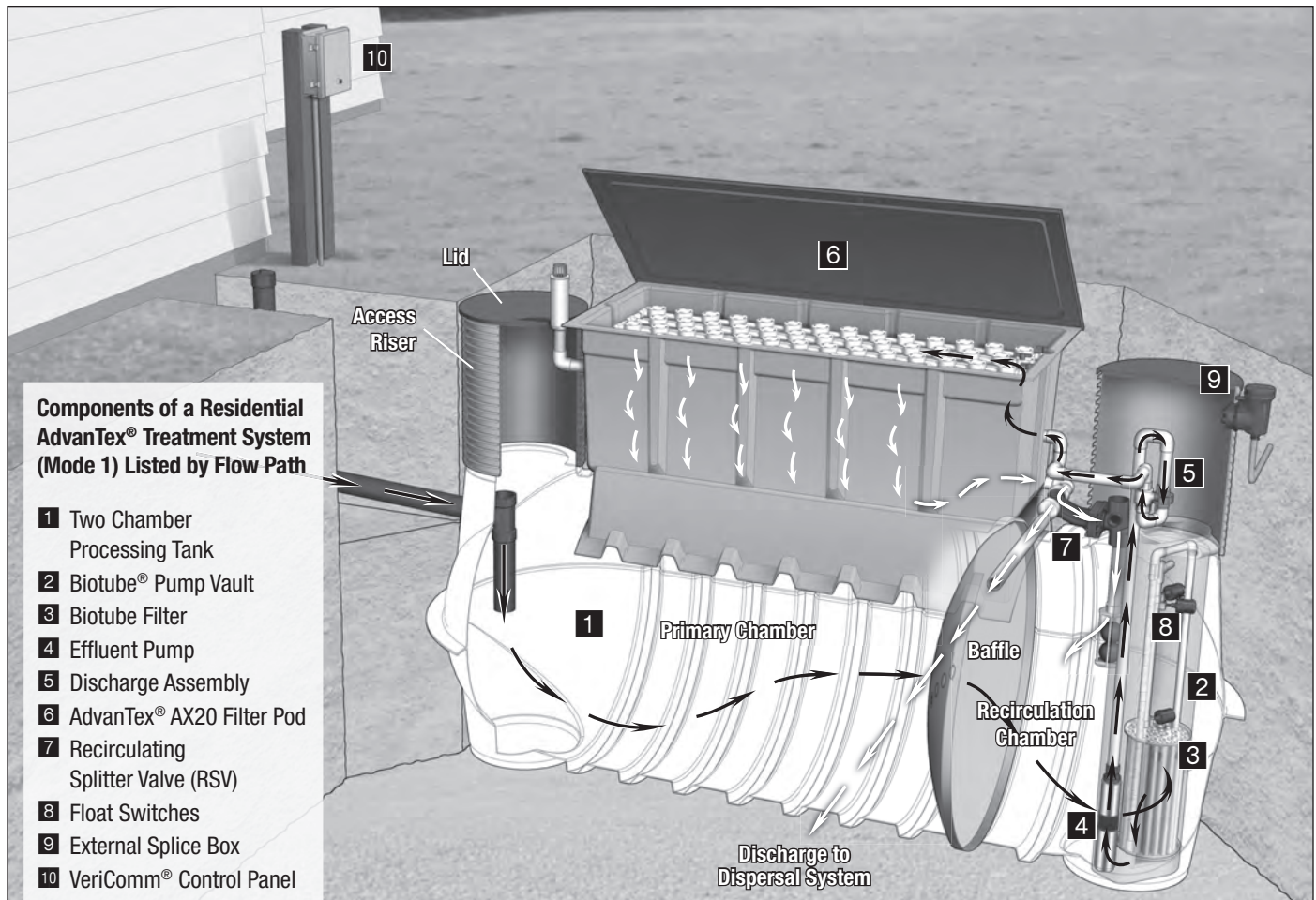
The AdvanTex Treatment System consists of a watertight processing tank and the AX20 textile filter pod. Wastewater from the home flows to the tank, where natural biological and physical processes provide primary treatment. In the primary chamber of the tank, the wastewater separates into three layers: a floating scum layer, a bottom sludge layer, and a relatively clear layer of liquid effluent in the middle.

From the secondary chamber, a pump draws liquid effluent through the Biotube® filter and sends it to the AX20 pod. There, the effluent is sprayed over hanging sheets of porous synthetic textile media. Microorganisms live in this moist, oxygen-rich (aerobic) environment. As effluent trickles over and through the sheets, the microorganisms break down the contaminants and eliminate them.

Effluent recirculates between the tank and the AX20 pod. In Mode 1, the most common configuration, the effluent recirculates to the second compartment of the tank. In Mode 3, effluent recirculates to the first compartment. This mode is used where maximum removal of nitrogen from the effluent is required.

After recirculating several times, the effluent is discharged, either directly from the processing tank or after first being collected in a pump basin. Depending on the design for a particular site, the treated effluent may be discharged to a drainfield, an underground drip irrigation system, a constructed wetland, an effluent sewer (STEP) system, or a reuse system. The system may include equipment for ultraviolet (UV) disinfection before ultimate dispersal of the effluent.

Properly designed, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 5 mg/L BOD<sub>5</sub> and 5 mg/L TSS. This level of treatment is better than what municipal wastewater plants provide. The system can also be configured to reduce nitrogen levels as required locally. When effluent treated in this way is dispersed to the soil, natural processes purify it further, and it eventually returns to the underlying water table, where it can be used again.



### Equipment List

Routine maintenance and troubleshooting require a variety of tools, equipment, and spare parts. We recommend that an Authorized AdvanTex Service Provider have the following items at hand:

#### For Routine Inspection and Maintenance

- Cordless drill with 3/16-in. Allen wrench for lid bolts on risers and pod
- Extra lid bolts
- Sludge and scum measuring device (e.g., Nasco Sludge Judge® for sludge and Orenco SMUG for scum)
- Hook for raising floats to test them
- Biotube® filter cradle (OM-BIOTUBE CRADLE)
- Backpack pressure washer
- Trash pump (and generator, if pump is electric) for removing solids from discharge basin
- AX20 manifold brush (AX-LATERALBRUSH)
- AX20 sheet cleaning wand (AX-CLEANINGWAND)
- Handheld computer (PDA) with Bluetooth® Kit or laptop with null modem cable (optional, to turn pump on and off at a distance from the panel)
- Electrical tester (voltage and amperage)
- Phone line tester (available from RadioShack®)
- Dissolved oxygen (DO) meter or colorimetric ampoules
- Sample bottles with grab sample device
- Turbidity meter
- pH meter or pH test strips
- Test strips for nitrate, ammonia, alkalinity
- Tape measure
- Calculator
- A copy of the *AX20 Installation Instructions* (NIM-ATX-AX-1) and *AdvanTex O&M Manual Part:1 Start-Up and Routine Maintenance* (AIM-OM-ATX-1), for reference

#### For Repairs

- Adhesive (ADH100, SS140, SS115, SS845)
- Control panel parts (circuit breakers, motor contractors, relays)
- Effluent pumps
- Extension cord
- Flashlight
- Hand tools (pliers, wrenches, screwdrivers, drill bits, hammer, shovel, hand saw, etc.)
- Inspection mirror (e.g., Prototek "Mirror on a Stick")

- Plumber's snake
- PVC cement and primer
- PVC fittings (3/4 in. to 2 in.)
- PVC pipe (3/4 in. to 2 in.)
- Spare parts for downstream components (e.g. drip headworks, UV disinfection unit)
- Waterproof wire nuts
- Wire stripping/crimping tool
- Float switches

#### For Troubleshooting

- Digital camera
- Watch or timer
- A copy of Part 2 of the AdvanTex O&M Manual: *Advanced Service Tips and Troubleshooting Guide* (AIM-OM-ATX-2)

#### For Personal Hygiene and Cleanup

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Protective clothing
- Rags
- Rubber gloves



### Factors Affecting the AdvanTex Treatment Process

Properly designed, installed, and operated, a Residential AdvanTex Treatment System can treat wastewater to 5 mg/L BOD<sub>5</sub> and 5 mg/L TSS. If treatment performance fails to meet that standard, the cause may be the design, installation, settings, or use of the system — or more likely, a combination of those factors. Here's what happens in each part of the system, and how each of these factors can keep the system from performing as well as it should.

#### Processing Tank

Primary treatment happens in the tank, and several conditions inside the tank affect the ultimate effluent quality. The first is the **incoming wastewater**: its strength (concentration), mass loading (amount of each wastewater component), hydraulic loading (volume), and chemical characteristics. Residential wastewater (raw influent) typically has BOD<sub>5</sub> of 450 mg/L, TSS of 500 mg/L, and total Kjeldahl nitrogen (TKN) of 70 mg/L. Practices in the home may raise the levels of these components and may also introduce harmful chemicals and indigestible solids into the system. Although the AdvanTex system is robust enough to accommodate a houseful of weekend guests or a couple of days of canning, residents must be aware that in the long run, certain habits can harm their septic system or increase the need for system servicing and/or pumping. The Troubleshooting section of this manual lists some household practices to inquire about when a system has problems.

In addition to the composition of a home's effluent, the **size of the tank** and the **volume of the effluent** also affect performance. Residential systems are sized and designed to accommodate the North American average of 50-60 gallons per person per day and are sized for a certain number of residents. A change in the number of residents, or a sudden increase in their water use per capita, can push wastewater through the tank without allowing the minimum 24 hours of retention time required for thorough separation and digestion of wastes.

Finally, the tank and all pipe joints must be **watertight** to prevent both infiltration and exfiltration of liquid. Infiltration of rainwater or groundwater will overload the system, preventing proper stratification in the processing tank and overloading the AdvanTex textile filter. Exfiltration of liquid effluent from the tank can make liquid levels too low for stratification, leading to clogging of the Biotube® effluent filter. Of course, exfiltration also pollutes the soil, and potentially the groundwater.

#### AdvanTex Textile Filter

The AdvanTex textile filter provides secondary wastewater treatment. The filter is a sturdy, watertight fiberglass basin filled with a nonwoven textile material. This lightweight, highly absorbent media treats a large amount of wastewater in a small space because it has a very large surface area

— about five times greater than that of an equivalent volume of sand, for example. Textile also has a greater void volume (for free flow of oxygen) and greater water-holding capacity.



These properties make it an excellent environment for aerobic microorganisms to live and digest the nutrients in effluent. As effluent from the processing tank percolates through and between the sheets of textile, the microorganisms remove what they need from it, reducing BOD<sub>5</sub> and TSS. Also, the aerobic conditions within the AdvanTex filter are ideal for microbes that convert ammonia to nitrates (nitrification). For sites where maximum denitrification is necessary, AdvanTex filters can be configured in Mode 3, so that the filtrate recirculates back to the high-carbon, low-oxygen environment at the inlet end of the processing tank, which is ideal for microbes that reduce nitrates to nitrogen gas (denitrification). Harmless nitrogen gas is then released back into the atmosphere.

In addition to being affected by **oxygen**, the AdvanTex filter's performance is affected by **mass loading, hydraulic loading, strength, and chemical characteristics** of the influent. If the effluent coming from the processing tank is contaminated with harsh chemicals or excessive grease, the biomat of microorganisms will suffer. The graphs on the next page show that low-to-moderate loading rates produce BOD<sub>5</sub> and TSS of <5 mg/L, and higher loading rates produce BOD<sub>5</sub> and TSS in the range of 15-25 mg/L.

#### About Recirculation Ratio

Maintaining an **appropriate recirculation ratio** is important for proper functioning of the system. Adjusting the frequency and length of the doses of effluent delivered from the tank to the AdvanTex filter optimizes the conditions for the microorganisms.

A recirc ratio that's too high can generate a highly aerobic biomat growth on the pump filter. It also increases alkalinity consumption and dissolved oxygen concentration in the processing tank, which can inhibit denitrification. Conversely, a recirc ratio that's too low can tend to liberate periodic odors during dosing events. The optimum ratio is typically between 2:1 and 6:1.

### Normal Performance of the AdvanTex System

The table below summarizes the typical levels of BOD<sub>5</sub>, TSS, and TKN in each part of the AdvanTex system, if proper conditions (described in the preceding section) are met:

#### Typical Values in the AdvanTex Treatment System

	BOD <sub>5</sub> (mg/L)	TSS (mg/L)	TKN (mg/L)
Raw Influent <sup>1</sup>	450	500	70
Primary Chamber Effluent	150	40	70
Secondary Chamber Effluent <sup>2</sup>	15-40	10-20	<sup>4</sup>
AXN Filtrate <sup>3</sup>	5	5	<sup>4</sup>

<sup>1</sup> Source: Crites and Tchobanoglous. *Small and Decentralized Wastewater Management Systems*, p. 180, 183, 1998. McGraw-Hill. Based on 50 gpcd.

<sup>2</sup> Will vary with recirc ratios and mode configuration. The numbers here represent a recirc ratio between 2:1 and 6:1 and are derived from Orenco and third-party testing in Mode 1.

<sup>3</sup> Actual performance results, based on a six-month accumulative average from NSF (National Sanitation Foundation) testing on the AX20N at 500 gpd, using composite sampling. Performance and servicing frequencies will vary relative to the mass load being treated. Procedures for treating excessively high loads will require engineering review. For more information, please review AdvanTex Design Criteria.

<sup>4</sup> Dependent on treatment system configuration and recirc ratios.

When all parts of the AdvanTex system are operating correctly and the component values in each part are within the limits above, the typical values or properties from field tests of AdvanTex effluent (filtrate) are summarized in the table below.

#### Typical Values for AdvanTex Effluent (Filtrate)

Parameter	Sampling Method	Typical Values or Properties
Clarity	Visual <sup>1</sup>	Clear (≤15 NTUs)
Odor	Sniff <sup>2</sup>	Non-offensive (musty is OK; rotten egg or cabbage is not OK)
Biotube®	Visual	No liquid level differential inside/outside filter
Oily film	Visual; inside the pump vault	None; no red, blue, green, or orange sheen
Foam	Visual; inside tank	None
pH	Field <sup>3</sup>	6-9
DO	Field <sup>3</sup>	≈2.5-6

If effluent is cloudy or smells pungent or if the biomat on the textile filter appears greasy, waxy, or oily, laboratory tests of the filtrate will aid troubleshooting. Following are the typical values for various lab tests of AdvanTex filtrate.

<sup>1</sup> To check for clarity, service providers can carry a portable turbidity meter or calibrated turbidity standards.

<sup>2</sup> To check for odor, service providers can simply sniff the effluent sample or can use a sulfide measuring packet or an olfactory sniffer device.

<sup>3</sup> To check for pH, service providers can use litmus paper, a pocket pH meter, or a benchtop pH meter.

#### Typical Values for Supplemental Lab Tests

Sampling Parameter	Sampling Method	Typical values <sup>1</sup> (mg/L)	
		Mode 1	Mode 3
BOD <sub>5</sub>	Grab	≈10	≈10
TSS	Grab	≈10	≈10
TN	Grab	≈25	≈10-20 <sup>2</sup>
G&O	Grab	<1	<1

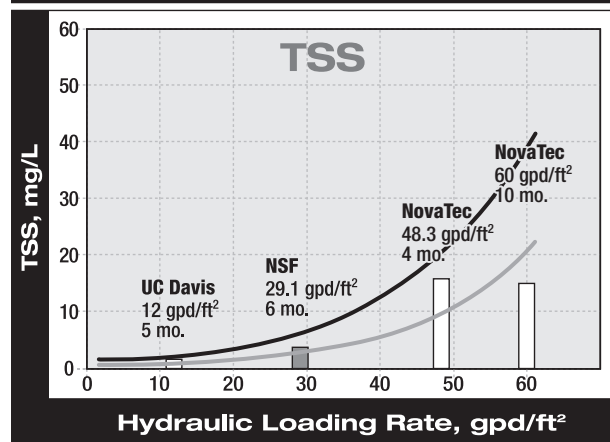
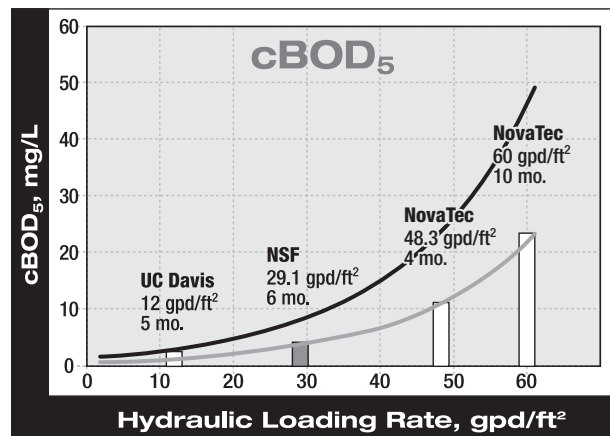
<sup>1</sup> Values are based on testing by Orenco and third parties.

<sup>2</sup> Typical nitrogen reduction ranges from ≈60-70%, with sufficient carbon source and alkalinity.

<sup>3</sup> To check for dissolved oxygen, use a DO meter or DO test kit.

#### Effluent Quality vs. Hydraulic Loading Rates

##### ANSI/NSF Standard 40 and Other Third Party Testing Results



— 95% Confidence Level — Current Average  
 ■ Recommended Design Range for Residential Strength Waste

### Troubleshooting Effluent Quality



Once you know the typical values for wastewater treatment system performance, you can be proactive and troubleshoot nontypical process indicators, before system performance is affected.

#### Low Effluent Quality

If your effluent samples are cloudy and color/turbidity is significantly higher than expected (greater than 15 NTU), do the following:

- Check the Biotube® filter for clogging.
- Check to see if the textile filter smells of chemicals (medication, chlorine, etc.) or has a granular or crusty appearance. (For example, a white crystalline crust could signal that water softener discharge or industrial strength detergents have been flushed into the system.)
- Check to see if the recirc ratio is too high or the pump dose time is too long. If the effluent cBOD<sub>5</sub> is high and TSS is low, a large amount of soluble cBOD<sub>5</sub> has not yet been consumed. That would likely be because the recirc ratio is too low for the influent strength or insufficient start-up time has elapsed. Typical organic reduction within the first 24 hours in residential systems is about 75% or greater. As the biomat begins to develop, greater reductions in the soluble cBOD<sub>5</sub> will occur (typically within the first 7-10 days). With a higher influent strength, the soluble cBOD<sub>5</sub> would not be readily removed until the biomat on the media is established.
- Check that ventilation is occurring, at the pod and from the house to the tank.
- Interview the users about system abuse, especially in the area of harmful chemicals, solvents, strong cleaning agents, or water softener backwash.

**Special Note about Water Softeners:** *Water softener backwash is extremely high in salts, which can disrupt system performance, especially nitrogen reduction processes. Talk with residents to make sure that no water softener backwash is discharging into the processing tank. Plumbing water softener backwash into the processing tank voids the warranty.*

If none of these troubleshooting steps makes a difference, lab tests may be necessary to determine the cause of the problem. Call Orenco for recommended lab tests or design remedies.



#### Odor

If the tank or textile filter smells like rotten eggs or cabbage:

- Check dissolved oxygen levels using a DO meter or DO wet test kit.
- Note filtrate DO levels that are <2.5 (less than 2.5) or >6 (greater than 6) mg/L.

Filtrate DO that's <2.5 mg/L indicates insufficient oxygen. If the filtrate DO is <2.5 mg/L:

- Check filter surface for evidence of clogging.
- Check that the pump is working.
- Check that ventilation is occurring, at the pod and from the house to the tank.
- Check that the recirc ratio isn't too low; increase if too low.
- Check that influent strength isn't too high (see AdvanTex Design Criteria).
- Check to ensure hydraulic retention time isn't too high.

Filtrate DO that's >6 mg/L indicates excessive aeration. If the filtrate DO is >6 mg/L:

- Check to ensure recirc ratio isn't too high.
- Check to see if influent flows are below normal.
- If influent flows are below normal or recirc ratio is too high, reduce recirc ratio.

### Troubleshooting Other Symptoms

#### Biotube® Filter Clogging

If a visual inspection of the Biotube® filter for biomass build-up shows the need for cleaning more often than once a year (annual cleaning is typical for recirculating systems), try the following:

- Verify the pump isn't running too long (typically 3 cycles/hour).
- Ensure the recirc ratio isn't too high.
- Verify normal DO levels; if high, reduce recirc ratio.
- Check for below normal influent flows.
- Check influent Grease & Oil and TSS; if excessive, a review of component sizes may be required.



#### Oily Film

All signs of oil or grease anywhere in the system (in the tank, in the vault, on the effluent filter or textile filter) must be investigated. Ask the system user to identify the probable source:

- Recent change of car oil?
- Canning meat or poultry?
- Excessive use of garbage disposal?
- Excessive use of bath or mineral oils? (Jacuzzi® tub?)
- Excessive use of detergents?

If the system user can't identify the probable source, try the following:

- Sample and test at all process steps, including influent (if possible).
- Label, date, and photograph all samples.
  - When photographing, use standard glass beakers and set samples in front of a common, uniform background
- Check biomat accumulation at AdvanTex Filter.
- Note if biomat is yellowish and wax-like or lard-like. If so, scrape biomat sample for analysis:
  - Photograph/document biomat sample.
  - Send to lab with effluent samples.

Excessive grease and oil (>25 mg/L) is typically a design and management concern with commercial applications.

#### Foam

Foam rarely occurs in packed bed filters. If you see foam in the textile filter, call Orenco.

### Troubleshooting Nitrogen Reduction

AdvanTex Treatment Systems do an excellent job of reducing nitrogen, especially in the Mode 3 configuration, where total nitrogen (TN)\* is typically reduced to 10-15 mg/L, from typical influent total Kjeldahl nitrogen (TKN)\*\* of 70 mg/L. Because many people purchase AdvanTex for its nitrogen-reducing capabilities, and because nitrogen reduction is a complex, many-staged process, it's important to understand the process, its related factors, the signs of effective nitrogen reduction, and how to keep the process optimized.

It's also important to know the TN limits required by the system user's permit. Some regulatory agencies have no requirement; some require a specific percentage reduction of a certain kind of nitrogen (90-95% nitrification of ammonia nitrogen, for example); and some require that TN be reduced to levels at or near drinking water quality at the point of final dispersal. A level of 20 mg/L TN is becoming increasingly accepted by regulators because it's typically achievable without relying on supplemental carbon and alkalinity feeds.

Finally, because influent characteristics greatly affect the amount of nitrogen reduction possible from any given system, it's vital to know the alkalinity of your waste source and the local or regional norms for organic and ammonia nitrogen.



### The Process

Appendix 1 describes the nitrification/denitrification cycle in more detail, but a brief description should help you with most troubleshooting. In nitrogen reduction, ammonia is converted to nitrate in an aerobic environment, and then reduced through bacterial action in an anaerobic environment to nitrogen gas, which is released harmlessly to the atmosphere. Optimum nitrogen reduction typically requires the following:

- Adequate alkalinity of approximately 250 mg/L or higher (a lab test shows levels).
- pH of 6-9. Fixed-film microbial processes generally thrive between pH 6 and 9. Treatment problems typically result from rapid changes in pH rather than extreme long-term mean values, although long-term levels can result in less efficient process activity.
- Filtrate DO level of 2.5-6 mg/L, process tank DO level of <1 mg/L.
- Adequate time for the nitrifying bacteria to develop (one to three months).
- Adequate temperature (below 40° F retards the process).
- Good organic removal.

For a thorough description of the nitrogen reduction process, see Appendix 1. In residential wastewater, the ammonia level is typically about 60 mg/L and the TN is typically ≈70 mg/L.

### Signs of Effective Nitrogen Reduction

Service providers frequently ask us, "How do I know if my wastewater treatment system is reducing nitrogen?" A thorough description of key indicators is included in Appendix 1. Following is a brief summary:

- Clear, odorless filtrate effluent (a "see and sniff" test is generally considered sufficient).
- Normal-looking biomat on the textile filter (light-brown to dark-brown and gelatinous in texture).

Additional filtrate tests will show ...

- Typically, low BOD<sub>5</sub>, low turbidity and high clarity.
- DO of ≈ 2.5-6 mg/L.
- Low ammonia levels (≈<1-3) and relatively high nitrate levels, since nitrification converts ammonia to nitrate.

\* Total Nitrogen (TN) is the sum of organic nitrogen (ON), ammonia nitrogen (NH<sub>3</sub>-N), nitrate nitrogen (NO<sub>3</sub>-N), and nitrite nitrogen (NO<sub>2</sub>-N).

\*\* Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen (ON) and ammonia nitrogen (NH<sub>3</sub>-N).

### Troubleshooting Nitrogen Reduction (continued)

#### Troubleshooting Nitrogen Reduction

If you suspect that the system is not meeting expectations for nitrogen reduction, troubleshoot each of the critical factors that contribute to optimum nitrogen reduction, to determine a cause.



**Filtrate Alkalinity Too Low** — Sufficient alkalinity is required to achieve the desired degree of nitrification for any wastewater treatment system, because it takes 7.14 parts alkalinity to nitrify 1 part ammonia.

If filtrate alkalinity is too low:

- Check the recirc ratio; a high recirc ratio increases alkalinity consumption.
- Check influent TKN or ammonia levels and source alkalinity.

If a large quantity of nitrification is required, it may be necessary to add alkalinity-raising chemicals to the system.

**Filtrate pH Too Low** — Nitrification is particularly sensitive to pH but tends to thrive at levels between pH 7 and 8. The nitrification process releases hydrogen that consumes alkalinity and causes pH levels to drop. A pH level of <6 retards microbial activity of all kinds, including denitrification, and with a pH level <5.5, nitrification may show signs of degradation. Maintaining an alkalinity of 50 to 80 mg/L in the effluent is typically sufficient to maintain pH levels above 5.5. If the filtrate pH level is too low:

- Check influent alkalinity level (pH drops when too much available alkalinity is consumed).
- Check recirc ratios; reduce if too high.
- Ask system user about chemical discharges into the system, including carpet cleaners, chlorine, and photo developing agents.

**Filtrate DO Levels Outside Range of 2.5-6 mg/L** — If filtrate DO is too low (indicating insufficient oxygen), the system may release sulfide odors during dosing events, or there may be a more lasting smell within the filter pod. Try the following:

- Check for surface clogging/ponding and clean as necessary.
- Check air flow through the vent assembly.
- Check the recirc ratio; if it's too low (<2:1), increase as necessary.

If your filtrate DO is too high (indicating excessive aeration), it's likely that excessive recirculation or insufficient hydraulic retention time are factors. Try decreasing the recirc ratio.

**High Filtrate Ammonia Levels** — Because ammonia is biochemically oxidized to nitrate during nitrification, high ammonia levels are a sign that something is amiss. Try the following:

- Check for surface clogging/ponding and clean as necessary.
- Check for sufficient aeration (measure DO).
- Ensure no blockage of air flow into textile filter (indicated by thick biomat development or a build-up of grease and oils).
- Ensure no blockage in the manifold, causing ...
  - Localized hydraulic overloading, saturation
  - Short circuiting
- Check for sufficient alkalinity; if insufficient, consider supplemental buffering using equipment that automatically adds an alkaline compound to the system. Call Orenco Engineering for assistance, if necessary.



### Troubleshooting Nitrogen Reduction (continued)

**Low Filtrate Nitrate Levels** — Residential packed bed filters normally yield more than 98% nitrification (conversion of ammonia to nitrate). Therefore, the ammonia levels in the filtrate should be low and the nitrate levels higher. Some denitrification occurs in the packed bed filter, so the normal nitrate level may vary. Be sure you are familiar with the mode of operation, as some AdvanTex modes are configured to produce lower nitrate levels. If it appears that nitrification is dropping off:

- Check the recirc ratio; adjust as necessary (high recirc ratios may drive pH too low for effective nitrification/denitrification, and low recirc ratios may not provide sufficient aeration).
- Verify incoming ammonia levels.
- Check recirc/blend for excessive organic food source (high BOD<sub>5</sub> may cause greater oxygen demand through the filter, reducing nitrification).

**Adequate Time and Temperature** — Nitrifying bacteria require one to two months to develop, and extremely cold temperatures (below 40° F) retard that process. If the AdvanTex Treatment System has been installed in a very cold climate, nitrification may not “kick in” for several months until warmer temperatures are reached. Typically, a June-September installation provides the necessary temperatures for a 30-60 day nitrification start-up time. Once nitrifiers colonize, they typically continue to nitrify through normal winter conditions. Only in severely cold regions should additional insulation be necessary.

### Appendix 1: More Information about Nitrogen Reduction

Nitrogen removal (or “nitrification/denitrification”) is a biochemical process. In nitrification, ammonia is oxidized to nitrate ( $2\text{NH}_3$  converts to  $2\text{NO}_3 + 3\text{H}_2\text{O}$ ). This nitrate is then reduced through bacterial action (denitrification) to nitrogen gas, which is released harmlessly to the atmosphere.

During the nitrification process, about 9 parts oxygen are consumed in converting 2 parts ammonia to nitrate. Therefore, depending on the concentration of ammonia, a considerable amount of air may be needed. Other processes, like  $\text{BOD}_5$  reduction, may occur simultaneously and further elevate the demand for aeration, especially if the organic level is high. In an abundance of air, all the aerobic or facultative microbes compete for their share of oxygen.

When the organic concentration is high, the microbes that oxidize organic matter, primarily the heterotrophic bacteria, are aggressive and tend to outcompete other microbes for the available free oxygen in solution. Ammonia is oxidized by autotrophic bacteria, which do not have as aggressive a growth rate, so if oxygen is not abundant, nitrification suffers. Consequently, the nitrification process usually lags until the organic concentration is depleted or until sufficient oxygen is present. At a 2.5:1  $\text{BOD}_5/\text{TKN}$  ratio, the nitrifiers may only make up about 10 percent of the microbial population. At 0.5:1  $\text{BOD}_5/\text{TKN}$ , the nitrifiers make up about 35 percent of the population.

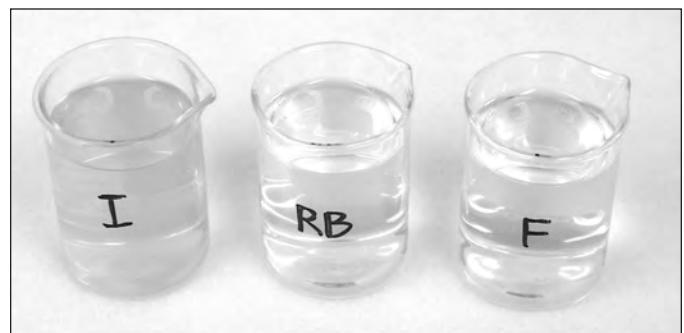
In a filtering process, the filter column must be deep enough, or the filter media must be efficient enough at filtering organic particles, to deplete organic concentrations to a level in which a sufficient population of nitrifiers will be sustained. The physical (dimensional) features of the filter will vary depending on the media’s characteristics — void ratio, moisture holding capacity, and effective surface area per unit volume ratio. Tankage, surge capacity, application rates, and loading characteristics are other design considerations that play a role in the sizing of the filter unit.



### Performance Indicators

To judge the nitrogen-reducing performance (or potential) of any wastewater treatment system, be sure to check the following performance indicators:

**Clear, Odorless Effluent** — Simple, “see and sniff” tests can be performed easily in the field. Effluent from packed bed filters (recirculating textile filters, recirculating sand filters, intermittent sand filters) that are performing well should be clear (with turbidity <20 NTUs) and odorless.



**Tests for Ammonia and Nitrate Nitrogen** — If the system is oxidizing ammonia to nitrate (nitrifying), lab tests should measure relatively low ammonia levels and relatively high nitrate levels in the filtrate. Because nitrification responds to many and varying conditions within the aerobic treatment processes, *ammonia and nitrate nitrogen levels in the filtrate are the most ideal constituents to watch for any changes in performance.* Start-up times can be plotted, optimum recirc ratios can be gauged, cleaning frequencies can be predicted, and nonvisible clogging or saturation can be detected by watching either of these constituents.

Typical nitrification in single-family residential systems is expected to be in the 98-99% range. Investigate if the process appears to degrade by 5 percentage points or more.

**$\text{BOD}_5$**  — The nitrification process requires oxygen, which is why nitrification is enhanced when  $\text{BOD}_5$  is extremely low. Measures of filtrate  $\text{BOD}_5$  should be <15 mg/L, although higher  $\text{BOD}_5$  may not necessarily correlate with low levels of nitrification.

Typical influent characteristics are shown on page 8. When  $\text{BOD}_5$  is high, there is a greater organic demand for oxygen, which may hamper the nitrogenous demand for oxygen. Increasing the recirc ratio should help establish oxygen balance.

### Appendix 1: More Information about Nitrogen Reduction (continued)



**Biological Growth on Filter** — With “fixed film” treatment systems, biological growth on the filter media is natural. The biomat should appear light-brown to dark-brown in color and gelatinous in texture.

**Dissolved Oxygen** — Dissolved oxygen also provides critical information with which to diagnose how well a system is performing. Measures of DO should be in the range of 2.5 to 6 mg/L. If the DO level drops, the degree of nitrification will normally drop as well, which could be a sign of

blinding or saturated flow conditions

— anything that might inhibit free air from flowing into the system. (Nevertheless, it’s quite possible to have low filtrate DOs and still have high effluent quality, as measured by BOD<sub>5</sub> and TSS levels.)



**pH** — For normal residential nitrogen loads, pH is typically maintained between 6 and 8.

**Influent Characteristics** — Influent characteristics (see page 9) will greatly affect the amount of nitrogen reduction that is possible from any wastewater treatment system. High solids and/or fats and cooking oils increase the oxygen demand and accumulation of material on and within the media, affecting the available oxygen for nitrification.

**Alkalinity** — The nitrification process releases hydrogen ions into solution, which tends to lower the pH level. Alkalinity is essential for nitrification. For each part ammonia that is nitrified, 7.14 parts alkalinity are consumed (buffering the acidity caused by the release of hydrogen ions). Consequently, if the degree of nitrification is less than expected, it could simply be a lack of sufficient alkalinity to support more. Typical residential nitrification requires alkalinity above about 250 mg/L for recirculating processes and double that for single-pass processes.

Many wastewater streams do not have sufficient alkalinity to support complete nitrification. In this case, nitrification may deplete the alkalinity, and pH may drop to a level that retards the microbial activity (<6). Recirculating the effluent helps, since half the alkalinity can be restored in the recirc or process tank, wherever denitrification occurs (and adjusting the recirc ratios may also bring the pH back to preferred operating levels). But wastewater streams that are alkalinity-starved can’t provide for 100% nitrification.

The use of low flush fixtures can reduce nitrification performance. Low flush fixtures tend to reduce hydraulic loads, which causes elevation of wastewater constituents (i.e., higher concentrations of BOD<sub>5</sub>, TSS, TKN, etc.). In this case, the available alkalinity in the water supply may not be adequate to accomplish the full level of nitrification desired.

These constraints exist for all wastewater treatment operations, regardless of whether the operation involves a suspended growth contact stabilization process or an attached growth packed bed filter. Packed bed systems will perform better, especially if they have a large attached growth surface area per unit volume ratio, because the micro-sites near the attached side of the biomat, where denitrification typically occurs, return some of the alkalinity. Textile packed bed filters, because of their large surface area per unit volume ratio, tend to perform even better.

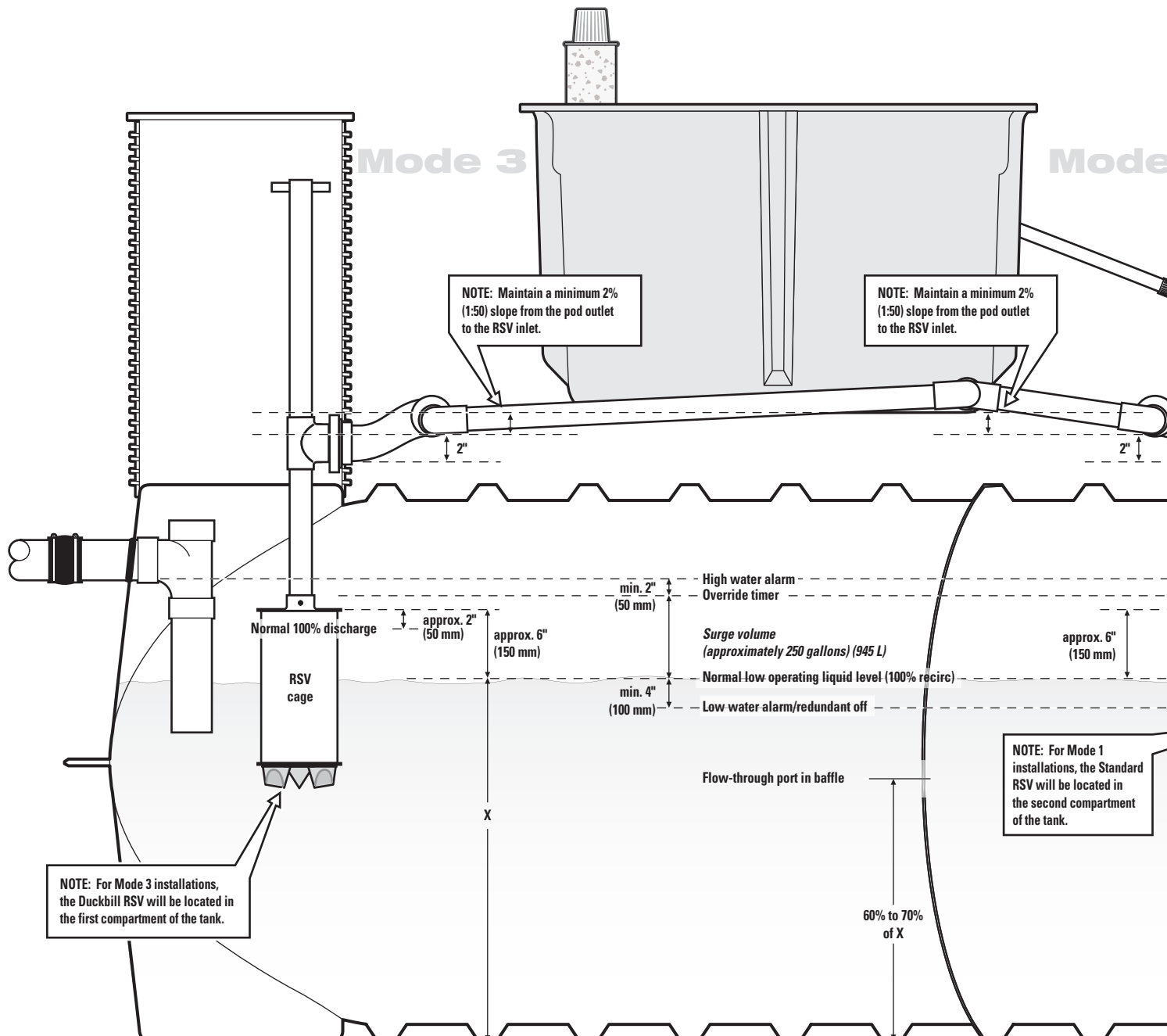
Nevertheless, additional buffering may be necessary to accomplish the level of nitrification desired. In low alkalinity conditions, pH adjustment can be made with the addition of quicklime or hydrated lime, soda ash, or caustic. If the alkali is to be introduced at a process point preceding sedimentation zones, such as in the tank, lime would be preferred. Soda ash and caustic both contain sodium, which is a dispersant and will impede settling of solids in the tank.

### Appendix 2: Float and RSV Settings

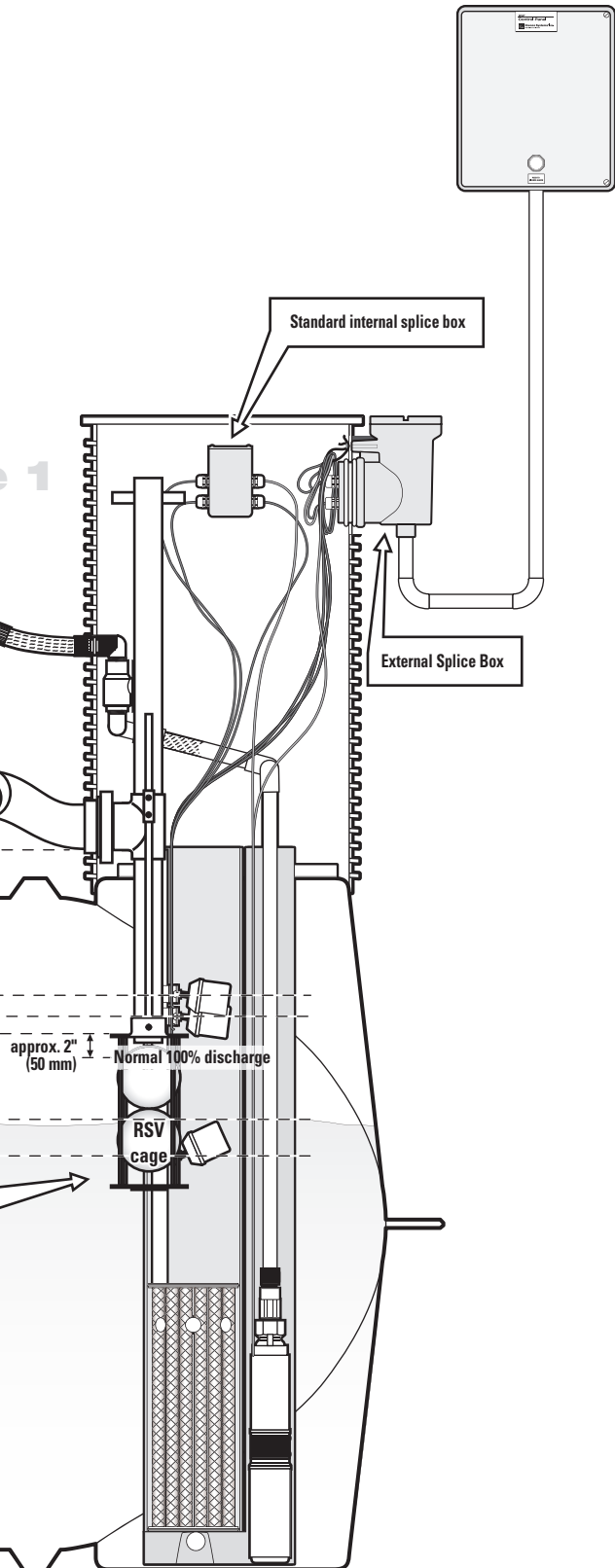
Orengo will provide the float and RSV settings for tanks that are approved for use with AdvanTex Treatment Systems in your area. Service Providers are simply required to verify that the float and RSV settings are correct.

This diagram shows how these settings are established for AdvanTex Treatment Systems that use a VeriComm® Control Panel. The diagram

shows both a Mode 1 and a Mode 3 setup. For Mode 1 setups, the recirculating splitter valve (RSV) is installed in the second compartment, with the Biotube pump vault. For Mode 3 setups, the RSV is installed in the first compartment, under the inlet riser.



### Appendix 2: Float and RSV Settings (continued)



#### Typical RSV Levels

For stinger pipe lengths up to 24 in. (610 mm) long, the “normal low operating liquid level” will be approximately 5-6 in. (127-152 mm) below the top of the RSV cage. (The normal low operating liquid level is the level at which 100% of the filtrate returns to the tank.) For most residential applications, the recommended surge volume — the volume between the low liquid level and the high water alarm float — is approximately 250 gallons (948 L). For Mode 3 installations, the duckbill model RSV, which has a flexible PVC tube that vents the RSV cage to atmosphere, is required.

#### Typical Float Levels

Be sure to check the plans for any site-specific or tank-specific float settings. The top float is normally set equal with the tank's invert of inlet. The bottom float should be approximately 4 in. below the normal low operating level.

**NOTE:** Before leaving the site, verify that the “low water alarm/redundant off” float is positioned at least 10 in. (254 mm) below the top of the RSV cage.

### Appendix 3: Timer Settings

The following chart shows recommended timer settings for a new system.

RESIDENTS	TIME ON (SEC)	TIME OFF (MIN)	NOTES
2	10 sec (0.17 min)	20.00	<ul style="list-style-type: none"> <li>Assumes water usage of 50 gal. (190 L) per person per day and a return recirculation ratio of 3 : 1 (Filter recirculation ratio of 4 : 1).</li> <li>Override OFF cycle time is set at one-half of the OFF cycle time.</li> <li>Override ON cycle time is set the same as the ON cycle time.</li> </ul>
3	15 sec (0.25 min)	19.75	
4	20 sec (0.33 min)	19.45	
5	25 sec (0.42 min)	19.70	
6	30 sec (0.50 min)	19.50	

As you gain experience with a system, you may conclude that you need to make adjustments, sometimes significant ones. This worksheet is intended to help you determine appropriate start-up timer settings (Pump ON, Pump OFF) for a single-pod AX20 system. Typical values and ranges are provided for each parameter. If you have any questions or if your values fall outside the desired ranges on this worksheet, contact your Dealer.

PARAMETER	TYPICAL VALUES	NOTES
Number of people	3	Range of 2 to 8 people.
Water usage per person	50 gpd (190 L/d)	Typical daily average is 50 gal. (190 L) per person.
Q <sub>i</sub> Actual daily flow (total)	150 gpd (570 L/d)	(Number of people) x (water usage per person).
R <sub>b</sub> Return recirculation ratio	3 : 1	You can adjust this ratio (return flow to forward flow) up or down depending on system performance. (Range of 2 to 6.)
R <sub>f</sub> Filter recirculation ratio	4 : 1	
Total daily flow to AX20	600 gpd (2280 L/d)	(Actual daily flow) x (return recirculation ratio + 1). Must be ≤ 3000 gpd (11,370 L/d). Actual flow should not exceed 500 gpd (1895 L/d). (500 gpd x 6:1 R <sub>b</sub> = 3000 gpd)
Q <sub>d</sub> Actual pump dose rate	33.3 gpm (126 L/min)	Determine this value by field-testing or by using Orenco's PumpSelect™. Start at the low end.
T <sub>d</sub> Pump ON cycle time (dose)	0.25 min	Select a value between 0.17 minutes (10 seconds) and 0.75 minutes (45 seconds).
T <sub>r</sub> Pump OFF cycle time (rest)	19.75 min	See Pump OFF equation below.

#### PUMP OFF EQUATION

#### EXAMPLE

Plugging in the above values and rounding results in the following:

$$T_r = \left[ \frac{1440 \cdot T_d \cdot Q_d}{(R_b + 1) \cdot Q_i} \right] - T_d$$

$$T_r = \left[ \frac{1440 \cdot 0.25 \cdot 33.3}{(3 + 1) \cdot 150} \right] - 0.25 = 19.74 \approx 19.75$$

After you determine your Pump ON and Pump OFF times, double check to make sure your start-up settings fall within the cycle time (CT) range, below. If they don't, make adjustments per the "Note."

ADDITIONAL PARAMETERS	TYPICAL VALUES	NOTES
CT Cycle time	20 min	Low flow applications may result in cycle times of an hour or more, which can cause the media to dry out or odors to develop in the recirc tank. If CT is much more than 30 minutes, consult your Dealer or Orenco for suggested adjustments.
Pump cycles per day	72 cycles	1440 min/day ÷ (OFF cycle time + ON cycle time). Must not exceed the pump's maximum rated cycles of 300 cycles per day.
Gallons per cycle	8.3 gal. (31 L)	With 68 orifices and using the T <sub>d</sub> range recommended above, you will maintain the recommended 0.08 to 0.25 gal. (0.45 to 0.95 L) per orifice per dose.

### Appendix 4: Glossary

**Alkalinity:** The amount of ions available in the filtrate to react with hydrogen ions. Although pH paper or a pH meter provides a quick field measure of the overall balance of acidity vs. alkalinity in the system and is useful for detecting changes that may cause problems, quantitative determination of alkalinity (measured in mg/L) is done in a lab.

**BOD:** Biological Oxygen Demand, a measure of the amount of organic material in wastewater. cBOD means carbonaceous BOD; the terms are often casually used interchangeably. cBOD<sub>5</sub> means “five-day cBOD” and is a lab test in which the sample is incubated for five days.

**DO:** Dissolved oxygen, in mg/L. It can be measured in the field using a DO meter or colorimetric kit, or in a lab.

**G&O:** Grease and oil, in mg/L, measured in a lab.

**NTU:** Clarity and color of wastewater can be measured in nephelometric units (NTU). Clarity of a sample in a glass container can be compared by eye against a prepared sample. To obtain a quantitative measure of turbidity, a turbidity meter can be used in the field or in a lab.

**pH:** A measure of the acidity or alkalinity of wastewater on a scale from 0 (acid) to 14 (alkaline), with 7 being neutral. pH can be measured in the field using pH test strips or a pH meter.

**TN, TKN:** Total Nitrogen (TN) is the sum of organic nitrogen (ON), ammonia nitrogen (NH<sub>3</sub>-N), nitrate nitrogen (NO<sub>3</sub>-N), and nitrite nitrogen (NO<sub>2</sub>-N). Total Kjeldahl Nitrogen (TKN) is the sum of organic nitrogen (ON) and ammonia nitrogen (NH<sub>3</sub>-N).

**TSS:** Total suspended solids, in mg/L, measured in a lab.



## 20. Appendix 12 – Control Panel Specification

DRAFT

# TCOM™ Timer Setting Guide

## Instructions For Setting Recirculating Pump Timers In Orenco® Telemetry Control Panels

### Overview

Orenco's TeleComm (TCOM) Control panels for AdvanTex® AX100 Treatment Systems are integrated panels that include digital control, data logging, and remote access. With TCOM Control Panels, you can remotely adjust operational parameters and monitor the system's function in real time. The unit has been programmed at the factory for the control functions specified in the design. Some operational parameters, such as recirculation timers, may require adjusting for your specific application.

This document discusses the methods for setting recirculation timing. It supplements the general login and menu structure information found in Custom TCOM™ Control Panels and HyperTerminal Access (EIN-CP-TCOM-3). For additional information specific to your panel, consult your panel-specific TCOM Settings Guide. Read and understand all three of these documents before setting your recirculation timer.

### TCOM Control Panels have three modes for recirculation timing:

**Estimated Flow Mode** is the default mode set by the factory. It's used at startup and when there is not enough flow trend data to implement Trend mode. It enables you to adjust and set the timer using projected flow data without manual calculations. Estimated Flow Mode changes are made on the Rec. Tank Auto Timer Settings page.

**Trend Mode** is the preferred timer setting mode for established systems. Trend Mode enables the panel to run the recirculation timers automatically using historical flow trend data. This mode can only be used after enough historical flow trend data has been collected to enable the system to set the recirculation timers automatically. We recommend that a minimum of two weeks trend data be recorded before this mode is used. Trend Mode changes are also made on the Rec. Tank Auto Timer Settings page.

**Manual Mode** is the mode used to address special circumstances, or to tightly constrain recirculation timer settings. It enables you to manually calculate and input recirculation on and off times based on formulas provided in this document. Manual Mode changes are made on the *Rec. Tank Manual Timer Settings* page.



## General Setting Instructions

This section covers general information about changing recirculation timer settings.

The screens to the left show typical examples of the TCOM **Rec. Tank Auto Timer Settings** page, **Rec. Tank Manual Timer Settings** page, and **Recirc Tank Status** page.

**NOTE:** Screen font styles, sizes, line numbers, and items appearing on page screens may differ, depending on system configuration and user settings.

To change TCOM recirculation timer settings, first select the correct System Status Display page. Changes to Estimated Flow Mode and Trend Mode are made on the **Rec. Tank Auto Timer Settings** page. However, recirculation timer “on” settings for all three modes can only be adjusted from the **Rec. Tank Manual Timer Settings** page. If the Manual Time Set “Value” datapoint on the **Rec. Tank Manual Timer Settings** page is set to “on,” then Manual mode settings will override all recirculation timer setting inputs based on trend or estimated flow! Other changes to Manual mode can be made on the **Rec. Tank Manual Timer Settings** page, as well.

You can view and confirm changes made to a recirculation timer mode on the **Recirc Tank Status** page.

When you are on the page you want, use your keyboard's directional arrows to move your cursor and select a specific parameter. To change the state of the parameter, key the alpha character for the change you want to make from the legend shown at the bottom of the System Status Display pages. Then key “enter” or “return.” To change a numeric value, select the value you want to change, key in “C,” then input the new numeric value, and key “enter” or “return.”

### Page Key

- **PT#** provides each line item with an identification number. This information is specific to your TCOM panel.
- **Description** displays the name and function of the line item.
- **Value** can describe the line item's state, or its numeric value.
- **Sts** identifies the line item value as either automatic (“A”) or constrained (“C”).
- **CurTm**, **PrevTm**, and **Why?** are explained in *Custom TCOM™ Control Panels and HyperTerminal Access (EIN-CP-TCOM-3)*.
- **Choices** explains which key to press to make a particular status or numeric value change to a timer setting.

### HMI-Equipped Panels

Some control panels are equipped with an optional, built-in graphic Human Machine Interface (HMI) touchscreen. The HMI provides a direct method for viewing and manually setting parameters at the panel, which is not covered in this document. Inputting values for HMI-equipped panels using the standard text interface is the same as for non-HMI-equipped panels, with one important, additional step:

You must return all changed “Value” datapoints to “A” after entering all of your new settings, or those values not returned to “A” will not be changeable from the HMI touchscreen.

```

LD 0k Std          SYSTEM STATUS DISPLAY          TUE 7/29/08 17:41
<----->
Quote #061208B1 Custom #123456          Rec. Tank Auto Timer Settings
Pt# Description      Value      Sts CurTm  PrevTm  Why?
49 Use Trend Data?   off 0/F    A   0:02:59 0:00:00 OFF
50
51 Ret RecircRatio    3.0 X:1   C   0:02:59 0:00:00 3.0
52 RT Max Off Time    10.0 Min  C   0:02:59 0:00:00 10.0
53 RT Min Off Time    0.5 Min   C   0:02:59 0:00:00 0.5
54
55 No. of Days-Avg    28.0 1-28  A   0:02:59 0:00:00 28.0
56 Avg Daily Flow     6000.0 GPD  A   0:02:59 0:00:00 Rule
57 qPeak Flow         12000.0 GPD  A   0:02:59 0:00:00 P390
58 RT TrendOffTime    2.55 Min  C   0:02:59 0:00:00 Rule
59 RT Trend OVRoff    0.53 Min  C   0:02:59 0:00:00 Rule
60
61 EstAvgDailyFlow    6000.0 GPD  A   0:02:59 0:00:00 6000.0
62 EstPeakDayFlow     12000.0 GPD  A   0:02:59 0:00:00 12000.0
63 RT EstFlowOffTm    2.55 Min  C   0:02:59 0:00:00 Rule
64 RTEstFlowOvrOff    0.53 Min  C   0:02:59 0:00:00 Rule

Choices: A(auto) O(on) F(off) C(const) P(point) T(timer) N(num) M(menu)
    
```

Typical Rec. Tank Auto Timer Settings page

```

LD 0k Std          SYSTEM STATUS DISPLAY          TUE 7/29/08 17:42
<----->
Quote #061208B1 Custom #123456          Rec. Tank Manual Timer Settings
Pt# Description      Value      Sts CurTm  PrevTm  Why?
65 Manual Time Set    on 0/F     A   0:03:32 0:00:00 OFF
66
67 RT Man Off Time     2.55 Min  A   0:03:32 0:00:00 2.55
68 RT Man Ovr Off      0.53 Min  A   0:03:32 0:00:00 0.53
69
70 RT On Time          1.5 Min   A   0:03:32 0:00:00 1.5
71 RT OVR On Time      1.5 Min   A   0:03:32 0:00:00 1.5
72
73

Choices: A(auto) O(on) F(off) C(const) P(point) T(timer) N(num) M(menu)
    
```

Typical Rec. Tank Manual Timer Settings page

```

LD 0k Std          SYSTEM STATUS DISPLAY          TUE 7/29/08 17:40
<----->
Quote #061208B1 Custom #123456          Recirc Tank Status
Pt# Description      Value      Sts CurTm  PrevTm  Why?
17 RT Alarm Status    0K         A   0:00:33 0:01:02 *OK
18 RT Pump Mode       OffCycl1   A   0:00:33 0:01:02 Rule
19 RT Lead Pump        Two        A   0:01:21 0:00:14
20
21 RT Timer Mode       Normal     A   0:00:33 0:01:02 Rule
22 RT Timer Type       EstFlow    A   0:01:35 0:00:00 *EstFlow
23 RTOffTimeStatus     Normal     A   0:01:35 0:00:00 *Normal
24 RTActiveOffTime     2.55      A   0:01:35 0:00:00 Rule
25 RTActiveOnTime      1.5       A   0:01:35 0:00:00 Rule
26
27 RT Pump1 Status     Off        A   0:01:35 0:00:00 Rule
28 RT Pump2 Status     Off        A   0:01:35 0:00:00 Rule
29
30
31
32

Choices: A(auto) O(on) F(off) C(const) P(point) T(timer) N(num) M(menu)
    
```

Typical Recirc Tank Status page



HMI touchscreen

```

LD Ok Std          SYSTEM STATUS DISPLAY          TUE
<=====
Quote #061208B1  Custom #123456          Rec. Tank Manu
Pt# Description          Value          Sts CurTm
65 Manual Time Set      off 0/F        A  0:03:32
66
67 RT Man Off Time      2.55 Min      A  0:03:32
68 RT Man Ovr Off       0.53 Min      A  0:03:32
69
70 RT On Time           1.5 Min       A  0:03:32
71 RT OVR On Time       1.5 Min       A  0:03:32
72
    
```

Make sure the Manual Time Set “Value” datapoint is “off” before entering trend or estimated flow data

```

LD Ok Std          SYSTEM STATUS DISPLAY          TUE
<=====
Quote #061208B1  Custom #123456          Rec. Tank
Pt# Description          Value          Sts CurTm
49 Use Trend Data?      off 0/F        A  0:02:
50
51 Ret RecircRatio       3.0 X:1       C  0:02:
52 RT Max Off Time      10.0 Min      C  0:02:
53 RT Min Off Time      0.5 Min       C  0:02:
54
55 No. of Days-Avg      28.0 1-28     A  0:02:
56 Avg Daily Flow       6000.0 GPD    0:02:
57 qPeak Flow           12000.0 GPD   0:02:
58 RT TrendOffTime      2.55 Min      0:02:
59 RT Trend OVRoff      0.53 Min      0:02:
60
61 EstAvgDailyFlow      6000.0 GPD    A  0:02:
62 EstPeakDayFlow       12000.0 GPD   A  0:02:
63 RT EstFlowOffTm      2.55 Min      0:02:
64 RTEstFlowOvrOff      0.53 Min      0:02:
Choices: A(auto) O(on) F(off) C(const) P(point)
    
```

Changing default values in Estimated Flow Mode

```

LD Ok Std          SYSTEM STATUS DISPLAY          TUE
<=====
Quote #061208B1  Custom #123456          Rec. Tank
Pt# Description          Value          Sts CurTm
49 Use Trend Data?      on 0/F        A  0:02:
50
51 Ret RecircRatio       3.0 X:1       C  0:02:
52 RT Max Off Time      10.0 Min      C  0:02:
53 RT Min Off Time      0.5 Min       C  0:02:
54
55 No. of Days-Avg      28.0 1-28     A  0:02:
56 Avg Daily Flow       6000.0 GPD    0:02:
57 qPeak Flow           12000.0 GPD   0:02:
58 RT TrendOffTime      2.55 Min      0:02:
59 RT Trend OVRoff      0.53 Min      0:02:
60
61 EstAvgDailyFlow      6000.0 GPD    A  0:02:
62 EstPeakDayFlow       12000.0 GPD   A  0:02:
63 RT EstFlowOffTm      2.55 Min      0:02:
64 RTEstFlowOvrOff      0.53 Min      0:02:
Choices: A(auto) O(on) F(off) C(const) P(point)
    
```

Changing default values in Trend Mode

## Detailed Setting Instructions

This section covers detailed instructions for changing recirculation timer settings in each mode.

Before entering trend or estimated flows, be sure the **Manual Time Set** “Value” datapoint on the **Rec. Tank Manual Timer Settings** page is set to “off.”

Although the default return recirculation value is set at 3 from the factory, actual return recirculation ratios can range from 2-5.

If the number of recirculating pumps operating in the system varies seasonally or due to system expansion, the **PumpsPerDose** “Value” datapoint (not covered in this document) must be set correctly for all three modes of timer settings. Call Orenco for more information.

### 1: Changing Settings in Estimated Flow Mode

Go to the **Rec. Tank Auto Timer Settings** page to make changes.

1. Change the “Value” datapoint for **UseTrend Data?** to “off” by keying “A” or “F” and then keying “enter.”
2. If a return recirculation ratio other than the default value of 3 is desired, change the **Ret RecircRatio** “Sts” datapoint to “C,” key “enter,” input the new numerical value, and key “enter” again.
3. To set the maximum off-time during extended periods of low flows, change the **RT Max Off Time** “Sts” datapoint to “C,” key “enter,” input the new numerical value, and key “enter” again.
4. To set the minimum off-time during extended periods of high flows, change the **RT Min Off Time** “Sts” datapoint to “C,” key “enter,” input the new numerical value, and key “enter” again.
5. To change the **EstAvgDailyFlow** “Sts” datapoint to “C,” key “enter,” input the projected daily flow number, and key “enter” again.
6. To change the **EstPeakDayFlow** “Sts” datapoint to “C,” key “enter,” input the estimated peak flow number, and key “enter” again.

### 2: Changing Settings in Trend Mode

Go to the **Rec. Tank Auto Timer Settings** page to make changes.

1. Change the “Value” datapoint for **Use Trend Data?** to “on” by keying “O” and then keying “enter.”
2. If a return recirculation ratio other than the default value of 3 is desired, change the **Ret Recirc Ratio** “Sts” datapoint to “C,” key “enter,” then input the new numerical value and key “enter” again.
3. To set the maximum off-time during extended periods of low flows, change the **RT Max Off Time** “Sts” datapoint to “C,” key “enter,” input the new numerical value, and key “enter” again.
4. To set the minimum off-time during extended periods of high flows, change the **RT Min Off Time** “Sts” datapoint to “C,” key “enter,” input the new numerical value, and key “enter” again.
5. If a data range for flow trending other than the default value of 28.0 days is desired, change the **No. of Days-Avg** “Value” data point to “C,” key “enter,” input the new numerical value, and key “enter” again.

## 3: Changing Settings in Manual Mode

Go to the **Rec. Tank Manual Timer Settings** page. Use the equations below as a basis for calculating recirculation tank manual off time and recirculation tank manual override off time. Times given are in minutes.

**NOTE:** *Off time cannot be less than 30 seconds for normal and override timer settings.*

### Normal timer settings:

*On time = 1.5 minutes (Default)*

*Off time is described in the equation below:*

$$T_r = \left[ \frac{(T_d)(1440)(Q_d)(P_d)}{(R_b + 1)(Q_a)} \right] - T_d$$

### Override timer settings:

*On time = 1.5 minutes (Default)*

*Off time is described in the equation below.*

$$T_r = \left[ \frac{(T_d)(1440)(Q_d)(P_d)}{(R_b + 1)(Q_p)} \right] - T_d$$

### For both equations:

- $T_r$  = Off time, in minutes (rest)
  - $T_d$  = On time, in minutes (1.5-minute dose, default)
  - 1440 = Available minutes per 24-hr day
  - $Q_d$  = Actual pump dose rate in gallons or liters per minute
  - $P_d$  = Number of pumps per dose
  - $R_b$  = Return recirculation ratio (recirc-blend ratio)
  - $Q_a$  = Average daily flow in gallons or liters per day
  - $Q_p$  = Peak daily flow in gallons or liters per day (estimated at 2x the average daily flow total, unless specified otherwise)
1. Change the **Manual Time Set** "Value" datapoint to "on" by keying "0" and then keying "enter."
  2. Change the **RT Man Off Time** "Sts" datapoint to "C," key "enter," input the new numerical value, and key "enter" again.
  3. Change the **RT Man OVR Off** "Sts" datapoint to "C," key "enter," input the new numerical value, and key "enter" again.
  4. If a recirculation timer "On" setting other than the default is desired, change the **RT On Time** "Sts" datapoint to "C," key "enter," input the calculated values, and key "enter" again.
  5. If a recirculation timer "OVR On" setting other than the default is desired, change the **RT OVR On Time** "Sts" datapoint to "C," key "enter," input the calculated values, and key "enter" again.

**NOTE:** *For additional assistance with recirculation timer settings, contact Orenco's Engineered Systems Department at (541) 459-4449 or (800) 348-9843.*

LD Ok Std		SYSTEM STATUS DISPLAY		
<=====				
Quote #	061208B1	Custom #	123456	Rec. Tank
Pt#	Description	Value	Sts	CurTm
1	65 Manual Time Set	on 0/F	A	0:03:
	66			
2	67 RT Man Off Time	2.55 Min	C	0:03:
3	68 RT Man Ovr Off	0.53 Min	C	0:03:
	69			
4	70 RT On Time	1.5 Min	C	0:03:
5	71 RT OVR On Time	1.5 Min	C	0:03:
	72			
	73			
	74			
	75			
	76			
	77			
	78			
	79			
	80			
Choices: A(auto) 0(on) F(off) C(const) P(point)				

Changing values in Manual mode



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# ATRTU-TCOM

## FIELD USER GUIDE

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# 1 Introduction

## 1.1 Scope

This document contains information regarding the ATRTU-TCOM system developed by Orenco Controls, a division of Orenco Systems Incorporated (OSI). It is intended to help users in the field configure, maintain, and support the ATRTU-TCOM based control systems.

NOTE: This document applies to ATRTU-TCOM firmware version 10.01c.f released 7/2018. Due to variations in functionality between firmware revisions, some feature descriptions may not apply to older versions of firmware. Major changes include expansion of the web server subsystem. The basic concepts of interacting with the system, particularly with TCOM Viewer and terminal mode, are fundamentally the same as previous firmware releases.

## 1.2 System Overview

Control systems incorporate a variety of devices and algorithms to efficiently manage various operations required to manage a process. There are many different types of devices and subsystems involved.

An advanced microcomputer-based system has been developed to control and coordinate the various subsystems and to provide ways to communicate with other devices and humans that may be nearby or literally thousands of miles away from the system. The ATRTU-TCOM system is comprised of multiple interacting mechanical, electrical, and software subsystems. Electro-mechanical components typically include liquid tanks, pipes, pumps, floats, sensors, valves, relays, wiring, and control panels.

The core of the system is the ATRTU-TCOM controller which typically resides in an electrical panel near the system being controlled. The controller is comprised of multiple printed circuit boards, one of which includes an advanced microcomputer based telemetry system. The control computer is programmed to support multiple interfaces to communicate with other devices and to provide human user interfaces.

User interfaces include:

- A built in web server that hosts a web site that can be accessed remotely or locally using a network connection and supports a variety of devices, operating systems, and web browsers.
- A Microsoft Windows® based software application called TCOM Viewer that communicates either remotely or locally using the full range of communication interfaces supported by the ATRTU-TCOM controller.
- A menu driven console style of interface that can be used with TCOM Viewer and a variety of terminal emulation programs.

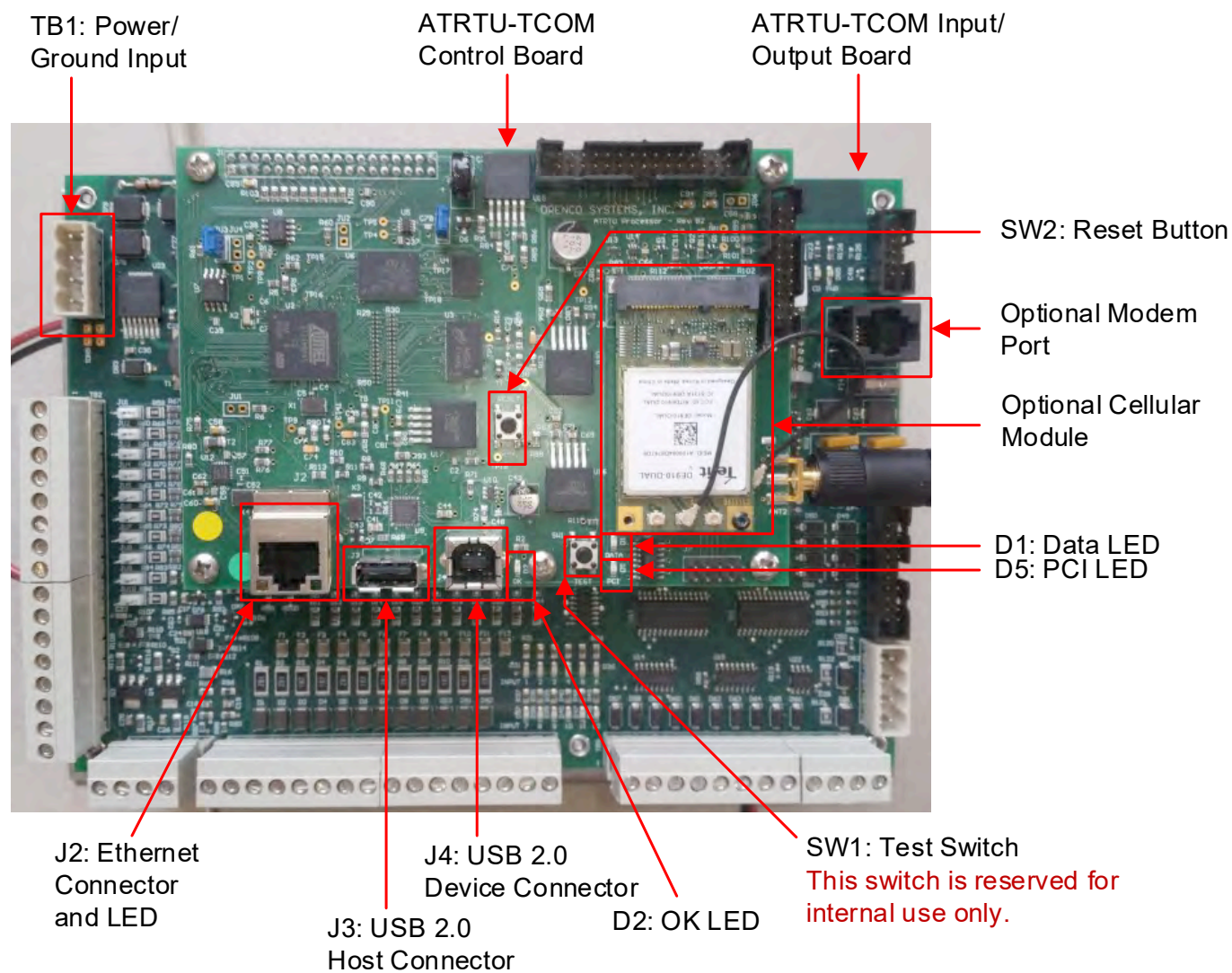
Additional hardware components include:

- Input/output boards that are physically connected to other electrical components in the system such as relays, sensors, pumps, etc.
- Optional cellular telephone module.
- Optional modem module.
- 10/100 Mbps Ethernet interface for optional network connection.
- USB V2.0 high speed host and client interfaces (one each).
- Modbus RS485 and Modbus TCP communication interfaces.
- LED indicators displaying power on and some status information.

Customizable Control Program:

- A control program that can be customized to monitor system inputs (i.e., sensors, floats, etc.) and control system outputs (i.e., pumps, relays, etc.). This control program incorporates an internally developed scripting language with a wide variety of features and functions tailored to efficiently manage waste water processes and other control applications.

### 1.3 ARTTU-TCOM Control System Electronics



**Figure 1: ARTTU-TCOM Control System Electronics**

## 1.4 Introduction to ATRTU-TCOM System Concepts

The ATRTU-TCOM system developed by Orenco Controls incorporates unique features and terminology. This section is intended to provide the user with an introduction to important concepts and terminology. For more information regarding terminology refer to section 7 “Glossary” on page 101.

- Each geographic location that has an ATRTU-TCOM system installed is referred to as a “site”.
- The ATRTU-TCOM system includes an advanced micro-computer system called the “controller”.
- Each site has one or more ATRTU-TCOM controllers installed.
- The term “firmware” refers to the program executed by the ATRTU-TCOM computer.
- The firmware is comprised of two main components called the boot loader and the application firmware.
- The firmware manages all external communication interfaces, interacts with the board hardware, manages LED’s and switches, and interprets and executes the “control program”.
- The “control program” is separate from the firmware.
- The purpose of the “control program” is to monitor sensor inputs such as floats and temperature gauges, execute algorithms specific to the installed site, and control outputs such as pumps and valves.
- The control program can be customized for each installation site, includes site specific information, and contains the logic that controls and monitors the devices directly involved in the system.
- Each ATRTU-TCOM controller managing a site has an associated set of configuration files that contain information specific to that site.

### 1.4.1 Control Program

The control program is written using a proprietary scripting language developed by Orenco Controls and optimized to efficiently perform the functions required to operate and monitor a process control system. Each control program is developed by Orenco Controls and, depending on the application, may be a standardized program or customized to meet the requirements of the installed system.

The control program can be reprogrammed. Once programmed into the ATRTU-TCOM system, the control program is interpreted at run time by the computer system running in the ATRTU-TCOM.

### 1.4.2 Firmware

Firmware is a computer industry term for a computer program that is tightly coupled with the underlying hardware. The ATRTU-TCOM firmware includes the boot loader firmware and the application firmware. The application firmware includes the web server subsystem, managing logs, managing event notifications via mailboxes, interacting with other computer systems, and interpreting and executing the control program.

Orenco Controls is continuously evolving the ATRTU-TCOM product line. New versions of firmware become available at times. It is not always necessary or even appropriate to update the firmware each time a new release becomes available. However, depending on the licensing and support agreement, whether the new firmware supports features the user would like to upgrade to, and the specific site configuration, it is possible to update the firmware.

### 1.4.3 Graphic View

The ATRTU-TCOM system supports an optional upgrade feature called the Graphics View. The graphics view feature enhances the base user interface by providing customizable graphical interfaces tailored specifically for individual site installations.

Depending on the configuration there may be zero or multiple graphic views available. Also depending on the specific system design the user may also be able to interact with and control the state of individual resources by applying or removing timed and/or permanent override values. Each Graphic View web page also provides visual indication of the current state of the associated resource.

Each graphic view is dynamically updated to provide the user ongoing visual feedback on the operating state of the system. The target update rate is configurable and may vary due to network loading and speed.

Graphics View is supported by both the TCOM Viewer Software and also the Web server subsystem. Refer to section 2.12 Web Server Graphic View on page 38 for more information on Graphics View.

To contact the Orenco Controls sales team for more information regarding the Graphics View upgrade option refer to section 6 "Support Information" on page 100.

### 1.4.4 User Accounts and Permission Levels

Users are required to logon on to use either the terminal or web subsystems. The logon credentials are associated with permission levels which are used to control read/write access to various system features.

The system supports log levels 0-3 with level 0 granting the highest level of access. Access refers to read/write controls which are defined as none, read only, and both read and write access.

**Key:**

- NA: No access. User is not logged on or is not allowed to modify or view specific content.
- R: Read access. Logged on user can view but not modify specific content.
- RW: Read and write access. Logged on user can view and modify content.
- Terminal: Refers to access controls when using TCOM Viewer and terminal mode.
- Web: Refers to access controls when using the web server.

#### 1.4.4.1 Run Mode Permission Level

Item	Feature Set	Min Level		Access	Description
		Terminal	Web		
1	View Points	3	3	R	View selected point.
2	View Point Override Page	2	2	RW	View point override page
3	Modify Point Override	2	2	RW	Modify (override) current point temporarily and/or permanently.
4	View Activity Log	3	3	R	View activity log.
5	View Alarm Log	3	3	R	View alarm log.
6	View User Log	3	3	R	View or download select user logs.
7	View System Log	3	3	R	View system log.
8	Digital Out Summary	3	NA	R	View digital output summary.
9	Point Status Report	3	NA	R	View current point status.
10	Setup Report Destination	3	NA	RW	View and change report destination.
11	Backup Program to Flash	3	NA	W	Writes program to flash.
12	Logon Modbus Child	3	NA	R	Logon allowed if peer enabled.
13	Logon Ethernet Peer	3	NA	R	Logon allowed if peer enabled.
14	Command mode	3	NA	RW	
15	View Mailbox Settings	2	3	R	View mailbox target and message.
16	Modify Mailbox Settings	2	2	RW	Modify mailbox target and/or message.
17	Set Date/Time	3	3	RW	Modify date and time settings

**Table 1: Run Mode Permission Levels**

**1.4.4.2 Program Mode Permission Level**

NOTE: The minimum permission level to access the program mode menu is 2.

Item	Feature Set	Min Level		Access	Description	Notes
		Terminal	Web			
1	View Any User Account	0	NA	R	View list of user names.	1
2	Add Any User Account	0	NA	RW	Ability to add a new user name and password at any log level.	1
3	Delete Any User Account	0	NA	RW	Ability to delete any user account.	1
4	View User Account Limited	1/2	NA	R	View list of user names.	2
5	Add User Account Limited	1/2	NA	RW	Ability to add a new user name and password at permission levels equal to or lower than the current user permission level.	2
6	Delete User Account Limited	1/2	NA	RW	Ability to delete another user account with a permission level equal to or lower than the current user permission level.	2
7	Delete Activity Log	1	NA	RW	View and delete/clear activity logs.	
8	Delete Alarm Log	1	NA	RW	View and delete/clear alarm logs.	
9	Delete User Log	1	NA	RW	View and delete select user logs.	
10	Delete System Log	1	NA	RW	View and delete/clear system logs.	

**Table 2: Program Mode Permission Levels**

**Notes:**

- 1) Level 0 users can add/delete/change any passwords or permissions.
- 2) Level 1 and 2 users may “see” any user info only if those users have been granted permission by a Level 0 user to add new users. If you have level 1 or 2 and you have permission to add new users, then you can add new users of equal or less permission, and you may view other names/passwords of equal and less permission and change those. Level 1 and 2 users with permission to add new users, may see only the names (not passwords) of other users with higher permissions (0-1).

## 1.4.5 Points

The term “point” refers to a control point in the set of logical rules and operations used in the custom scripting language developed by Orenco Controls to monitor and operate the target system. The use and mapping of points is defined within the control program.

Typically, the control programs are developed such that similar or logically related points are collected into pages. For example, a point may map to a specific sensor input, pump control output, etc. A point can also map to internal variables within the control program. Examples include variables storing total daily flows, average values over a period of time, etc. Typically input points, output points, and internal points are collected into pages of similar types. The total number of point pages is determined by the program and the number of devices being managed by it.

### 1.4.5.1 Point Types

The Orenco Controls control programs internally interpret the points as having specific types. The point type defines what range of values it can have. Point types include:

- Analog numbers.
- Digital binary values.
- Label as text strings.
- Date.
- Time.

Analog points are numeric values that may be integer or floating point numbers and can be either positive or negative.

Digital points can be one of two paired values. The pairs are “ON/OFF” or “YES/NO”.

Label points are text strings and are used to associate useful names to point values. The list of labels available for use is defined by the control program. Label points can only be assigned label values that are included in the list defined by the control program.

Date points represent dates in the form “MM/DD/YY” or “MM/DD/YYYY” where MM is a two digit month starting at zero, DD is a two digit day of the month, and “YY/YYYY” represent either a two digit year since 2000 or a full four digit year.

Time points represent time in a 24 hours HH:MM:SS format where HH represents hours, MM represents minutes, and SS represents seconds. SS is usually optional and will default to zero if not entered.

### 1.4.5.2 Point Override (Operating) Mode

The current value of a point is typically determined by logical rule defined in the control program and the state of the installed system. The control program defines whether the operating mode of a point can be changed such that the point value is forced to another value. Changing the operating mode of a point is called “overriding” the point.

Not all points can be overridden. The control program defines whether a point can or cannot be overridden. Points defined as overridable can only be overridden by users logged on with a permission level that allows them to override points (see section 1.4.4 User Accounts and Permission Levels on page 10 for more information).

Possible operating modes (override types) include:

- Automatic (no override)
- Permanent (overridden)
- Timed (timed override)

When in the automatic operating mode, no override is applied, and the value of the point is determined by the control program and the current system state.

When in the permanent operating mode, an override is applied, and the point value is forced to the override value. Permanent overrides remain in effect until a user intervenes and applies a new override value.

When in the timed operating mode, an override is applied, and the point value is forced to the override value. Timed overrides remain in effect for a duration of time that is specified when the override is applied. When the specified time duration has elapsed, the point returns to the operating mode that was in effect when the timed override was applied.

For example, if the point was in the permanent override operating mode when the timed override was applied, the point state will return to the permanent override mode and have the assigned permanent value after the timed override expires.

Automatic, permanent, and timed overrides can be applied to analog (numeric), digital, label, date, and time points.

### 1.4.5.3 Point Overrides, Limits, and Lists

In addition to defining whether a point can be overridden, the control program optionally specifies limits that may be applied to the override value. For example, the control program can define a numeric point that can be overridden, but the valid range of overrides is bounded between a high and low limit. Limits are optional. A low limit, a high limit, or both can be defined.

When low or high limits are applied, the point value is allowed to range between the limits where:

$$\text{Low Limit} \leq \text{Point value} \leq \text{High Limit}$$

The control program can also define a list of values that can be applied as overrides. In this case, the allowed override value must be one of the listed values.

Point Type	Limits Allowed	Lists Allowed
Analog	Yes	No
Digital	NA	Yes (ON/OFF or YES/NO)
Label	NA	Yes, constrained to defined labels
Date	Yes	No
Time	Yes	No
Set point	Yes	No

**Table 3: Map of Point Types, Limits, and Lists**

## 1.4.6 Logging Information

Each ATRTU-TCOM system is capable of tracking and storing information related to system operation. This information is stored in a “log”. Multiple log types are supported. Some log types are dedicated for specific types of information and there are several log types that are more general purpose.

The control program defines the events that are monitored, and the information stored in the log. Log types include:

- Activity log
- Alarm log
- System log
- User log
- Maintenance log

### 1.4.6.1 Activity Logs

Activity logs track and store information specific to individual points such as saving a single data value and recording transitions and duration.

Activity logs are available for tracking the recent activity of a specific input (e.g. floats) or output (e.g. pumps). Activity logs are mainly used for troubleshooting. Activity logs may be viewed onscreen using TCOM Viewer or the web server, exported to a comma separated file, and displayed as a line plot versus time within TCOM Viewer.

### 1.4.6.2 Alarm Logs

Each ATRTU-TCOM system manages one alarm log. The alarm log is used to store information about events that may require operator intervention or otherwise be of interest to an operator. The events that are monitored are determined by the control program in the ATRTU-TCOM system and may vary from one installation site to another. Alarm logs can be displayed onscreen or exported to comma separated file.

### 1.4.6.3 System Logs

Each ATRTU-TCOM system manages one system log. The control program defines the events that trigger storing information in system logs. Typically, system logs track things such as whether an optional or removable device is or isn't installed, whether it's configured or not, input/output errors, communications errors, and other system events. System logs can be displayed onscreen or exported to comma separated file.

### 1.4.6.4 User Logs

The ATRTU-TCOM control program can define anywhere from 0 to 48 separate user logs. User logs are very flexible and can be configured to store information about a broad range of user specified events. Up to four data values and a date and time stamp can be stored for each event.

Logs 1 – 16 are stored in high speed RAM and are suitable for tracking events that may occur frequently. However, the content of logs 1 – 16 are volatile and will not persist through a prolonged loss of power. Logs 17 – 48 are stored in non-volatile flash memory and the contents will persist through power cycles of any duration. However, the time required to store information in flash memory is significantly greater than storing information in RAM and therefore should be used for events that occur at relatively low frequency (multiple seconds or longer).

User logs may be viewed onscreen, exported to a comma separated file, and displayed as a line plot versus time within TCOM Viewer.

### 1.4.6.5 Maintenance Logs

The maintenance log allows operators and service personnel to record actions that have been performed at the installation site. Examples include replacing a part or routine maintenance. This log can be viewed onscreen and exported to a comma separated file.

### 1.4.7 Event Notification Using Mailboxes

The ATRTU-TCOM system can be configured to notify external systems when specific events have occurred. The external system to be notified is referred to as a “mailbox”. The events that trigger a notification are defined by the control program. When a mailbox is defined, the type of mailbox is also specified.

Supported mailbox types include:

- Phone
- Pager
- Modem
- Email
- Text

The primary objective of the event notification is to inform support personnel that something in the system may require operator attention. Actual message content is limited by the technology hosting the destination mailbox. Depending on the technology, the event notification may be a call showing up on caller ID or a pager, or include an actual message.

Mailbox Technology	Destination Address Format	Notification Type and/or message	Dependencies
Phone/Pager	Phone number	Caller ID. No message.	Requires installed phone line. Must be enabled, configured, and connected.
Email	Email address	Email with limited message.	Requires network connection using either Ethernet or cellular network. Must be enabled, configured, and connected.
SMS Text	Phone number	Text with limited message.	Requires optional cellular module Must be enabled, configured, and connected.

**Table 4: Mailbox Types, Event Notification, and Messages**

Successful event notification requirements include:

- One or more mailbox types are defined by the control program and associated with an event.
- The mailbox is enabled.
- All components required to communicate between the ATRTU-TCOM system and an external device are connected and functioning.
- The mailbox must be configured with valid information. If it’s a phone, pager, or SMS text mailbox, the target phone number must be valid. If it’s an email address, URL, or IP address, it must be valid.

## 2 Web Server

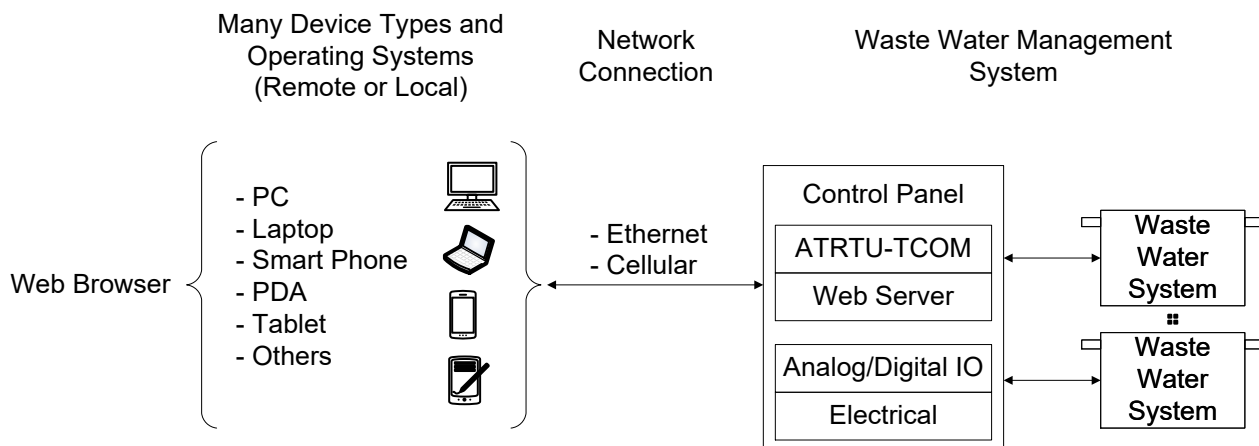
The ATRTU-TCOM controller hosts a web site that can be used to monitor and adjust various system settings. Hosting a web site increases the range of devices and operating systems that can be used to interact with the ATRTU-TCOM system to virtually any device that has a web browser, a network connection, and can access a web site.

Examples include, but are not limited to, Android smart phones, iPhones, iPads, Windows® laptops and PC's, Mac® laptops and PC's, Amazon Kindle Fire®, etc.

The range of features supported by the web site is primarily intended to facilitate remote monitoring and adjustment from a wide range of mobile devices therefore making it simpler for support personnel to access the systems on the go.

The web site includes support for:

- Logon mechanisms requiring credentials and access permission controls.
- Remote monitoring and adjustment of system settings.
- View logs and download select logs.
- View and modify notification mailbox settings.
- Adjust date and time settings.



**Figure 2: Web Server Overview**

### 2.1 Device and Browser Support

Due to rapidly evolving technology, evolving standards, and the vast range of devices, browsers, and operating systems, Orenco Controls cannot guarantee compatibility with every combination of browser and device. However, if an incompatibility is encountered it can typically be resolved by updating the web browser on the user's system.

Supported browsers include (not limited to):

- Google Chrome:
  - o Version: 58.0.3029.83, on Android mobile phone.
  - o Version: 54.0.2840.99 (64 bit), Windows® 10.
  - o Version: 58.0.3029.110 (64 bit), Windows® 7
- Microsoft Edge:
  - o Version: 38.14393.1066.0 Windows® 10

- Firefox:
  - o Version: 50.0.2 Windows© 10
- Safari:
  - o Version 5.1.7 Windows© 10
  - o iPhone, Mac iOS
  - o Version: 5.1.10, Mac OS X 10.6.8
  - o Version: 10.1.1, Mac OS 10.12.5
- Internet Explorer:
  - o Version 11.0.9600.18638, Windows© 7
  - o Version: 11.447.14393.0, Windows© 10
- Silk: Kindle Fire

## 2.2 Web Server Connection Requirements

Connection to the web site requires a functioning network connection between the user's device and the ATRTU-TCOM.

On the ATRTU-TCOM side of the link, the network connection must use either:

- 1) The hardwired Ethernet interface directly on the main controller board.
- 2) The internal cellular modem module.

The internal cellular modem module plugs into a connector on the main controller circuit board within the ATRTU-TCOM system. Current ATRTU-TCOM systems include a hardwired 10/100 base-T Ethernet interface. The internal cellular modem module is an optional device that may or may not be installed depending on the target site and how it is configured.

For the web server to be used, at least one of the network interfaces must be enabled, properly configured, and have a valid network connection. See section 3.2 "TCOM Viewer Communication Interfaces" on page 47 for more information.

To successfully access the web server:

- 1) The ATRTU-TCOM system must be connected to either a private or public network.
- 2) The ATRTU-TCOM network subsystem must be enabled and configured with a valid IP address and HTTP port number.
- 3) The client device must be connected to either a private or public network which can be hardwired, wireless, or a mixture of both.
- 4) If the client device and the ATRTU-TCOM system are connected to separate networks, there must be a connection between the networks and access controls must be set by the network administrators to allow communication between the two subsystems (i.e., VPN's, firewalls, router settings, etc.).
- 5) The client user must know the IP address and HTTP port number that has been assigned to the ATRTU-TCOM system. This is typically determined by the network administrator of the installation site.
- 6) The client user must have a valid username and password that can be authenticated by the ATRTU-TCOM system.
- 7) The client browser must have JavaScript enabled.
- 8) The client browser must have popup's enabled.

## 2.3 Connecting a Web Browser to the Web Server

To logon on to the web server:

- 1) Open the web browser on the client device.
- 2) In the navigation field enter:

`http://<IP address or hostname>:<port number>`

For example, assuming the IP address is 192.168.0.10 and the port number is 2080, the user would enter the following into the URL bar of their browser:

<http://192.168.0.10:2080>

**Note:** The IP address above is for example only. The correct address and port number are determined by the local network administrator.

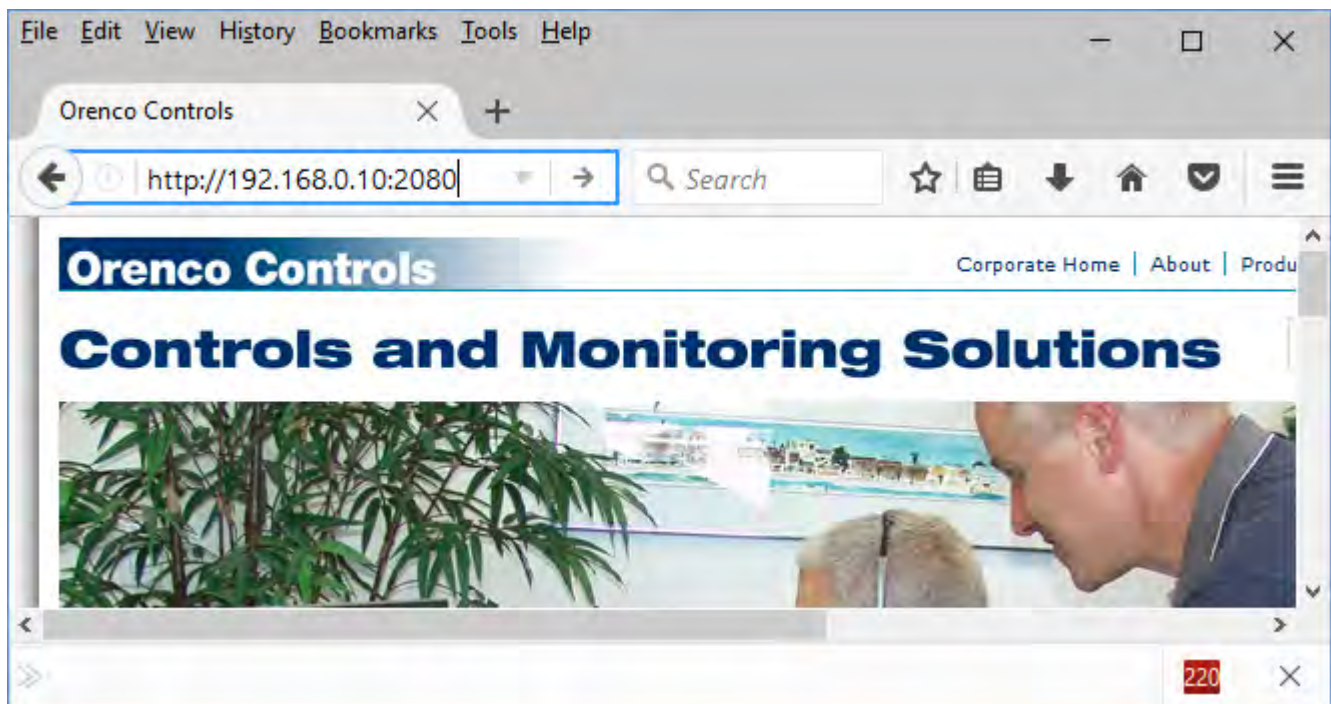


Figure 3: Example Browser Connection to the Web Server

## 2.4 Web Server Logon

There are two ways to log in to the web server. These include:

- Entering a username and password combination.
- Using a temporary “unlock” mechanism.

By default, the web server presents the user with the logon page shown in Figure 4 below. The web server keeps track of the number of sequential logon attempts from client devices. If the number of sequential logon attempts exceeds a threshold, the user will be directed to another page to request a temporary unlock code.

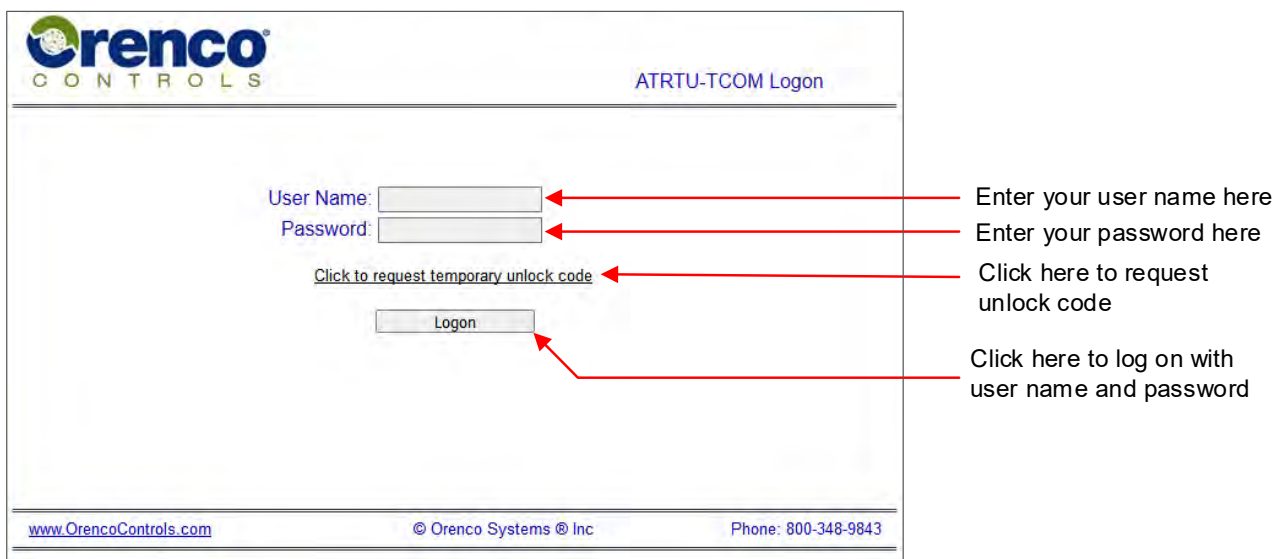


Figure 4: Logon Page: Username and Password

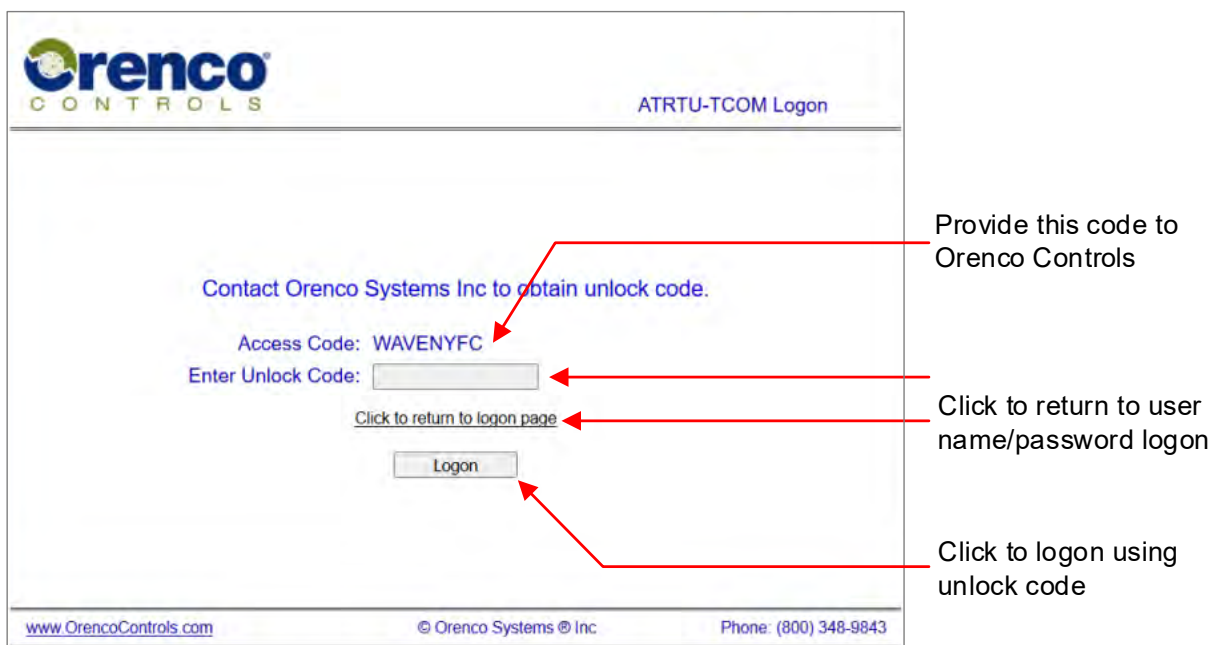


Figure 5: Logon Page: Unlock Key

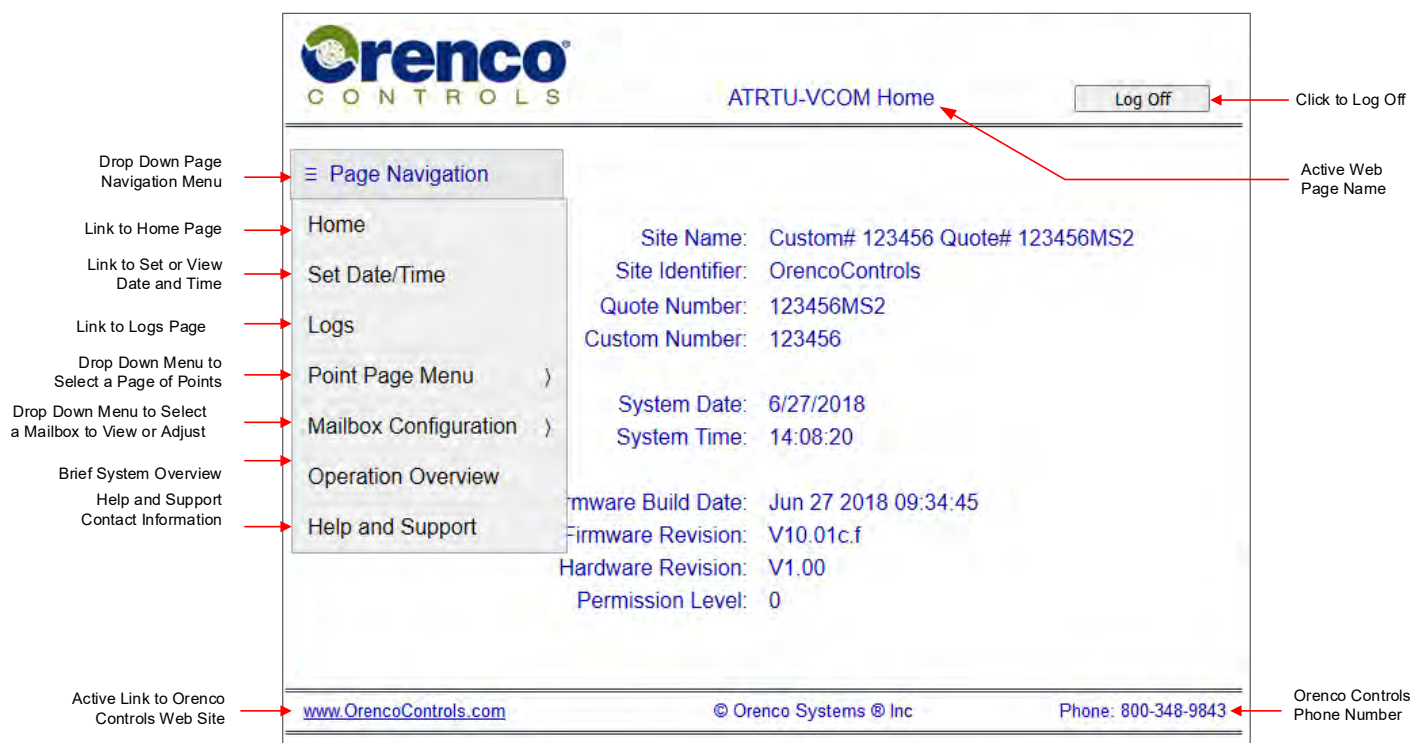
## 2.5 Features Common to All Web Server Pages

In general, each web page hosted by the ATRTU-TCOM web server has been designed to have a common look and feel. There may be some variation depending on the configuration of the target site and the user's logon permission level.

For example, the "Mailbox" dropdown menu exists only if there are defined mailboxes. The point page dropdown menu lists only points defined for the control program in the target ATRTU-TCOM system. The figure below shows an example configuration that is representative of most systems.

The user can navigate from any active page to any other page using the "Page Navigation" menu. Each page includes:

- A corporate logo.
- Page name.
- Log off button.
- Page navigation menu.
- Link to Orenco Controls website.
- Copyright notice.
- US toll free telephone number for Orenco Controls.



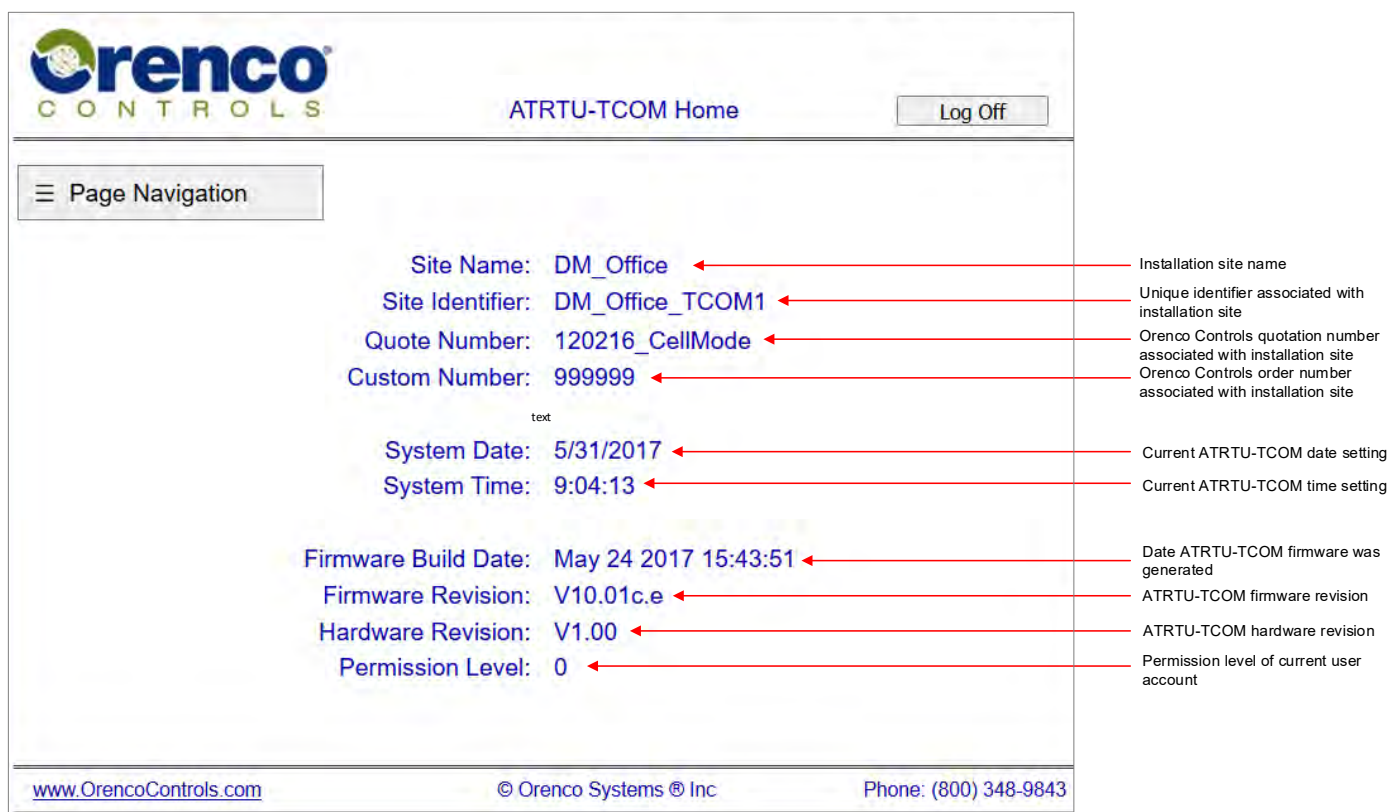
**Figure 6: Common Web Page Components**

## 2.6 Log Off – Timed and Manual

As shown in Figure 6 “Common Web Page Components” on page 20, each web page includes a “Log Off” button that the user can select to manually log off at any time. The web server also tracks activity on incoming client IP addresses and will automatically log the user off after approximately 10 minutes of inactivity. If the user attempts to interact with the web server after being automatically logged off, the web server will automatically redirect the user to the log on page.

## 2.7 Home Page

After the initial log on the user is directed to the “home” page which displays information specific to the target ATRTU-TCOM system. The user is free to navigate the web site from there. Note that the date and time settings are updated on a periodic interval. The default update rate is approximately 10 seconds.



The screenshot shows the ATRTU-TCOM Home page. At the top left is the Orenco Controls logo. To its right is the text "ATRTU-TCOM Home" and a "Log Off" button. Below the logo is a "Page Navigation" menu. The main content area displays the following information:

- Site Name: DM\_Office
- Site Identifier: DM\_Office\_TCOM1
- Quote Number: 120216\_CellMode
- Custom Number: 999999
- System Date: 5/31/2017
- System Time: 9:04:13
- Firmware Build Date: May 24 2017 15:43:51
- Firmware Revision: V10.01c.e
- Hardware Revision: V1.00
- Permission Level: 0

Red arrows point from each of these items to a list of descriptions on the right side of the page:

- Installation site name
- Unique identifier associated with installation site
- Orenco Controls quotation number associated with installation site
- Orenco Controls order number associated with installation site
- Current ATRTU-TCOM date setting
- Current ATRTU-TCOM time setting
- Date ATRTU-TCOM firmware was generated
- ATRTU-TCOM firmware revision
- ATRTU-TCOM hardware revision
- Permission level of current user account

At the bottom of the page, there is a footer with the following information:

- [www.OrencoControls.com](http://www.OrencoControls.com)
- © Orenco Systems © Inc
- Phone: (800) 348-9843

Figure 7: Home Page

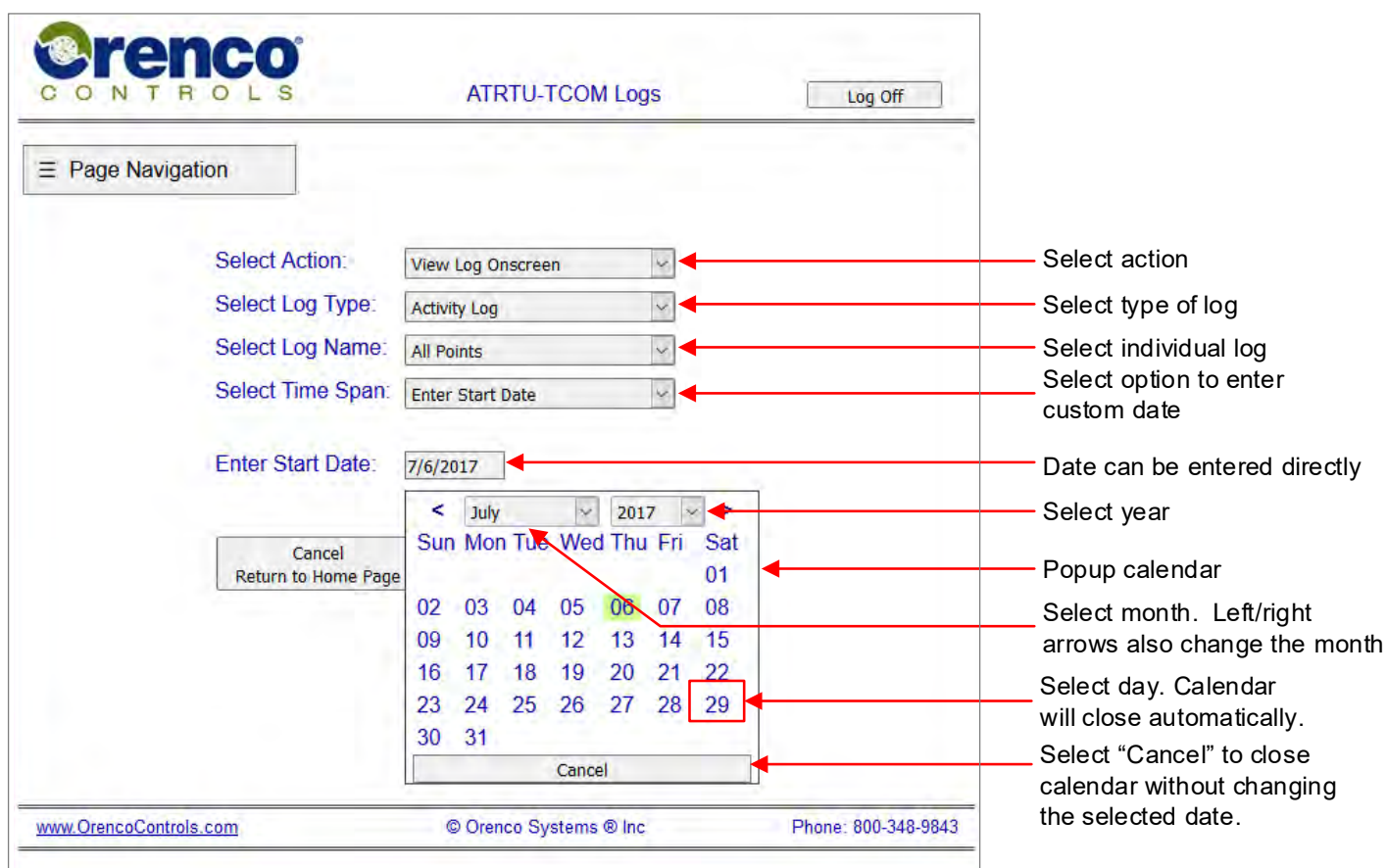
## 2.8 Set Date and Time Page

The user can view or adjust the date and time settings in the target ATRTU-TCOM system using the “Set Date/Time” web page. The date can be entered manually in the format MM/DD/YYYY where MM is the two-digit month, DD is the two digit day, and YYYY is the four digit year. Valid year selections range from 2000 to 2100.

Clicking on the date entry field will also pop up a graphical calendar which allows the user to select the desired month, day, and year.

The user can enter the time in the format HH:MM where HH is a two-digit hour using 24-hour time where 0 corresponds to 12:00 am. MM is the number of minutes ranging from 0 – 59. Seconds entry is not supported.

To save the changes to the ATRTU-TCOM system the user must click the “Save Changes” button. To cancel, the user can click the cancel button, simply navigate to another page using the navigation menu, or log off without saving.



The screenshot shows the 'ATRTU-TCOM Logs' interface. It includes a 'Page Navigation' menu, a 'Log Off' button, and several selection fields: 'Select Action' (View Log Onscreen), 'Select Log Type' (Activity Log), 'Select Log Name' (All Points), and 'Select Time Span' (Enter Start Date). The 'Enter Start Date' field is populated with '7/6/2017'. A 'Popup calendar' is displayed, showing the month of July 2017. The calendar grid has the 29th highlighted. A 'Cancel' button is visible at the bottom of the calendar. Red arrows point from text annotations to these specific elements.

**Annotations:**

- Select action
- Select type of log
- Select individual log
- Select option to enter custom date
- Date can be entered directly
- Select year
- Popup calendar
- Select month. Left/right arrows also change the month
- Select day. Calendar will close automatically.
- Select “Cancel” to close calendar without changing the selected date.

**Figure 8: Setting the Date and Time**

## 2.9 Point Menu Page

Point menu pages provide information about the current system state. Depending on the type of page, the specific point, and the user's permission level, the user may also be able to modify point settings.

Depending on the complexity of the control program the ATRTU-TCOM system may be configured with many pages or relatively few pages. The "Page Navigation" pulldown menu allows the user to select an individual page of points defined by the control program. Once on the point menu web page, the user may also browse sequentially through point pages. Each page allows the user to view and potentially interact with up to 16 points at a time.

Each point menu page is built dynamically when requested. Pages with no defined points will not be displayed. The maximum number of points displayed at one time is 16. However, fewer points may be displayed. Non-sequential points are represented by a single blank line on the point menu page.

If the user account permission level is high enough and the control program has defined a point as being overridable, the current point value of the point is displayed as a hyperlink with an underline beneath it. Point values that are underlined can be clicked on to navigate the user to another page that allows the user to enter override settings. Point values that are not underlined are either not overridable or the user has insufficient permission.

The point units and activity log columns are only displayed if one or more points has defined units or an activity log associated with it. If there is an activity log, it is displayed as "Show" and the user can click on the link to view the activity log.

By default, the point menu page automatically updates to make it easier to view dynamically changing values. The automatic refresh can be disabled by clicking on the "Disable Automatic Page Refresh" button on the web page. The user can also change the refresh period within the allowed range. Automatic page refreshing does not reset the timer tracking user activity on the web pages. Therefore, if the user does not directly interact periodically with the web site they will be automatically logged out.

The "Control Logic" column indicates what is controlling the point value. Depending on the operating mode of the point the value may be determined by the control program, a permanent override value, or a timed override value.

For more information about "points" see section 1.4.5 "Points" on page 12.

**ATRTU-TCOM Point Page Menu** Log Off

Page Navigation

< Previous Page    Next Page >

**DIGITAL/ANALOG 2**

Point Number	Point Description	Current Point Value	Units	Current Override Status	Time at Current Value	Time at Previous Value	Point Type	Contol Logic	Activity Log
609	DT HLA/LagOn	ON		Permanent	0:01:32	21:31:55	D	Ovr/Const	Show
610	DT Lead On Flt	OFF		Automatic	21:33:27	0:00:00	D	DI16	Show
611	DT PumpsOff	ON		Timed	0:01:19	21:32:08	D	27:45:20	Show
612	DT LLA/RO Flt	OFF		Automatic	21:33:27	0:00:00	D	DI14	Show
613	PLC Fuse OK	OFF		Automatic	21:33:27	0:00:00	D	REG1_3	Show
614	AX Fan 1 CS	OFF		Automatic	21:33:27	0:00:00	D	DI11	Show
615	AX Fan 2 CS	OFF		Automatic	21:33:27	0:00:00	D	DI12	Show
616	PLC Spare Input	OFF		Automatic	21:33:27	0:00:00	D	REG1_4	Show
617	PLC Spare Input	OFF		Automatic	21:33:27	0:00:00	D	REG1_5	Show
619	Flow Meter	0.00	maDC	Automatic	21:33:27	0:00:00	A	AI13	
620	Temp	0.00	maDC	Automatic	21:33:27	0:00:00	A	AI16	
621	pH	0.00	maDC	Automatic	21:33:27	0:00:00	A	AI15	
622	D.O. Input	0.00	maDC	Automatic	21:33:27	0:00:00	A	AI14	
623	PulseMter1Speed	<u>50.00</u>	%	Automatic	21:33:27	0:00:00	A	Rule	
624	PulseMter2Speed	<u>0.00</u>	%	Automatic	21:33:27	0:00:00	A	0.00	

Note: When present, underlined text can be clicked on to override point values or view activity logs.

Disable Automatic Page Refresh:

Refresh Period (8 - 30 seconds):  Change Refresh Period

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**Figure 9: Example Point Menu Page**

## 2.10 Point Override Page

If the control program defines a point as overridable and the current user has adequate access permission, the user may be able to override the current point value. See section 1.4.5.2 “Point Override (Operating) Mode” on page 13 for more information.

The type of point, any limits that are defined, and the type of override determines how the point override page is generated by the web server. The user should first select the type of override they want to apply to the point. The user interface will then adapt to the new settings.

If the selected override type is automatic all fields associated with entering a value are disabled.

If the selected override type is permanent, the user interface will present either a selection list or text entry field so the user can select or enter a new value.

A selection list is presented for digital points and any point that has a limit list defined. Otherwise, the point override page presents a text entry box. If the point type is a date, the user can enter the new date directly into the text box or click on it. This will cause a graphical calendar to be displayed and allows the user to select the desired date.

If high and low limits are defined, the point override page displays the high and low value. If no limits are defined nothing is displayed.

When a timed override is applied, a text entry box is displayed to allow the user to enter the time duration to apply the override. The maximum time duration is limited to the range displayed by the on screen prompts. When a timed override is applied a count down timer is started. The amount of time remaining for the applied override is displayed on both the point override and point menu pages. The time duration can be entered as a number representing the time in seconds. It can also be entered in hours:minutes format.

If the user decides not to apply an override they can click the cancel button to return to the point menu page or select any page from the page navigation menu. To apply an override, the user must click either the “Save Changes and Return to Point Menu” or “Save Changes and Remain on This Page” buttons.

When a new value is entered it is checked to ensure the data entered is valid for the point type and is within the range of any limits applied. The override is only applied if there are no data entry errors. If an error is detected an error message is displayed and the user is prompted to re-enter the data.

Point Type	New Value Entry	Allowed Format/Content	Notes
Analog	Text field or selection list	0-9, plus (+) or minus (-), decimal point (.)	1
Digital	Selection list	ON/OFF or YES/NO	2
Date	Text field or select from graphical calendar	Two digit fields, month 1 – 12, day 1 – 31, year 2000-2100, and / or separator	3, 4
Time	Text field	Two digit fields, hour 0 – 23, minutes 0 – 59, and : for separator	
Label	Text field or selection list	The label entered must match a label defined by the control program	1

**Table 5: Map of Point Type and Point Override Format**

**Notes:**

- 1) The control program defines whether a value list is applied or a range of values is allowed.
- 2) The control program defines whether digital points are treated as “ON/OFF” verses “YES/NO”.
- 3) MM/DD/YYYY where MM = month 1-12, DD = day of month 1-31, YYYY = year between 2000 – 2100.
- 4) Valid day range depends on the number of days in the selected month.

### 2.10.1 Point Override Page Overview

The screenshot shows the 'ATRTU-TCOM Point Override' page. At the top left is the Orenco Controls logo. The page title is 'ATRTU-TCOM Point Override' and there is a 'Log Off' button at the top right. A 'Page Navigation' menu is on the left. The main content area includes the following fields and controls:

- Point Number:** 354 (Annotation: Point number affected)
- Description:** RT1PumpsPerDose (Annotation: Point Name)
- Point Type:** Analog (Annotation: Defines override value format)
- Current Override State:** Automatic (Annotation: Current operating mode)
- Current Point Value:** 2.00 (Annotation: Value when page loaded)
- Override Action:** Permanent (dropdown menu) (Annotation: Makes new value permanent)
- Enter Override Value:** 2 (text input) (Annotation: Value to assign to point)
- Annotations for Override Action and Value:**
  - X.XX (Annotation: Help text changes when override type changed)
  - Annotation: Type of override to be applied
  - Annotation: Help text changes when override type changed
- Buttons:**
  - Cancel Return to Point Menu (Annotation: Cancel without saving)
  - Save Changes Return to Point Menu (Annotation: Save and return to last page)
  - Save Changes Remain on This Page (Annotation: Save and stay on this page)
- Override Options:**
  - To override the current point value, enter a value, an optional timeout, and select submit.
  - Note: Some point types have limited override options.
  - Override Type Effect**
    - Automatic: Places point in automatic mode. No override is applied. Point value is determined by controller program.
    - Permanent: Makes new value permanent. Bypasses controller program.
    - Timed: Change point value for specified time. When the time elapses, the override type reverts to either automatic or permanent depending on the previous setting.

At the bottom of the page, there is a footer with the website [www.OrencoControls.com](http://www.OrencoControls.com), copyright © Orenco Systems © Inc, and phone number 800-348-9843. A red bracket on the right side of the 'Override Options' section is labeled 'On page help'.

**Figure 10: Point Override Page Overview**

## 2.10.2 Point Override Page with Timed Override

The screenshot shows the 'ATRTU-TCOM Point Override' interface. At the top, there is a 'Log Off' button. Below it is a 'Page Navigation' menu. The main form contains the following fields and controls:

- Point Number:** 460 (Annotation: Point number affected)
- Description:** MB#1 Enable (Annotation: Point Name/Label)
- Point Type:** Digital (Annotation: Defines override value format)
- Current Override State:** Permanent (Annotation: Current operating mode)
- Current Point Value:** OFF (Annotation: Value when page loaded)
- Override Action:** Timed (Annotation: Help text changes when override type changed)
- Change point value for specified time:** (Annotation: Type of override to be applied)
- Override Value:** OFF (Annotation: List to select digital point value)
- Override Timeout:** 60 (Annotation: Enter time to apply override for)
- Format:** hh:mm or N seconds (Annotation: Override time can be hours:minutes or in seconds)
- Override Timer Value:** 0:00:00 (Annotation: Current value of override timer)

At the bottom of the form are three buttons:

- Cancel Return to Point Menu (Annotation: Cancel without saving)
- Save Changes Return to Point Menu (Annotation: Save and return to last page)
- Save Changes Remain on This Page (Annotation: Save and stay on this page)

Below the form is an 'Override Options' section with a note: 'To override the current point value, enter a value, an optional timeout, and select submit.' and 'Note: Some point types have limited override options.' This is followed by a table:

Override Type	Effect
- Automatic:	Places point in automatic mode. No override is applied. Point value is determined by controller program.
- Permanent:	Makes new value permanent. Bypasses controller program.
- Timed:	Change point value for specified time. When the time elapses, the override type reverts to either automatic or permanent depending on the previous setting.

At the bottom of the page, there is a footer with the website 'www.OrencoControls.com', copyright '© Orenco Systems © Inc', and phone number 'Phone: 800-348-9843'. A red bracket on the right side of the 'Override Options' section is labeled 'On page help'.

**Figure 11: Timed Point Override Example**

### 2.10.3 Point Override Page with Limits

**Annotations:**

- Point Number: 33 → Point number affected
- AT HLA Delay → Point Name
- Analog → Special point. Only allowed override type is "permanent". Will display as "Automatic" or "Timed"
- Note: For this type of point the override state displays as "Automatic" or "Timed" → Value when page loaded
- Automatic → Value when page loaded
- 5.00 → Value when page loaded
- 1.0 → Minimum allowed value.
- 10.0 → Maximum allowed value.
- Permanent → Type of override to be applied
- Permanent → List to select digital point value
- Makes new value permanent. → Enter time to apply override for
- 5 → Enter new value here
- X.XX → Format to enter new value
- Cancel Return to Point Menu → Cancel without saving
- Save Changes Return to Point Menu → Save and return to last page
- Save Changes Remain on This Page → Save and stay on this page
- On page help → (points to the Override Options section)

**Override Options**

To override the current point value, enter a value, an optional timeout, and select submit.

Note: Some point types have limited override options.

Override Type	Effect
- Automatic:	Places point in automatic mode. No override is applied. Point value is determined by controller program.
- Permanent:	Makes new value permanent. Bypasses controller program.
- Timed:	Change point value for specified time. When the time elapses, the override type reverts to either automatic or permanent depending on the previous setting.

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Figure 12: Point Override with Limits Example

2.10.4 Point Override Page with Time of Day Point and Timed Override

The screenshot shows the 'ATRTU-TCOM Point Override' page. At the top, there is a 'Log Off' button. Below it is a 'Page Navigation' menu. The main content area contains several fields and controls:

- Point Number:** 186 (Annotation: Point number affected)
- Description:** P186:T:Minonly (Annotation: Point Name)
- Point Type:** Time (Annotation: Point type represents time of day)
- Current Override State:** Timed (Annotation: Value when page loaded)
- Current Point Value:** 11:11 (Annotation: Value when page loaded)
- Low Limit:** 1:02:03 (Annotation: Minimum allowed value. New value must be within the low/high limit range)
- High Limit:** 24:00:00 (Annotation: Maximum allowed value. New value must be within the low/high limit range)
- Override Action:** Timed (dropdown menu) (Annotation: Change point value for specified time. Timed overrides can be applied to points representing time of day)
- Enter Override Value:** 11:11 (text input) (Annotation: Enter new point value in 24 hour format)
- Range:** 00:00-23:59 (text input) (Annotation: Enter new value here)
- Override Timeout:** 60 (text input) (Annotation: Format: hh:mm or N seconds. A new timed override can be applied to a time of day point that already has a timed override applied)
- Override Timer Value:** 0:00:50 (text input) (Annotation: Current value of override timer)

At the bottom of the form area, there are three buttons:

- Cancel Return to Point Menu (Annotation: Cancel without saving)
- Save Changes Return to Point Menu (Annotation: Save and return to last page)
- Save Changes Remain on This Page (Annotation: Save and stay on this page)

Below the form area is an 'Override Options' section with a paragraph of text and a note. Below that is a table with 'Override Type' and 'Effect' columns. A bracket on the right side of this section is labeled 'On page help'.

At the very bottom of the page, there is a footer with the following information:

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Figure 13: Point Override Page with Time of Day Point and Timed Override

### 2.10.5 Point Override Page with Date Point

**Point Number: 181** ← Point number affected

Description: **P181-DT:4Y** ← Point Name

Point Type: **Date** ← Point type represents time of day

Current Override State: **Automatic** ← Value when page loaded

Current Point Value: **2/2/2002** ← Value when page loaded

Override Action: Permanent

Enter Override Value:  MM/DD/YYYY

Enter date override in text box or select from graphical calendar

Cancel Return to Point | Save Changes Remain on This Page

**Override Options**

To override the current point value, enter a value, an optional timeout, and select submit.

Note: Some point types have limited override options.

Override Type	Effect
- Automatic:	Places point in automatic mode. No override is applied. Point value is determined by controller program.
- Permanent:	Makes new value permanent. Bypasses controller program.
- Timed:	Change point value for specified time. When the time elapses, the override type reverts to either automatic or permanent depending on the previous setting.

On page help

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**Figure 14: Point Override Page with Date Point Example**

## 2.11 Accessing Log Information

Users with sufficient permission levels can access several types of data logs by selecting “Logs” from the page navigation drop down menu. The content of each log is specified by either the firmware, the control program in the ATRTU-TCOM panel, or both. The content also depends on what events have or have not happened since the log was last cleared.

The user interface presented on the logs page is created when the web page is loaded and is based on default settings, the ATRTU-TCOM system configuration, and user permission levels. As the user interacts with the page the user interface dynamically adapts to the selections made.

Supported operations include viewing a log onscreen, downloading the log in a comma separated file format, and clearing the selected log. Available log types include the alarm log, the system log, activity logs, and user logs.

General Notes:

- The permission level required to clear logs is more restrictive than the permission level required to view logs. The user interface adapts to the permission level of the current user and presents only the options that the user has access to.
- When clearing logs there is no date range option and the entire log will be deleted. The date entry dialog boxes are removed when the user selects the clear log option and restored when the user selects the view or download options. The user is prompted to confirm or cancel all clear log requests before action is taken.
- There is only one alarm log and one system log per ATRTU-TCOM controller.
- There may be zero or multiple user and activity logs.
- If there are zero user or activity logs the option to select them is removed.
- The list of activity and/or user logs is based solely on the system configuration.

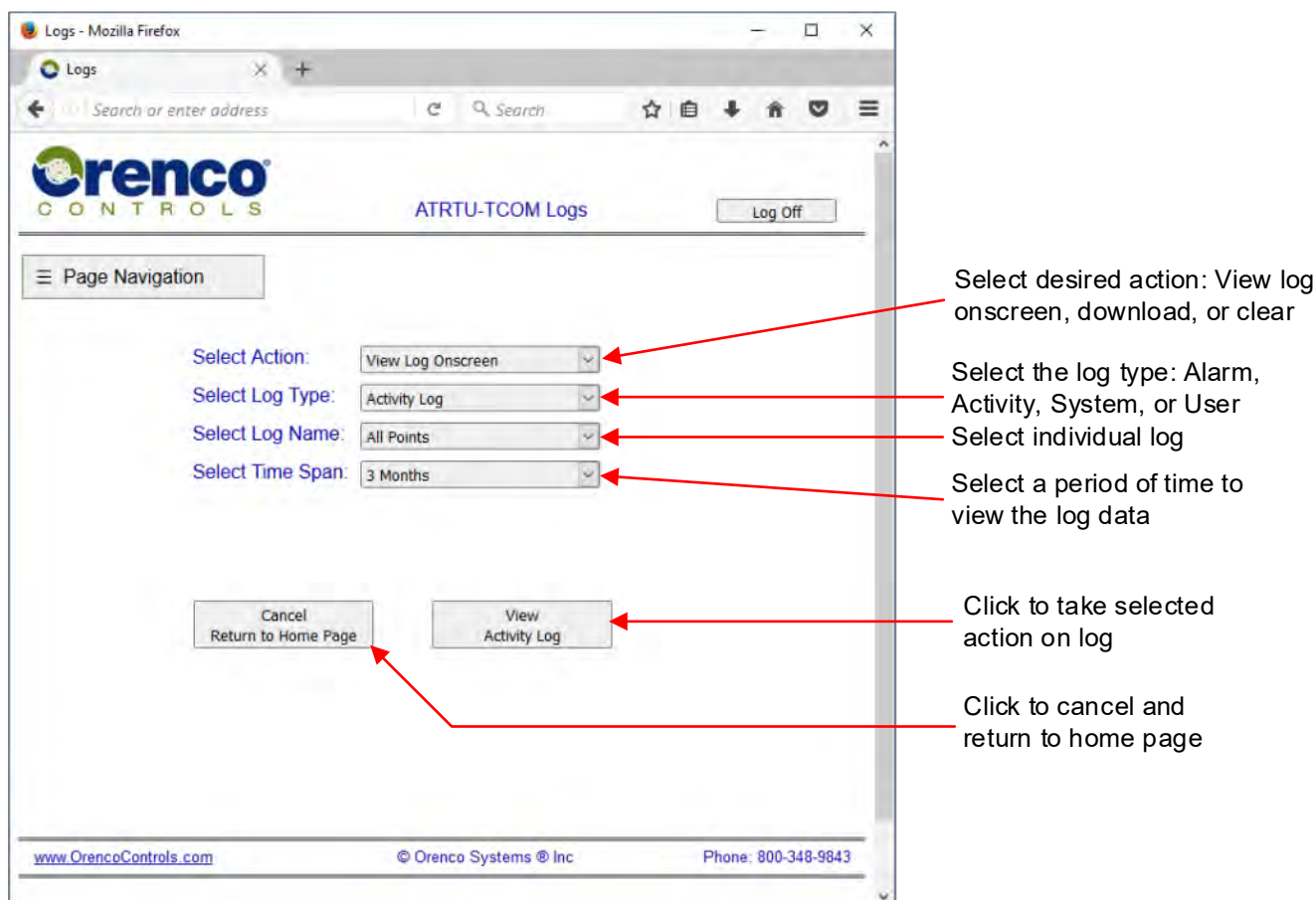


Figure 15: Logs Page

### 2.11.1 Selecting the Log Date Range

Logs can be gathered over long time periods. The user has the option to specify, from the current date, how far back in time they would like to view the log. The web page provides a list of time ranges the user can select from. It also allows the user to enter a specific date. The date entry dialog box is only available when the user has selected “Specific Start Date” from the “Select Time Span” menu.

To specify a specific start date the user can enter the desired date directly in the format MM/DD/YYYY where MM is the month, DD is the day, and YYYY is the year. Valid year selections range from the current date to the year 2100.

Clicking on the date entry field will also pop up a graphical calendar which allows the user to select the desired month, day, and year.

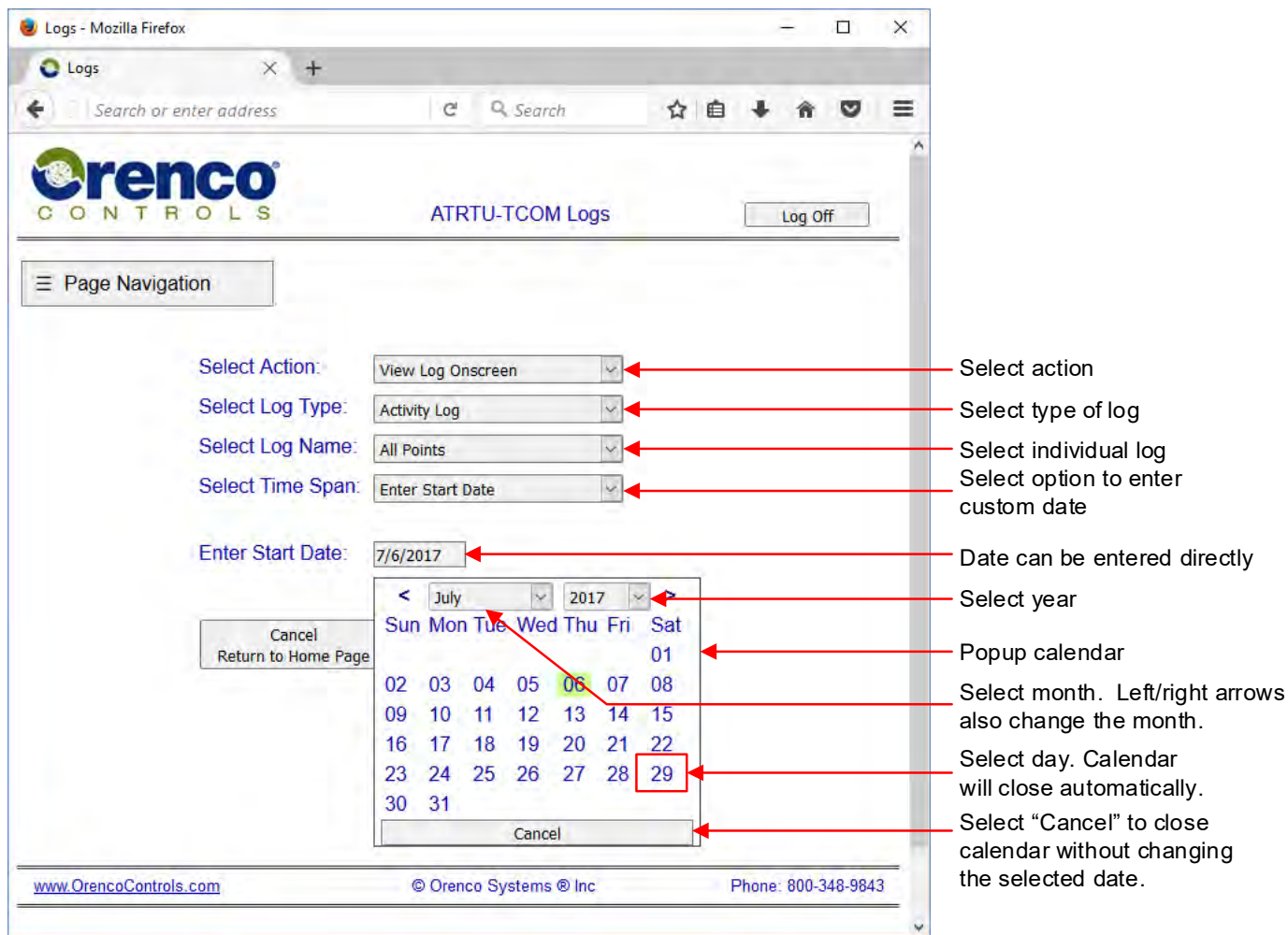


Figure 16: Log Date Select

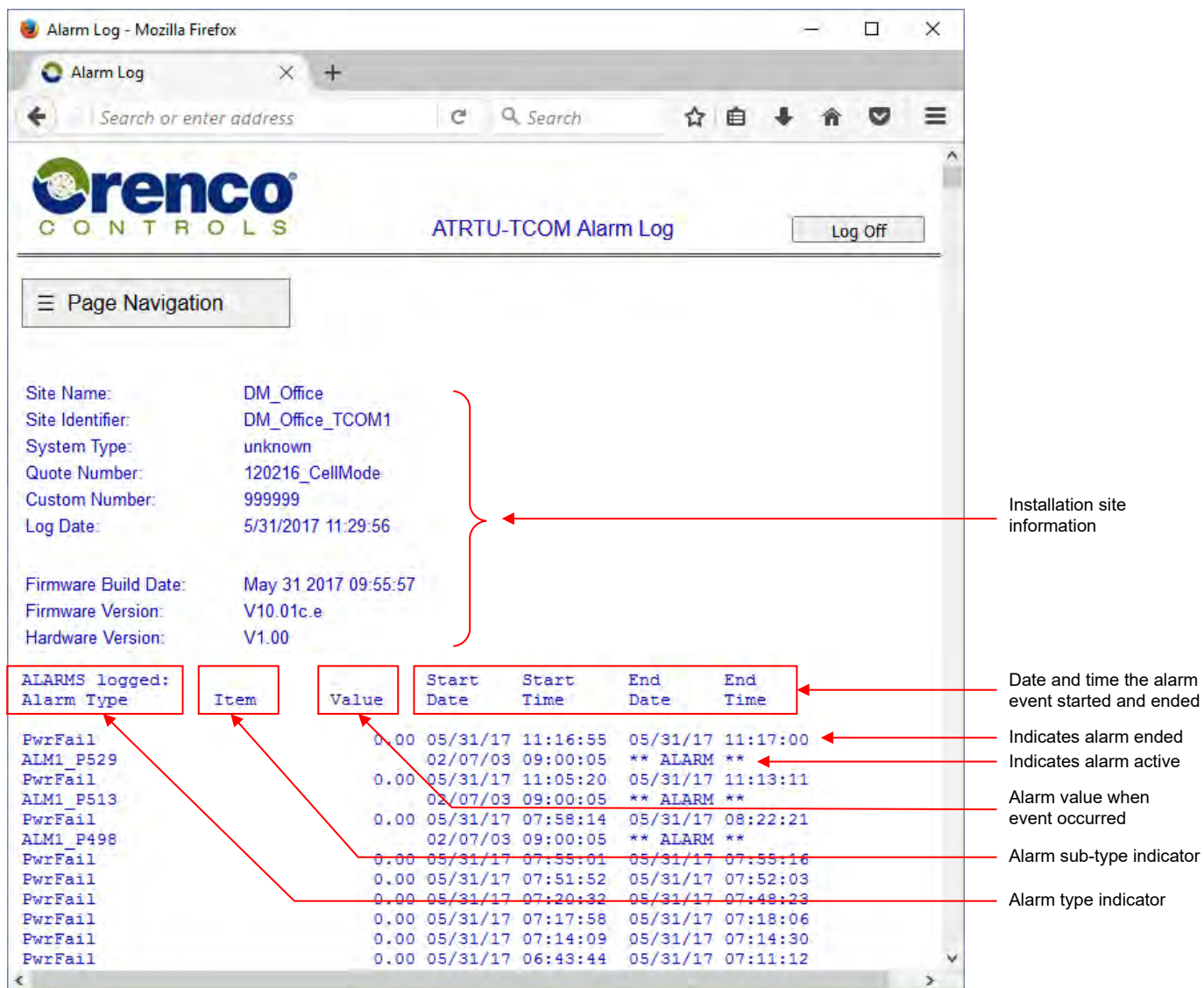
### 2.11.2 Alarm Log

There is a single alarm log used to store information about events that may require operator intervention. The events that are monitored are determined by the control program in the ATRTU-TCOM system and may vary from one installation site to another.

If no events that are being monitored have occurred the log will contain only log header information and will otherwise be empty. If events have occurred, the log will contain information about the events. The figure below shows an example alarm log file.

**Note:**

- 1) The log file tracks alarm events that have occurred and been resolved. Alarms that are still active do not have an end date specified.
- 2) This log was captured from an engineer's office development system. There weren't any power failures. Rather, it's just that the engineer frequently cycles the power for testing purposes.



Installation site information

Date and time the alarm event started and ended

Indicates alarm ended

Indicates alarm active

Alarm value when event occurred

Alarm sub-type indicator

Alarm type indicator

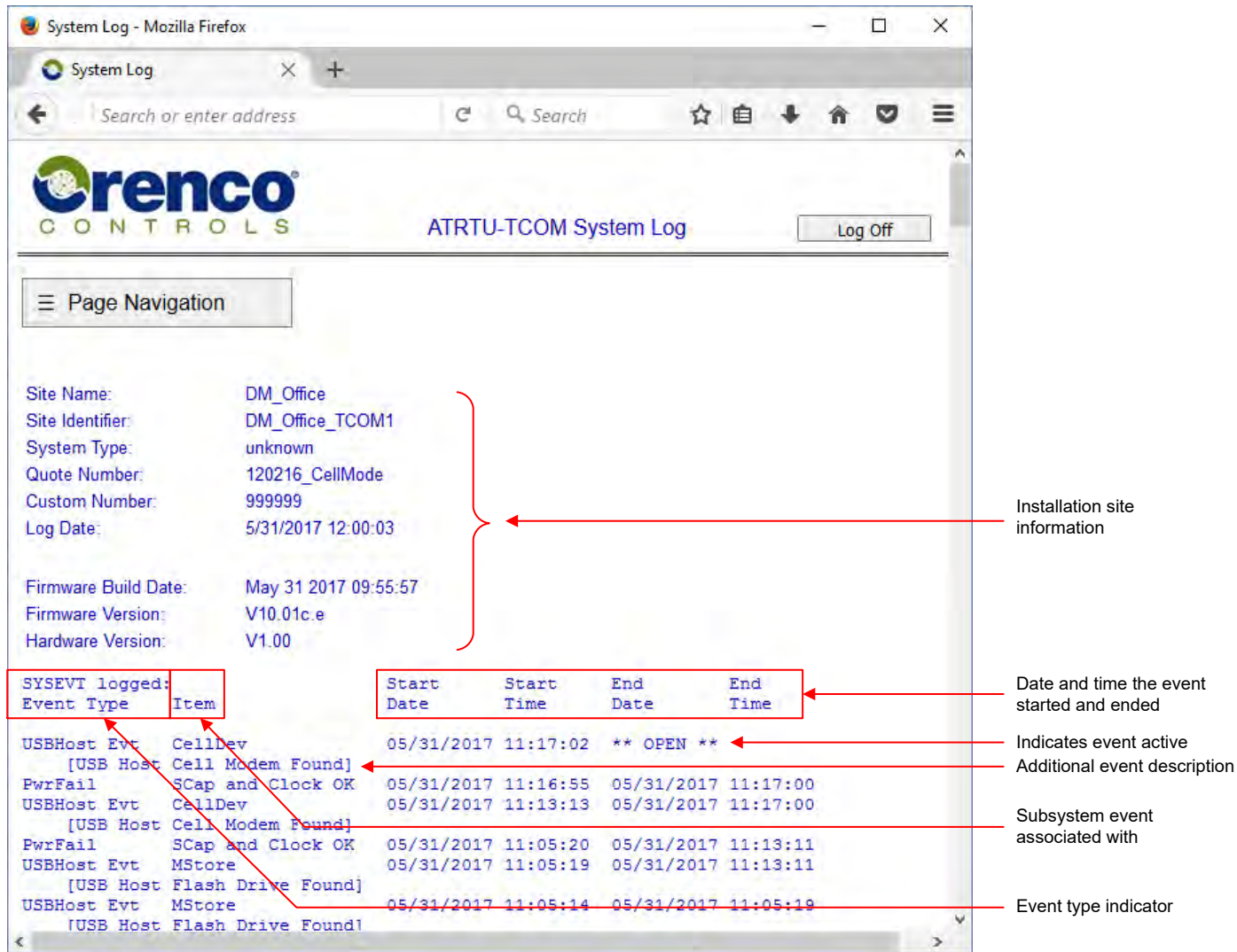
ALARMS logged:	Item	Value	Start Date	Start Time	End Date	End Time
PwrFail		0.00	05/31/17	11:16:55	05/31/17	11:17:00
ALM1_P529			02/07/03	09:00:05	** ALARM **	
PwrFail		0.00	05/31/17	11:05:20	05/31/17	11:13:11
ALM1_P513			02/07/03	09:00:05	** ALARM **	
PwrFail		0.00	05/31/17	07:58:14	05/31/17	08:22:21
ALM1_P498			02/07/03	09:00:05	** ALARM **	
PwrFail		0.00	05/31/17	07:55:01	05/31/17	07:55:16
PwrFail		0.00	05/31/17	07:51:52	05/31/17	07:52:03
PwrFail		0.00	05/31/17	07:20:32	05/31/17	07:48:23
PwrFail		0.00	05/31/17	07:17:58	05/31/17	07:18:06
PwrFail		0.00	05/31/17	07:14:09	05/31/17	07:14:30
PwrFail		0.00	05/31/17	06:43:44	05/31/17	07:11:12

Figure 17: Example Alarm Log

### 2.11.3 System Log

There is a single system log. Typically, system logs are used to capture system wide events that have been detected by the ATRTU-TCOM firmware. For example, during a power up sequence the firmware may make a log entry indicating whether an optional or removable device that may or may not be installed was detected.

For example, the system log depicted below shows that an optional cellular modem module was detected as being installed in the system and a USB Flash storage device was detected. The actual content of the system log at any time depends on the ATRTU-TCOM control program and what, if any, events have been detected since the log was last cleared.



Installation site information

Date and time the event started and ended

Indicates event active

Additional event description

Subsystem event associated with

Event type indicator

SYSEVT logged:	Event Type	Item	Start Date	Start Time	End Date	End Time
	USBHost Evt	CellDev	05/31/2017	11:17:02	** OPEN **	
		[USB Host Cell Modem Found]				
	PwrFail	SCap and Clock OK	05/31/2017	11:16:55	05/31/2017	11:17:00
	USBHost Evt	CellDev	05/31/2017	11:13:13	05/31/2017	11:17:00
		[USB Host Cell Modem Found]				
	PwrFail	SCap and Clock OK	05/31/2017	11:05:20	05/31/2017	11:13:11
	USBHost Evt	MStore	05/31/2017	11:05:19	05/31/2017	11:13:11
		[USB Host Flash Drive Found]				
	USBHost Evt	MStore	05/31/2017	11:05:14	05/31/2017	11:05:19
		[USB Host Flash Drive Found]				

Figure 18: Example System Log

### 2.11.4 User Logs

The data sampled and stored in user logs is defined by the control program and can be different for each of the 0 - 48 possible user logs. The column headers displayed in the log are determined by the control program. Individual user logs can be viewed, downloaded, and cleared independently of other user logs.

An example user log is shown below.



**ATRTU-TCOM User Log** [Log Off]

Page Navigation

**User Log 1: DMUserLog**

Site Name: DM\_Office  
 Site Identifier: DM\_Office\_TCOM1  
 System Type: unknown  
 Quote Number: 120216\_CellMode  
 Custom Number: 999999  
 Log Date: 6/2/2017 14:18:37

Firmware Build Date: May 31 2017 09:55:57  
 Firmware Version: V10.01c.e  
 Hardware Version: V1.00

Date	Time	DO Now	pH Now	Temp Now
06/02/17	14:57:38	11.25	7.00	118.63
06/02/17	14:57:36	11.25	7.00	118.63
06/02/17	14:57:34	11.25	7.00	118.63
06/02/17	14:57:32	11.25	7.00	118.63
06/02/17	14:57:30	11.25	7.00	118.63
06/02/17	14:57:28	11.25	7.00	118.63
06/02/17	14:57:26	11.25	7.00	118.63
06/02/17	14:57:24	11.25	7.00	118.63

Installation site information

Date and time data sample/ event occurred

Column labels are specific to site control program

Date log is specific to site control program

Figure 19: Example User Log

### 2.11.5 Activity Log

The data sampled and stored in activity logs is defined by the control program and the firmware. Activity logs typically store information about transitions or state changes within the system. For example, a sensor on/off change mapping to an input point may be logged.

Multiple activity logs are supported. Activity logs related to individual point numbers can be accessed from both the logs page and also from the point menu page. See section 1.4.6.1 “Activity Logs” on page 14 and section 2.9 “Point Menu Page” on page 23 for more information.

The logs page allows the user to view or download logs tracking activity on a single point and on all points. The user can also view a non-point specific activity log that tracks events such as user logons, clock changes, etc.

Note: Activity logs cannot be cleared individually. When the clear option is applied to activity logs all activity logs are cleared.

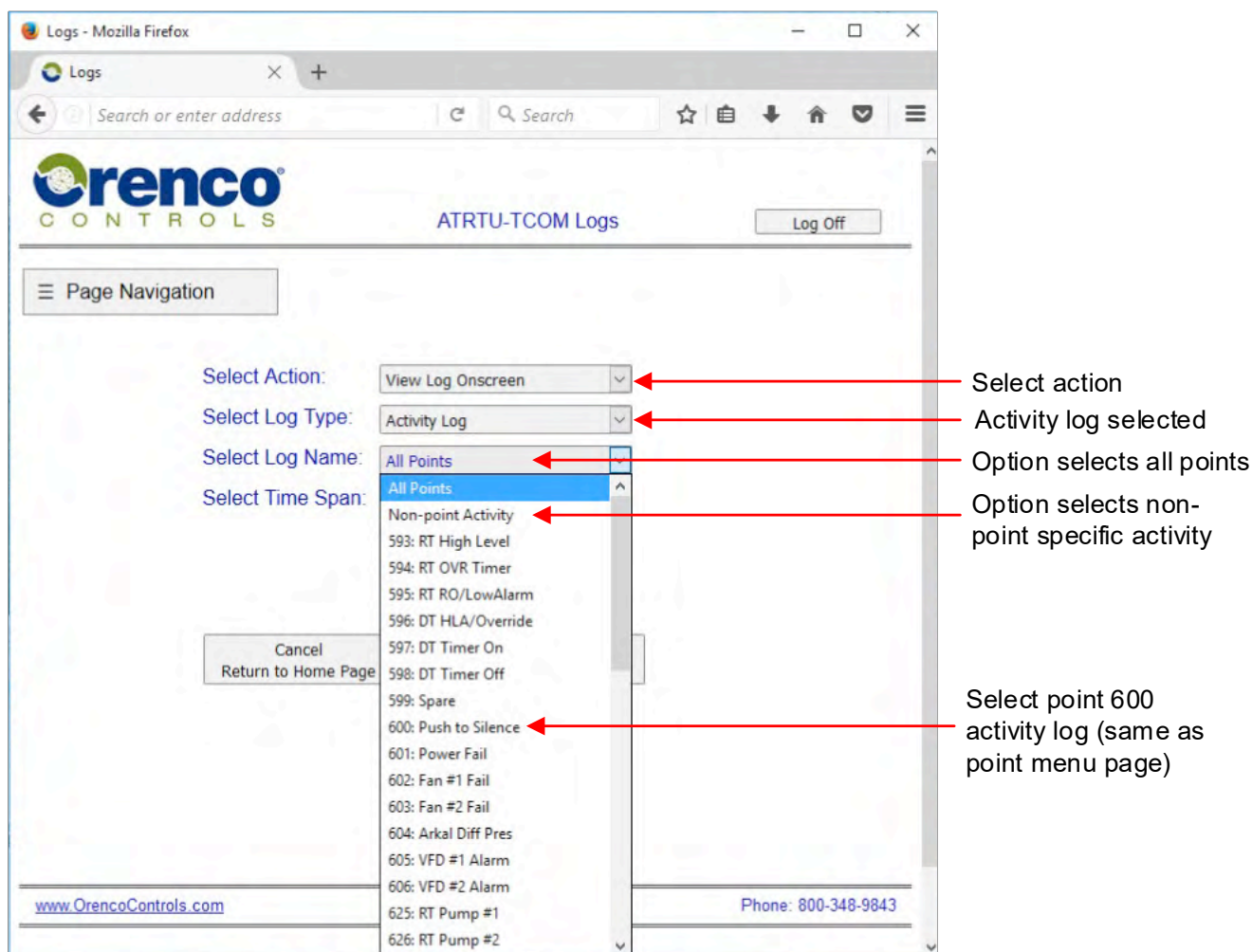


Figure 20: Selecting an Activity Log

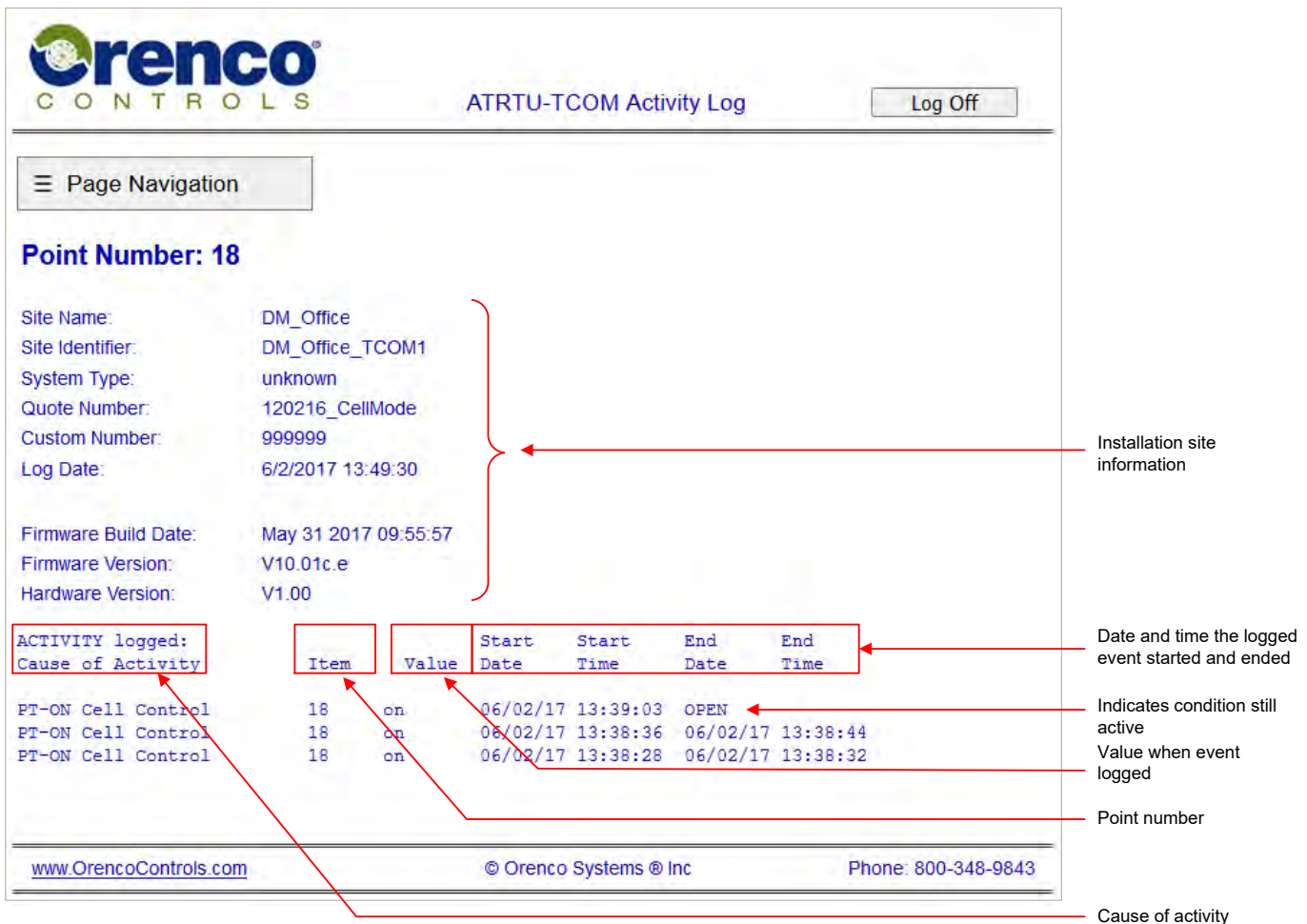


Figure 21: Example Activity Log

## 2.12 Web Server Graphic View

The web server graphics view is an optional upgrade feature that may or may not be available at a particular installation. Graphics View is customizable, tailored to each installation site, and typically specific to each installation. Because of this the following descriptions and images are likely to vary from installation to installation.

This section is intended to provide a conceptual overview of the common graphics system capabilities and operation and should be viewed as a reference rather than an exact depiction of the system the user is interacting with.

### 2.12.1 Overview of Web Server Graphics Configuration

Depending on the system configuration, there may be zero or multiple web pages associated with Graphics View. Each web page is generated from a base template. There are multiple base templates and multiple web pages can be created from each base template.

The base templates have a predefined number of objects placed on them that can be enabled or hidden when the graphics system is being designed. The objects represent text fields and graphic images and are associated with resources in the control system. In this context, resources refer to “points”, digital inputs, digital outputs, analog inputs, and analog outputs.

When the Graphics View subsystem is configured for an installation, designers choose the configuration of each page by:

- 1) Selecting a base template.
- 2) Selecting which objects on the template are enabled or hidden.
- 3) If applicable, selecting which graphical images are associated with the object.
- 4) Selecting the resource to associate with the object.
- 5) Repeat steps 1-4 until the desired number of pages/views are created or the maximum number of pages is reached.

**Note:** The maximum number of pages is limited by available memory, the total number of bytes consumed by each page, and an internal limit currently set at 20.

### 2.12.2 Selecting a Web Server Graphic View

The “Page Navigation” menu is automatically populated with a “Graphic View” dropdown menu on systems with graphics view installed. Systems that do not display the “Graphic View” dropdown menu do not support graphic view.

Each selection on the graphic view dropdown menu is a link to an individual web page. To select a specific graphic view, open the “Page Navigation” menu, select “Graphic View”, then select the desired graphic view web page.



**Figure 22: Selecting a Web Server Graphic View**

### 2.12.3 Features Common to Web Server Graphic Views

Features common to each Graphic View include:

- There can be multiple instances of each base template.
- Each base template can be configured to display information about a different set of resources.
- Unused objects can be hidden to avoid screen clutter.
- Resource labels are configurable.
- Graphic images representing on/off or other states of resources are configurable.
- Displayed values and graphic images are updated periodically to show the current state of the resource and enhance visual monitoring of the real time system state.
- The override state of each resource is also displayed and updated at each refresh cycle.
- Dashed outlines indicate the resource cannot be overridden.
- Solid outlines indicate overrides can be applied.
- The color of the outline indicates the current override state.
- Each graphic view web page includes a color key and set of notes describing the outline and color mapping of the override states.
- To view more information or to apply an override the user can click on the target resource. If the resource is overridable a dialog box is then displayed providing a user interface to show the current state and available override options.
- If a user is working in a situation where the outline color is difficult to see, such as using a small cell phone in bright sunlight, the user can click on the object to open the override dialog box which provides additional information in text form. The dialog box can be closed without applying an override and, if an attempt to apply an override is made, the user is required to confirm the selection.
- The override dialog box is a popup window and requires popups to be enabled on the host browser.
- The override dialog box supports overrides for point, digital outputs, and analog outputs.

See section 2.10 "Point Override Page" on page 25 for more information on applying overrides.

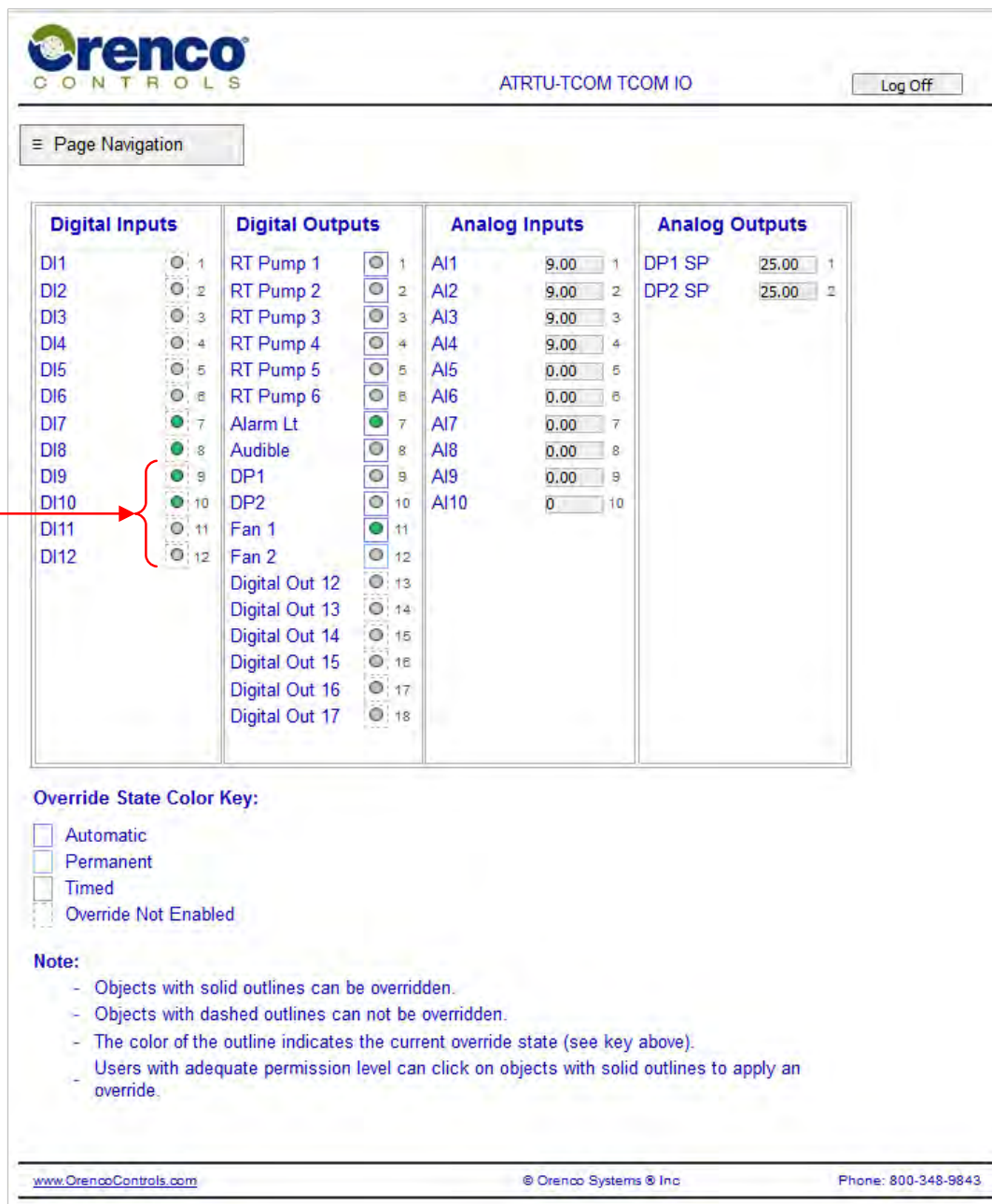
**Note:**

The point override page is a stand alone web page while the override dialog box is popup dialog box. However, the features and operation are basically the same.

### 2.12.4 Web Server Graphic View IO Template

Each ATRTU-TCOM controller hosts a set of digital inputs, digital outputs, analog inputs, and analog outputs. The IO template includes up to 12 digital inputs, 18 digital outputs, 10 analog inputs, and 2 analog outputs.

Unused resources can be hidden at design time to reduce screen clutter. The graphic images associated with the on/off state of each resource are configurable at design time. The labels assigned to each resource are also configurable (example: RT Pump 1).



**Digital Inputs**

DI1	<input type="radio"/>	1
DI2	<input type="radio"/>	2
DI3	<input type="radio"/>	3
DI4	<input type="radio"/>	4
DI5	<input type="radio"/>	5
DI6	<input type="radio"/>	6
DI7	<input checked="" type="radio"/>	7
DI8	<input checked="" type="radio"/>	8
DI9	<input checked="" type="radio"/>	9
DI10	<input checked="" type="radio"/>	10
DI11	<input type="radio"/>	11
DI12	<input type="radio"/>	12

**Digital Outputs**

RT Pump 1	<input type="radio"/>	1
RT Pump 2	<input type="radio"/>	2
RT Pump 3	<input type="radio"/>	3
RT Pump 4	<input type="radio"/>	4
RT Pump 5	<input type="radio"/>	5
RT Pump 6	<input type="radio"/>	6
Alarm Lt	<input checked="" type="radio"/>	7
Audible	<input type="radio"/>	8
DP1	<input type="radio"/>	9
DP2	<input type="radio"/>	10
Fan 1	<input checked="" type="radio"/>	11
Fan 2	<input type="radio"/>	12
Digital Out 12	<input type="radio"/>	13
Digital Out 13	<input type="radio"/>	14
Digital Out 14	<input type="radio"/>	15
Digital Out 15	<input type="radio"/>	16
Digital Out 16	<input type="radio"/>	17
Digital Out 17	<input type="radio"/>	18

**Analog Inputs**

AI1	9.00	1
AI2	9.00	2
AI3	9.00	3
AI4	9.00	4
AI5	0.00	5
AI6	0.00	6
AI7	0.00	7
AI8	0.00	8
AI9	0.00	9
AI10	0	10

**Analog Outputs**

DP1 SP	25.00	1
DP2 SP	25.00	2

**Override State Color Key:**

- Automatic
- Permanent
- Timed
- Override Not Enabled

**Note:**

- Objects with solid outlines can be overridden.
- Objects with dashed outlines can not be overridden.
- The color of the outline indicates the current override state (see key above).
- Users with adequate permission level can click on objects with solid outlines to apply an override.

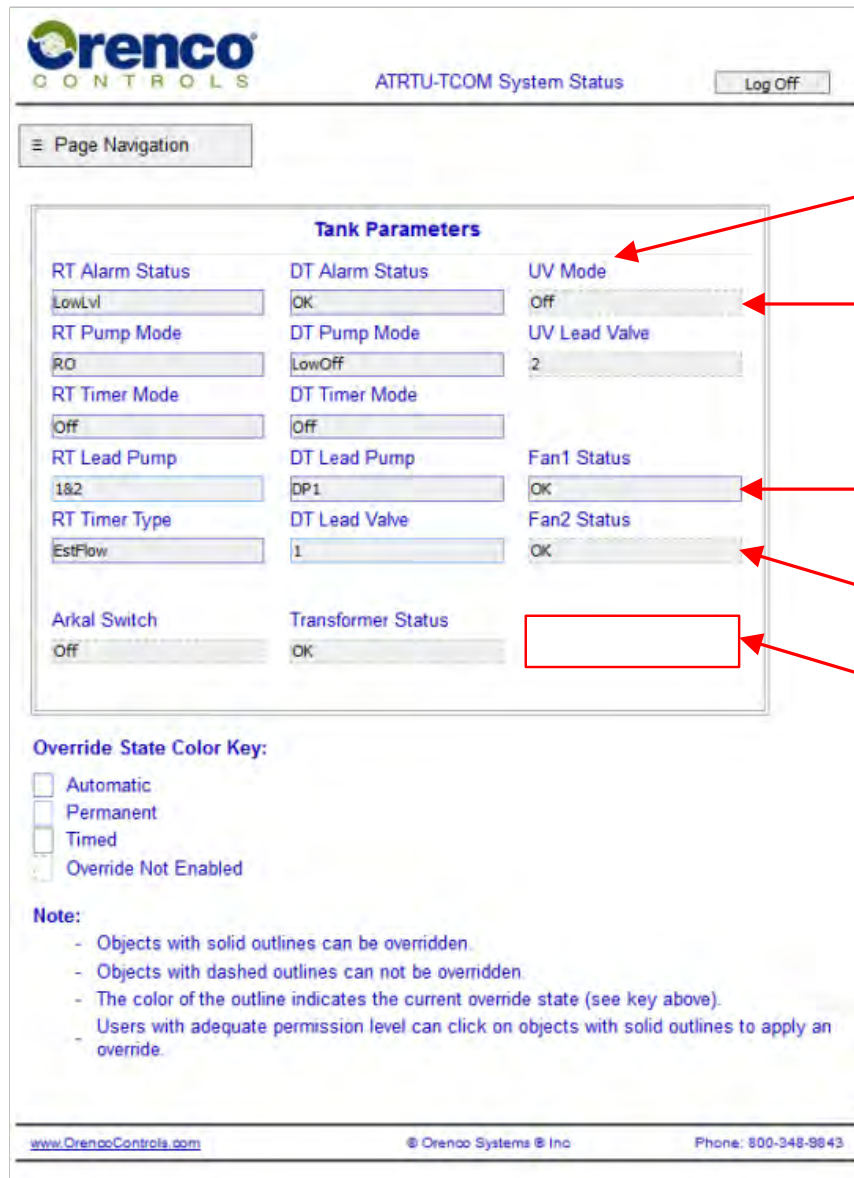
Graphics indicating on/off state are configurable. In this example green is on and grey is off.

Describes current override state of each resource

Figure 23: Web Server Graphic View IO Template

### 2.12.5 Web Server Graphic View Parameter Template

The parameter template is typically used to represent text values. As with all templates, the parameter values are updated periodically and the parameters and labels are selected at design time. Depending on the control program design, parameters may or may not be overridable. Overridable parameters can be clicked on to pop up a dialog box showing more detail about the parameter and providing a user interface to support applying or removing an override.



Custom parameter label selected by design

Parameter value updated periodically

Overridable parameter in automatic mode

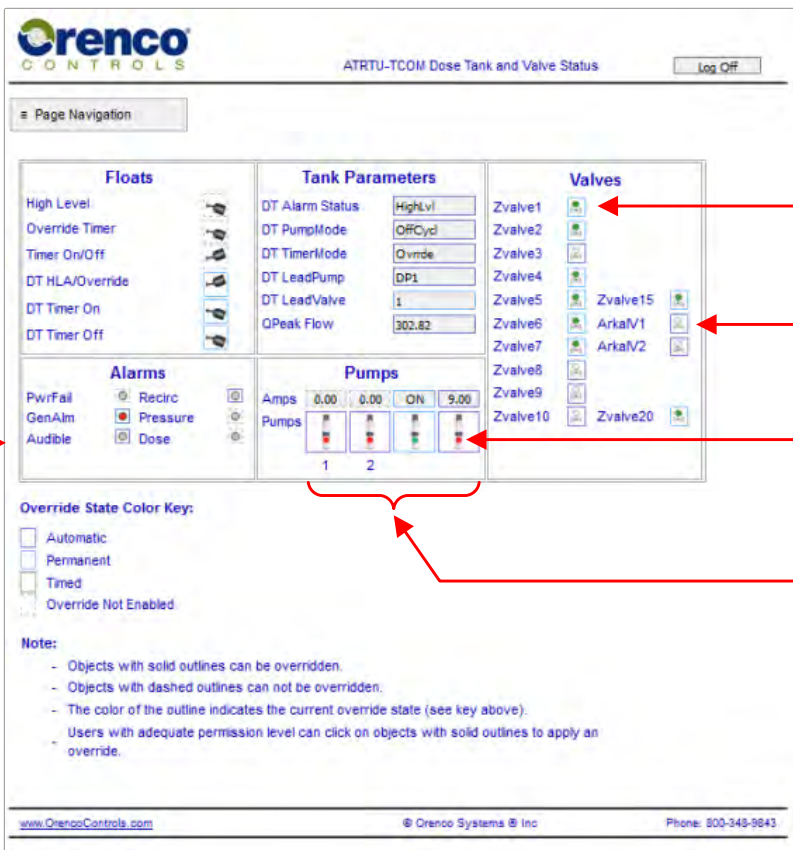
Parameter cannot be overridden

Unused template object hidden

**Figure 24: Web Server Graphic View Parameter Template**

### 2.12.6 Web Server Graphic View Tank with Valves

The tank with valves template shows a combination of resources in graphical and text format including floats, pumps, parameters, alarms, and valves. As with all templates, the values are updated periodically and the resources and labels are selected at design time. Depending on the design the resources may or may not be overridable. Overridable resources can be clicked on to pop up a dialog box showing more detail about the resource and providing a user interface to support applying or removing an override.



Float up/down graphics track float state

Alarms/Status source and graphics configurable

Custom label configured by design

Overridable parameter in permanent mode

Green/Gray color indicates valve on/off state

Red/Green color indicates pump on/off state

Labels can be visible or hidden

Figure 25: Web Server Graphic View Tank with Valves

### 2.12.7 Web Server Graphic View Tank Without Valves

The tank without valves template shows a combination of resources in graphical and text format including floats, pumps, parameters, alarms, and valves. As with all templates, the values are updated periodically and the resources and labels are selected at design time. Depending on the design the resources may or may not be overridable. Overridable resources can be clicked on to pop up a dialog box showing more detail about the resource and providing a user interface to support applying or removing an override.

The screenshot shows the 'ATRTU-TCOM Recirc Tank Status' page. It features a 'Page Navigation' menu, a 'Log Off' button, and several data sections:

- Floats:** Includes HLA/Lag, Override Timer, LLA/RO, DT HLA/Override, DT Timer On, and DT Timer Off. Each item has a float icon.
- Tank Parameters:** Includes Alarm Status (HighLvl: 6.79), Pump Mode (RO: 1.50), Timer Mode (Off), Lead Pump (1&2), Timer Type (EstFlow), and Off Time Status (Normal).
- Alarms:** Includes Alm Light (Fan 1 CS), Audible (Fan 2 CS), and Fan (PwrFail).
- Pumps:** A row of 10 pump indicators, each with a numerical value (9.00 or 0.00) and a red/green indicator.
- Override State Color Key:** Lists Automatic, Permanent, Timed, and Override Not Enabled.
- Note:** Explains that solid outlines indicate overridable objects, dashed outlines indicate non-overridable objects, and the outline color indicates the current override state.

Annotations with red arrows point to the following elements:

- Custom parameter label selected by design (Active Off Time)
- Parameter value updated periodically (6.79)
- Overridable parameter in automatic mode (Active On Time)
- Float up/down images track float state (DT Timer On)
- Selectable parameter (Pumps)
- Red/Green color indicates current on/off pump state (Pumps)
- Configurable label (Override State Color Key)

Figure 26: Web Server Graphic View Tank Without Valves

## 2.13 Mailbox Page

The ATRTU-TCOM system supports event notification to a variety of external systems referred to as “mailboxes”. As described in section 1.4.7 “Event Notification Using Mailboxes” on page 15, multiple interacting subsystems are required for successful event notification using mailboxes. The web server supports assigning message and destination information for mailboxes that have been defined by the control program. Currently, the web server does not support adding, removing, or changing the type of mailboxes.

To configure a mailbox the user must enter information that is valid for the destination device and mailbox type.

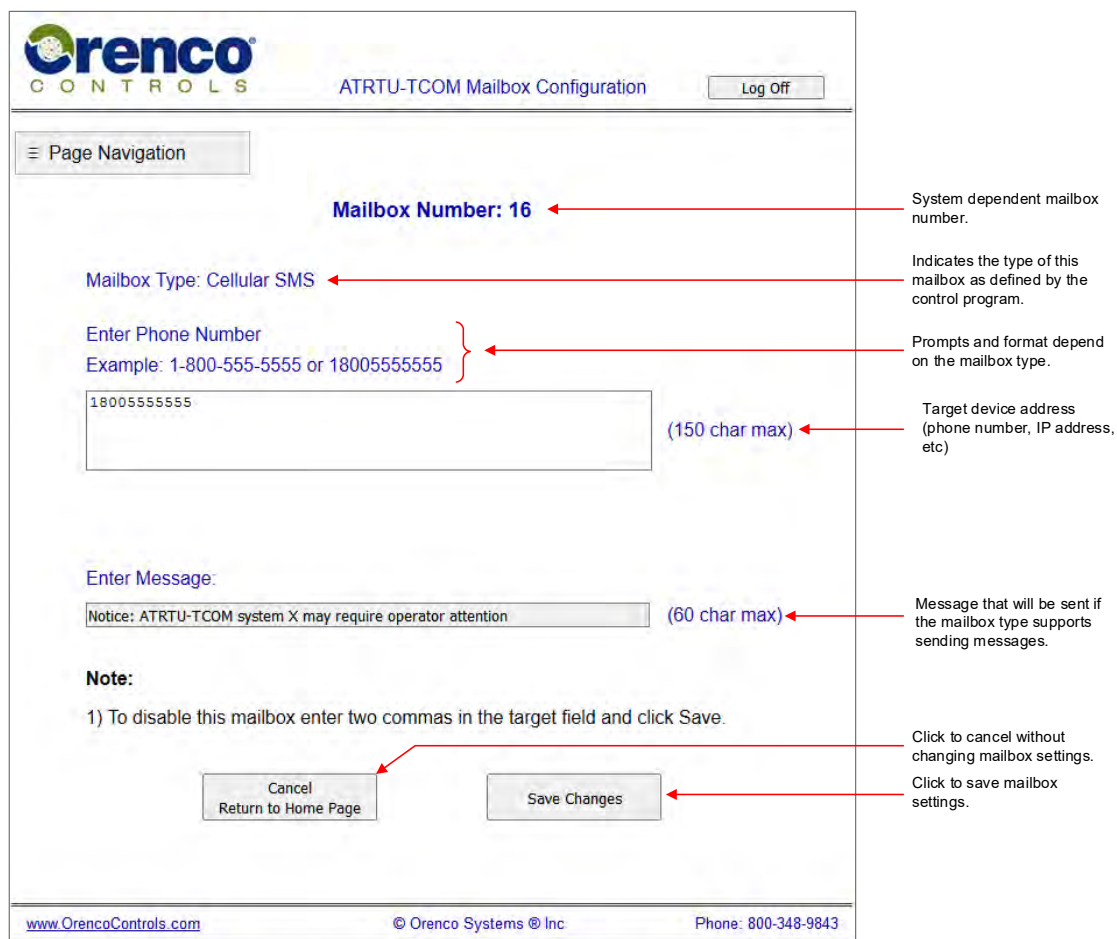
For a pager, phone, or modem the user must enter the pager or phone number to call. No message information is required and no message will be left. The notification is via caller ID. The phone number must be entered as it would be from the site location. This includes an area code or any other prefix numbers that are required by the phone system the panel is connected to. Five commas must be appended to the end of the phone number.

For example: “1800554444,,,,,”.

For an email, the user must enter the destination email address and a message. In some configurations, it may be possible to send an email to a wireless cellular network and have it converted into an SMS text message.

For a direct cellular SMS text, the user must enter the phone number and a limited message.

**Note:** The mailbox type depicted below is for an optional cellular module that is not installed in all systems.



**Mailbox Number:** 16

**Mailbox Type:** Cellular SMS

**Enter Phone Number**  
Example: 1-800-555-5555 or 1800555555

1800555555 (150 char max)

**Enter Message:**  
Notice: ATRTU-TCOM system X may require operator attention (60 char max)

**Note:**  
1) To disable this mailbox enter two commas in the target field and click Save.

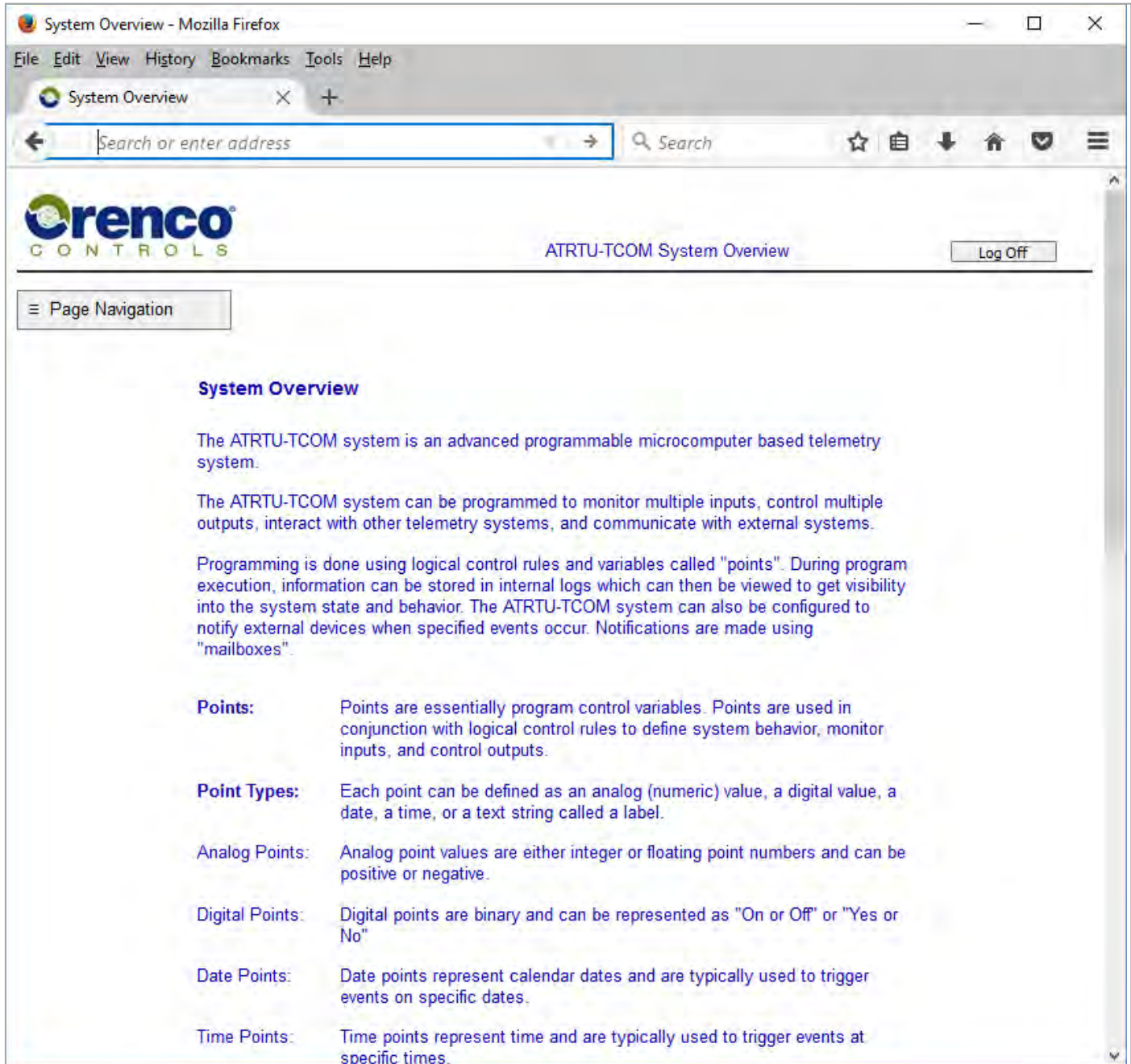
Buttons: Cancel Return to Home Page, Save Changes

Annotations on the right:  
 - System dependent mailbox number.  
 - Indicates the type of this mailbox as defined by the control program.  
 - Prompts and format depend on the mailbox type.  
 - Target device address (phone number, IP address, etc)  
 - Message that will be sent if the mailbox type supports sending messages.  
 - Click to cancel without changing mailbox settings.  
 - Click to save mailbox settings.

**Figure 27: Example Mailbox Page for SMS Text Messaging**

## 2.14 System Overview Page

The web site includes a system overview support page that provides an overview of the system.



**Figure 28: System Overview Page**

## 2.15 Support Page

The web site includes a simple support page that provides contact information for Orenco Controls and a link to this document.



Orenco Controls contact information

Link to additional documentation

**Orenco Controls**  
814 Airway Ave  
Sutherlin Oregon 97479

Direct: 541-459-4449  
Toll Free: 1-800-348-9843  
Fax: 541-459-6781  
Internet: [www.OrencoControls.com](http://www.OrencoControls.com)

**Download Documentation**

For more information download the ATRTU-TCOM Field User Manual from:  
[http://www.orenco.com/controls/tcom\\_viewer.cfm](http://www.orenco.com/controls/tcom_viewer.cfm)

[www.OrencoControls.com](http://www.OrencoControls.com) © Orenco Systems © Inc Phone: 800-348-9843

Figure 29: Help and Support Page

## 3 TCOM Viewer Software

The TCOM Viewer software is an application provided by Orenco Controls that can be installed on a computer and used to monitor, program, configure, and interact with ATRTU-TCOM systems that are installed and controlling the target systems. To connect to a system using TCOM Viewer, the user may need to be physically present at the installation site or may be at a geographically remote location from the installation site.

TCOM Viewer is a Microsoft Windows© based application compatible with Windows© 7 and newer.

The TCOM Viewer software features include:

- The built in “Terminal Mode” which offers a series of menus that provide prompts to the user and allow the user select from the options. Terminal Mode is similar to previous generations of Orenco Control systems.
- As a standard offering, TCOM Viewer also offers improvement in the ability to view, plot, and export historical log data.
- Methods to configure the various communication interfaces between the user’s computer (client) and the ATRTU-TCOM system.
- Methods to view system status and modify settings.
- As an optional add-on purchase for each site, TCOM Viewer AT can be enhanced to support graphical views and defined plots.

### 3.1 Computer System Requirements

TCOM Viewer is designed to run on computers running Windows© 7/8/10.

Depending on the computer and the method of communication used to connect to the panel, additional accessories for the computer may be required. Contact Orenco Controls if assistance is required. See section 6 “Support Information” on page 100 for contact information.

### 3.2 TCOM Viewer Communication Interfaces

Users can connect to the ATRTU-TCOM system using either a network connection or a direct point to point connection. Network connections allow the user to be virtually any distance from the ATRTU-TCOM system. Local connections require the user to be within close physical proximity to the system.

Remote interaction requires either a modem connection, a network connection, or a cellular connection between the client computer running the TCOM Viewer software and the target ATRTU-TCOM system.

Physical connection options include:

#### **Network:**

- 1) Built in 10/100 base-T hardwired Ethernet Interface (IPV4).
- 2) Optional Cellular Modem interface.
- 3) Optional Modem.

#### **Local:**

- 1) Built in USB 2.0 High Speed compatible client interface.
- 2) Optional Bluetooth Port.

A functioning network requires at least one of the above network interfaces to be installed and connected. It also requires that the subsystem be enabled and correctly configured. Correct configuration requires compatible settings on the host network side and on the ATRTU-TCOM system side. For more information contact your local network administrator, Orenco Controls support, or refer 3.7.3 “Configuring Network (WAN/LAN) and Optional Cellular Connections” on page 60.

### 3.3 Overview of TCOM Viewer Installation and Operation Sequence

This section provides an overview of the basic sequence of steps required to install and operate the TCOM Viewer application. More detailed information is included in following sections of this document.

At a high level, the steps required to install and operate the TCOM Viewer application include:

- 1) Download and install TCOM Viewer.
- 2) Determine what physical interfaces (network, USB, etc.) the specific site supports.
- 3) Decide which interface to connect to and configure TCOM Viewer to use the desired interface.
- 4) Add a site to TCOM Viewer. Refer to section 3.5.1 Adding Sites to TCOM Viewer on page 50.
- 5) Optionally install a configuration file to enhance the capabilities of TCOM Viewer for a better user experience.
- 6) Connect to a site.
- 7) Once connected, the system is ready for the user to interact with.

### 3.4 Installing TCOM Viewer

The following sections describe how to install the TCOM Viewer software which can be downloaded from the Orenco Controls website. A USB flash storage device typically provided with this user manual also includes the TCOM Viewer software.

#### 3.4.1 Install TCOM Viewer from USB Flash Storage Device

To install the TCOM Viewer software from a USB flash storage device:

- 1) Insert the USB flash storage device into a USB client port on the host computer.
- 2) Use the Windows® file explorer to navigate to the USB flash storage device.
- 3) Double click on the TCOM View <xxx>.exe file to begin the installation process. Note that the <xxx> refers to the version number of the TCOM Viewer installation program which changes as new releases are created.
- 4) Follow the onscreen prompts.

#### 3.4.2 Download TCOM Viewer from Website and Install

Prior to installing TCOM Viewer AT, it is recommended that any Windows® service packs or security updates from Microsoft® are installed. The user is also advised to close any open applications prior to initiating the installation process.

Internet access is required during the TCOM Viewer AT install process as required Microsoft libraries will be downloaded and installed if they are not already on the computer. Required USB drivers will be installed if they aren't already.

To decrease the time required to download the installation file it has been compressed using a common "zip" file format. Once downloaded the compressed file must be uncompressed (unzipped). Once decompressed, the TCOM View executable file can be run without further installation.

To download and install TCOM Viewer the user should:

- 1) Optionally review the notes below.

- 2) Ensure that the ATRTU-TCOM system powered is on.
- 3) Ensure that the computer they are working with has an active connection to the internet.
- 4) Navigate to the following link: [http://www.orenco.com/controls/tcom\\_viewer.cfm](http://www.orenco.com/controls/tcom_viewer.cfm)
- 5) Locate the “TCOM View Software Download” link on the web page and click on it to download the file.
- 6) Note the location in the local computers file system where the file is being downloaded to (see Notes 1, 2, and 3 below). Depending on your browser and operating system version, a link to the file may show on on the browser’s page.
- 7) Find the compressed zip file and, at the user’s discretion, copy the file into another directory of their choice (see Note 3, 4, 5). The specific folder the file is copied to doesn’t really matter. What important is that the user knows where it is located and can easily find it when needed. Example location: “C:\OrencoTools\TCOMViewer\”
- 8) Click on the uncompressed TCOM Viewer file to start the installation process.
- 9) Follow the onscreen prompts.

**Notes:**

- 1) If additional assistance is required, please contact the computer administrator, network administrator, or Orenco Controls.
- 2) Computers can be configured to control what specific users are allowed to do with the computer. Depending on how the user’s computer is configured, “Administrator” privilege may be required to install new programs. If the user sees prompts or error messages indicating a need for “Administrator” privilege they may need to contact their computer administrator for assistance.
- 3) Unless otherwise specified, the default download directory will typically be “c:\Users\- 4) The file must first be unzipped (uncompressed). Depending on the users computer configuration, simply double clicking on the compressed file will automatically decompress it. Otherwise the user may need to use “Winzip” which is a software application that can be used to compress (zip) or de-compress (un-zip) files with the “.zip” file extension

### 3.4.3 Installing the TCOM Viewer USB Driver

The USB driver for the ATRTU-TCOM controller is automatically installed when TCOM Viewer is installed on Windows© 7, 8, and 10.

### 3.5 TCOM Viewer Configuration Files

TCOM Viewer uses configuration files to store information specific to each ATRTU-TCOM controller, the control program in the ATRTU-TCOM system, and some information about the computer the TCOM Viewer application is running on.

Since multiple ATRTU-TCOM controllers may be installed at an individual site, and some support personnel manage multiple sites, the TCOM Viewer software allows the user to set up multiple configurations where each configuration maps to a single instance of an ATRTU-TCOM controller.

The configuration information is stored in two separate files. One file is used to store information specific to the installation site and primarily contains settings required to establish a communication channel with the target ATRTU-TCOM system. This is referred to as a “site” file. The optional second file stores information specific to the control program in the ATRTU-TCOM system. This is referred to as the “config” file.

TCOM Viewer configuration files are typically stored on the computer running the TCOM Viewer application in the following directory: C:\ProgramData\Orenco Systems\Data

### 3.5.1 Adding Sites to TCOM Viewer

To add site information, click on the “Add Site” tab. The “Add Site Process” dialog box will pop up and prompt the user to choose whether to attempt an automatic setup or a manual setup. Note that the user cannot cancel this dialog box. However, after selecting an option the user does have the option to cancel the add site process. The recommended method to add site files is via the automated process. However, depending on the installation site and the version of ATRTU-TCOM system it is sometimes necessary to add the site using the manual process.

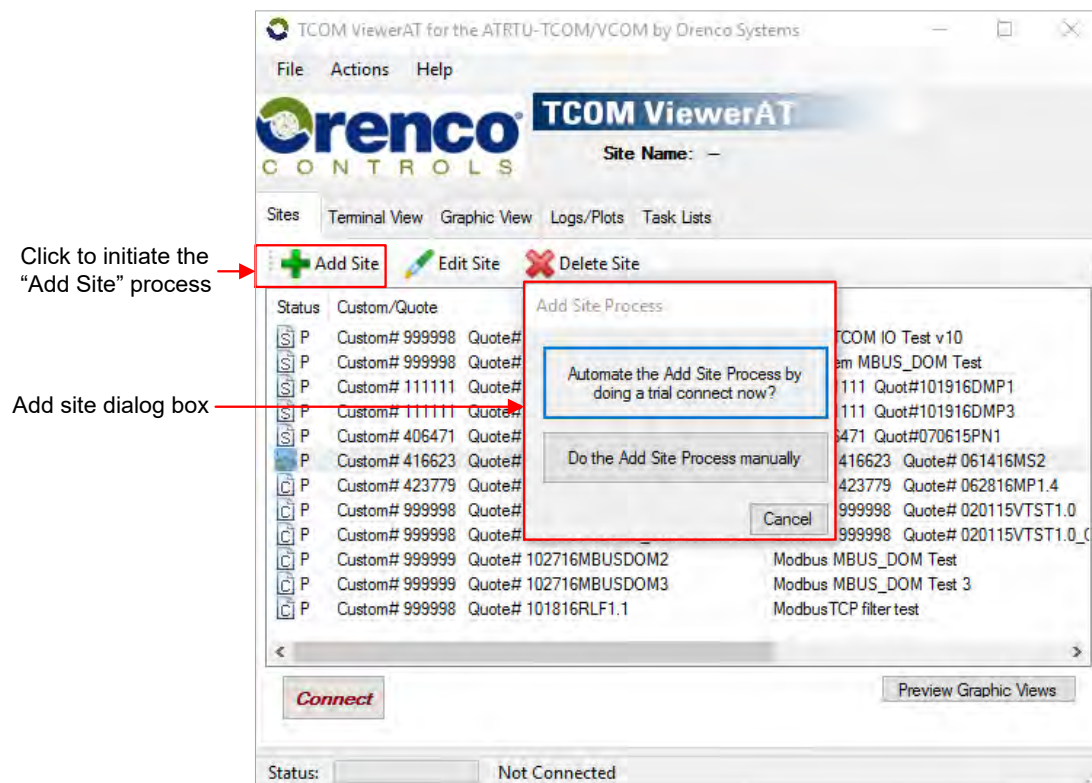
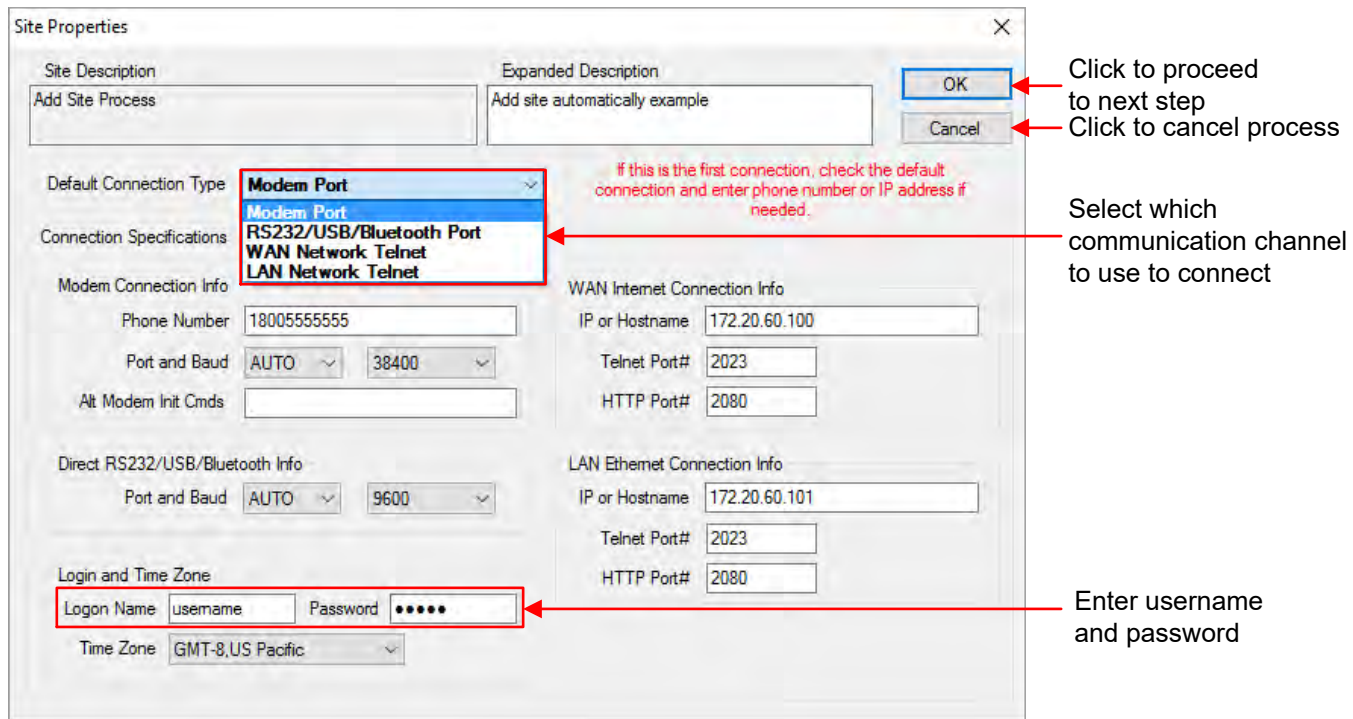


Figure 30: Adding Site Files

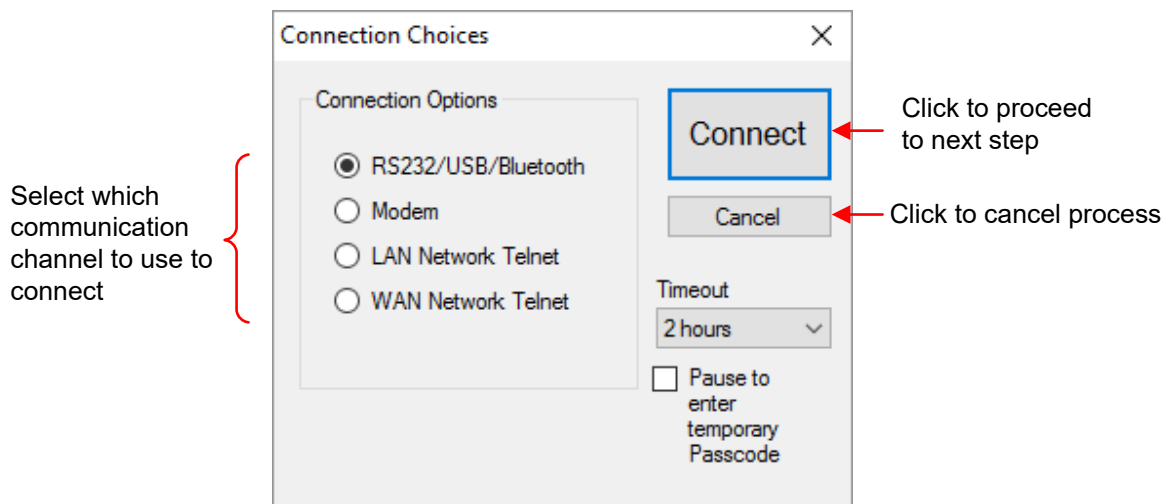
### 3.5.1.1 Adding Sites Using the Automated Method

Using the automated process, TCOM Viewer will attempt to make a trial connection using the communications settings entered by the user. The user will need to know a valid user name and password combination. The user will also need to decide which communication interface to use and settings required for that interface. Depending on the installation site, there may be multiple communication channels available. Only one is required for this process.

See section 3.7 “Configuring TCOM Viewer Connection Parameters” on page 57 for detailed information on how to configure each communication channel. After configuring the communication parameters and entering a username and password click “OK” to proceed to the next step.



**Figure 31: Adding Site Information Automatically**

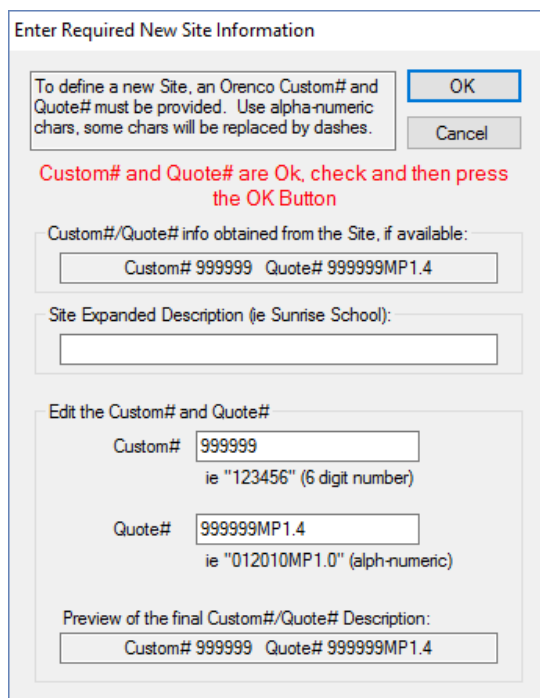


**Figure 32: Initiate Connection**

If the trial connection is successful, TCOM Viewer will obtain unique identification from the target ATRTU\_TCOM system the user connected to.

To complete the add site process, the user can optionally enter a description of the site for their own reference under the "Site Expanded Description".

If the trial connection was not successful, the process can be cancelled or the site properties screen can be returned to, adjustments can be made, and another attempt at a trial connection can be initiated.



The screenshot shows a dialog box titled "Enter Required New Site Information". It contains the following elements:

- A text box with instructions: "To define a new Site, an Orenco Custom# and Quote# must be provided. Use alpha-numeric chars, some chars will be replaced by dashes." To the right are "OK" and "Cancel" buttons.
- Red text: "Custom# and Quote# are Ok, check and then press the OK Button".
- A section "Custom#/Quote# info obtained from the Site, if available:" with a text box containing "Custom# 999999 Quote# 999999MP1.4".
- A section "Site Expanded Description (ie Sunrise School):" with an empty text box.
- A section "Edit the Custom# and Quote#" with two text boxes: "Custom# 999999" (with subtext "ie '123456' (6 digit number)") and "Quote# 999999MP1.4" (with subtext "ie '012010MP1.0' (alph-numeric)").
- A section "Preview of the final Custom#/Quote# Description:" with a text box containing "Custom# 999999 Quote# 999999MP1.4".

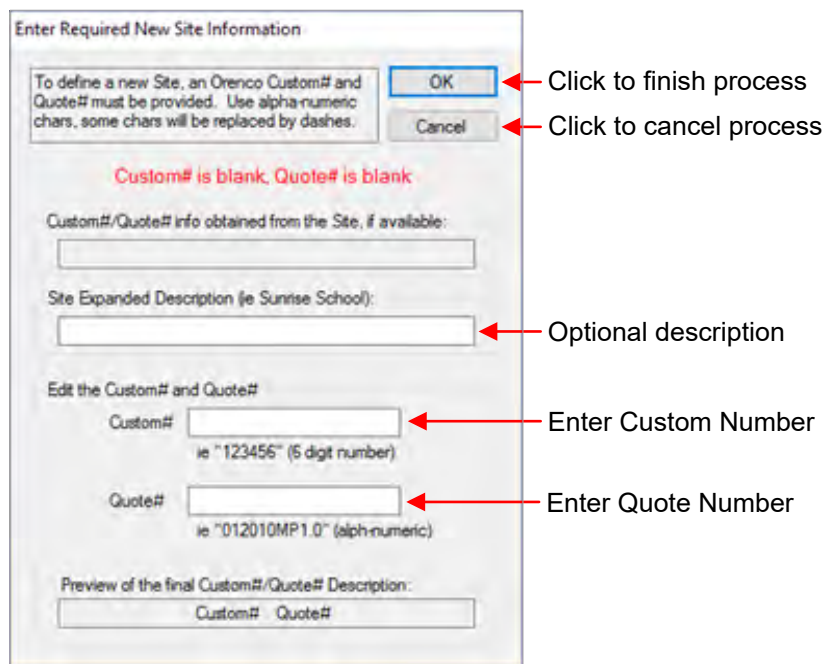
**Figure 33: Successful Connection Using Automated Method to get Site Information**

### 3.5.1.2 Adding Sites Using the Manual Method

The manual process is only recommended if the automated process cannot be used. If the manual process is selected the user will be required to enter a Custom# and a Quote# for the site. The user may also enter an optional description of the site for reference under the “Site Expanded Description”

The custom number (Custom#) and and quote number (Quote#) is needed to uniquely identify the site and to create a properly named data folder to hold logs and reports obtained from the site. These numbers are also used to link the site to any Orenco Controls provided configuration files, including those with graphic views.

All custom ATRTU-TCOM systems produced by Orenco Controls should have these numbers included on the wiring diagram and other paperwork sent with the panel. If none of the numbers are known, a “One-Time Connect” process can be used to connect to the panel and look for the numbers in the Terminal view (see top left corner of screen shot depicted in Figure 42: TCOM Viewer Main Screen on page 63).



**Figure 34: Manually Adding Installation Site Information**

After entering the required and optional information for the “Enter Required New Site Information” screen, click “OK”. The site properties screen will be displayed next. The site properties screen is similar to the one used during the automated add site process and a description of it can be found there (see Figure 32 on page 51). For the manual add site process, once the communication information is entered on the site properties screen, the process will be completed when “OK” is clicked.

### 3.5.2 Adding Configuration Files to TCOM Viewer

TCOM Viewer supports optional configuration information that can be obtained directly from Orenco Controls and is often stored on a USB flash drive provided to the customer. The configuration file contains site specific information to support enhanced features, such as graphical views, point and log names, and defined plots.

In most cases, it is recommended that the configuration file be imported after the site has been created through the “Add Site” process (see section 3.5.1 “Adding Sites to TCOM Viewer” on page 50).

If the site exists, TCOM Viewer will simply update the site with the new enhancements and no other action is required. If the site definition does not already exist (or does not match), TCOM Viewer will automatically create a new site. The new site will appear on the list of sites. If the site is new, the user must select that site and perform an “Edit Site” process using the tab menu above the site list. The user must define the communications settings for the new site (i.e. phone number, IP address etc.) before the first connection attempt.

To import a configuration file select “File” then “Import Site Config File”, navigate to the location of the file, and select it. TCOM Viewer will move the configuration file into the existing or newly created site folder. Upon completion, the site list graphic column should update to indicate the presence of the configuration file and whether it includes graphic views.

Select “Import Site Config File” from the “File” Menu

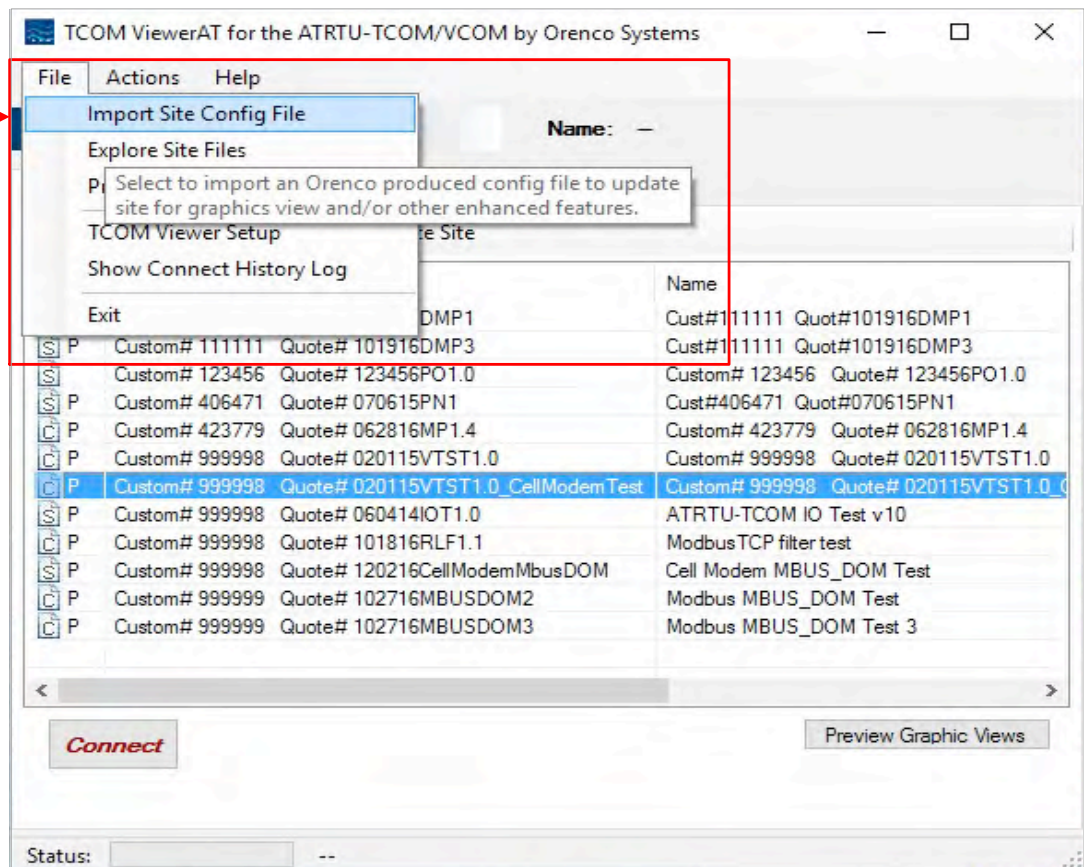


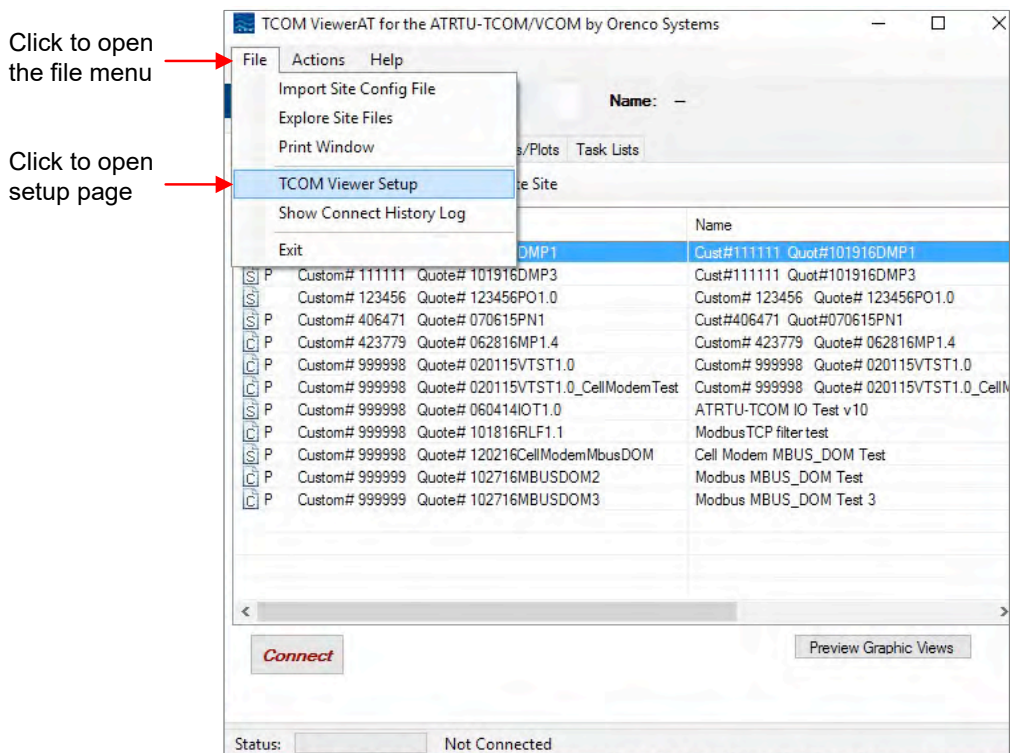
Figure 35: Import TCOM Viewer Configuration File

After a successful automated site add process completes, and a user connects to the new site, the TCOM Viewer software will automatically query the site controller for the presence of a USB flash drive plugged into J3. If a valid "OSD\_C..Q..xml" configuration file is found in the root folder of the USB flash drive, the user will be asked permission to retrieve this file, and if permitted, will retrieve the file and place it into the site folder for future connection usage.

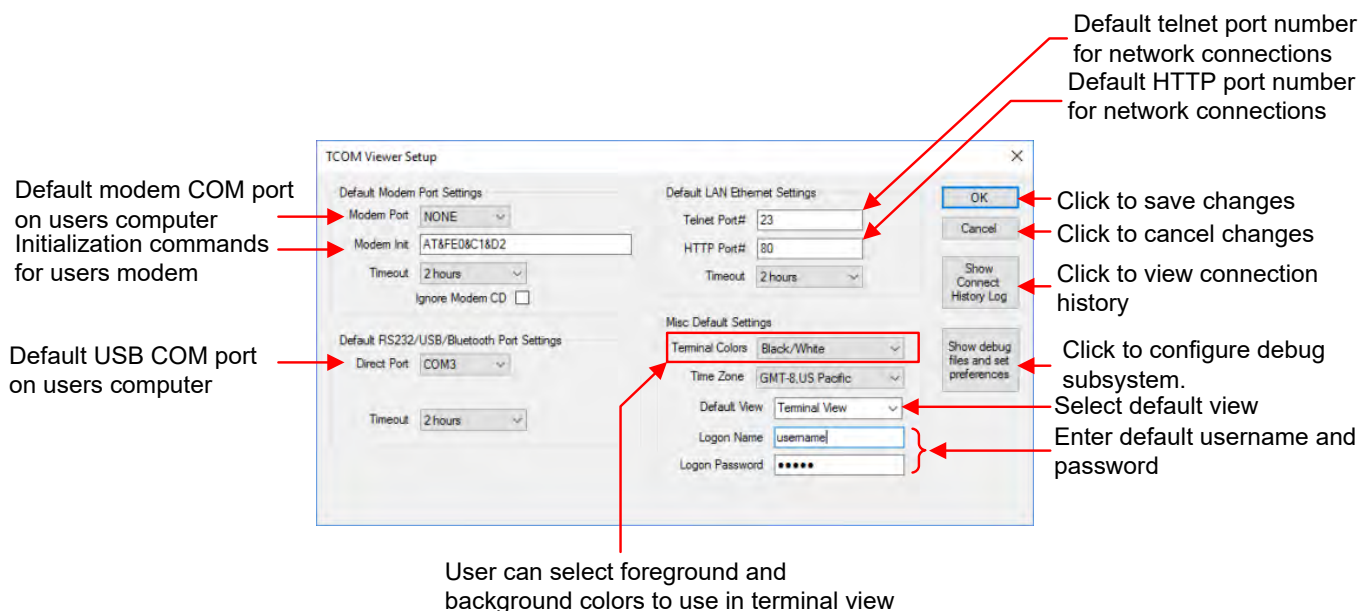
### 3.6 TCOM Viewer Setup

The TCOM Viewer software allows the user to define a set of default values which are then used to pre-populate fields in a variety of dialog boxes in the program. Much of the information entered here will be used as default settings whenever a new site is added.

To open the setup dialog box select “File” and then select “TCOM Viewer Setup”.



**Figure 36: Open TCOM Viewer Setup**



**Figure 37: TCOM Viewer Setup**

See section 3.7.5 “Determining Modem COM Port Numbers on Windows© 7/8/10” on page 62, and section 3.7.6 “Determining Assigned USB COM Port Numbers on Windows© 7/8/10” on page 62 for more information regarding identifying the correct COM port numbers.

**Notes:**

<b>Timeout</b>	This setting specifies the amount of dead/inactivity time that will be allowed before the software automatically disconnects from the TCOM Panel.
<b>Modem Init</b>	This setting is used to initialize the Modem device. The standard “AT&FE0&C1&D2” entry is usually sufficient.
<b>Telnet Port</b>	This setting is determined by network administrator of individual sites.
<b>HTTP Port</b>	This setting is determined by network administrator of individual sites.
<b>Terminal Colors</b>	This setting controls the text foreground and background colors used as the initial color scheme for the terminal view for any new connection.
<b>Ignore CD</b>	The “Ignore Carrier Detect” checkbox is a rarely needed option for modem use on some non-standard computer configurations such as in a virtual machine environment. This should not be checked in most cases.
<b>Default View</b>	This setting specifies the view displayed by default once a new connection is established with a panel. The choices are graphic view or terminal view. If a site does not have a configuration file with graphics, it will always start in the terminal view.
<b>Logon Name</b>	Default user name to use when logging in to an ATRTU-TCOM controller.
<b>Logon Password</b>	Default password to use when logging in to an ATRTU-TCOM controller.

Each time a new site is created the default username and password values will initially be presented in the “Site Properties” window where they can be confirmed or changed as needed for each site.

### 3.7 Configuring TCOM Viewer Connection Parameters

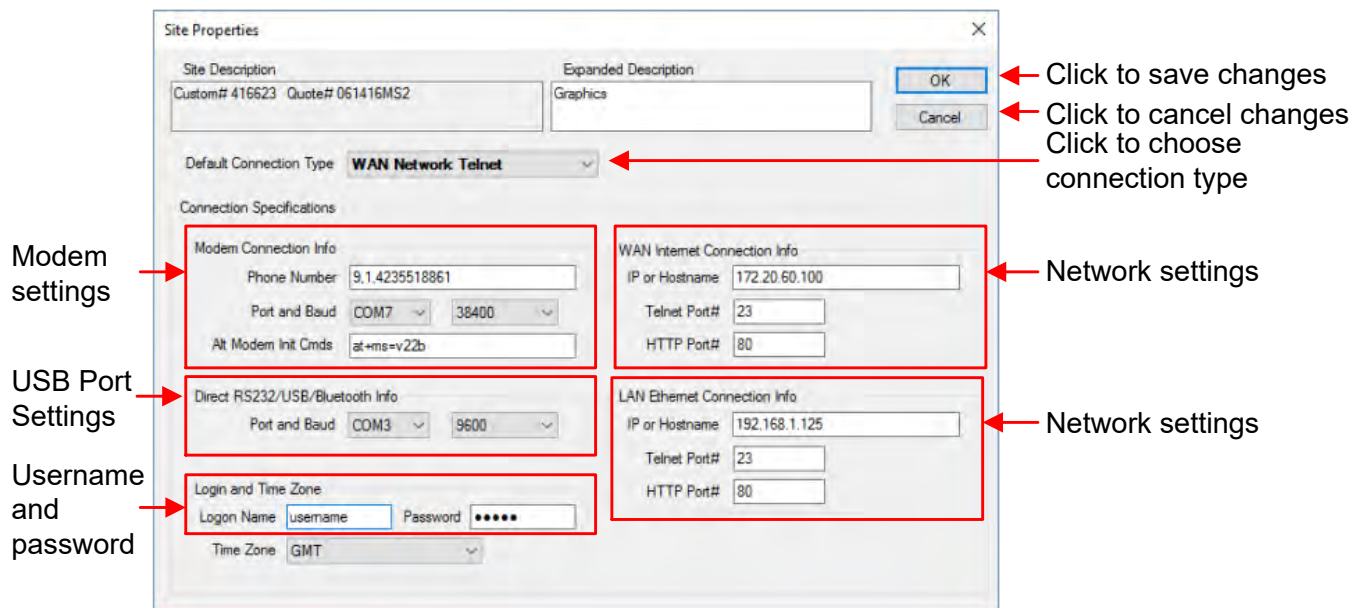
The ATRTU-TCOM system supports a variety of communication channels including optional expansion modules and channels that are included in all systems. This section describes the TCOM Viewer parameters that must be configured to use each communication channel. Installation sites typically do not include all possible communication channels. It is only necessary to configure channels that are actually used.

See section 3.2 “TCOM Viewer Communication Interfaces” on page 47 for more information regarding available communication channels.

See Figure 1: ATRTU-TCOM Control System Electronics on page 7 for connector and module locations.

**Note:**

- 1) Entering a username and password is required.
- 2) Only parameters for connections that are installed and intended for use need to be configured.
- 3) Regardless of whether the communication channel is built in or an installed optional module, there are additional requirements that must be met to successfully establish communication. See section 3.7 “Configuring TCOM Viewer Connection Parameters” on page 57 for more information.



**Figure 38: Configuring Connection Parameters**

### 3.7.1 Configuring the Optional Modem Port

The modem port is typically used to connect to an ATRTU-TCOM controller from a remote location.

**Basic Requirements:**

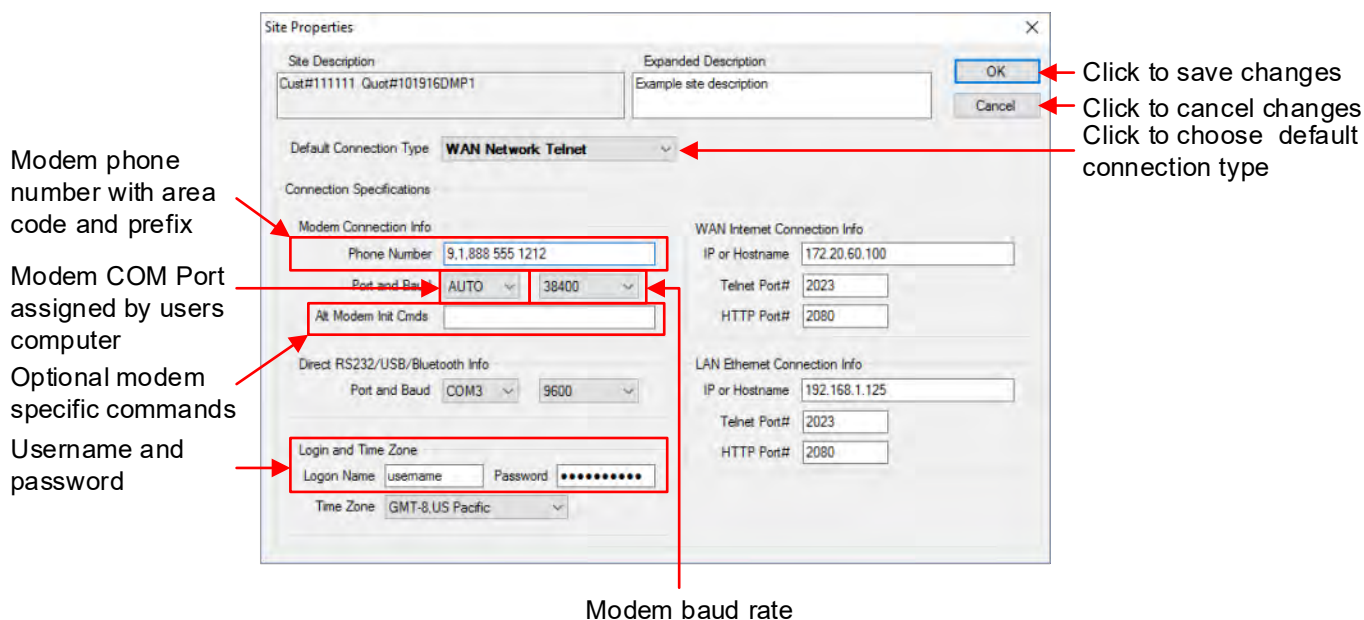
- An optional modem is installed, has an assigned phone number, and is connected to a telephone network.
- The optional modem must be connected to the ATRTU-TCOM system.
- The computer running TCOM Viewer must be connected to a telephone network with a modem.

The phone number assigned to the ATRTU-TCOM controller must be entered in the “Phone Number” field (see modem settings, Figure 38 on page 57) and should include any prefixes and/or area codes required to call from the user’s location to the controller’s location.

The COM port number is assigned by the Windows® Operating System running on the user’s computer when their modem is connected and/or installed in their computer. The assigned COM port number should be entered in the “Port” portion of the modem settings area in TCOM Viewer or the “Port” field should be set to “DEFAULT” to use the setting that was defined in the TCOM Viewer setup.

For additional information on how to identify the COM port number on the users computer, see section 3.7.5 ” Determining Modem COM Port Numbers on Windows® 7/8/10” on page 62.

The baud rate default of 38400 may need to be reduced if the phone connection is unstable. If adjustments are needed for the modem for a specific site, additional modem commands can be entered in the “Alt Modem Init Cmds” area.



**Figure 39: Modem Connection Parameters**

### 3.7.2 Configuring a Direct Connection Using the USB Port

The user must be physically located near the ATRTU-TCOM installation site to connect using the USB port.

#### Basic Requirements:

- The TCOM Viewer USB driver has been installed on the user’s computer.
- The target ATRTU-TCOM controller power is on.
- A USB cable has been connected from the user’s computer to the client USB port (see Figure 1 on page 7).
- The user has identified the COM port number assigned to the USB channel (see section 3.7.6 “Determining Assigned USB COM Port Numbers on Windows© 7/8/10” on page 62).

The COM port number assigned to the USB channel connecting the user’s computer and the ATRTU-TCOM controller must be entered in to the USB Port Settings field (see Figure 38 on page 57). The COM port field can also be set to “AUTO” to use the setting defined in the TCOM Viewer setup.

As of this date, all ATRTU-TCOM controllers are configured to use the default baud rate of 9600.

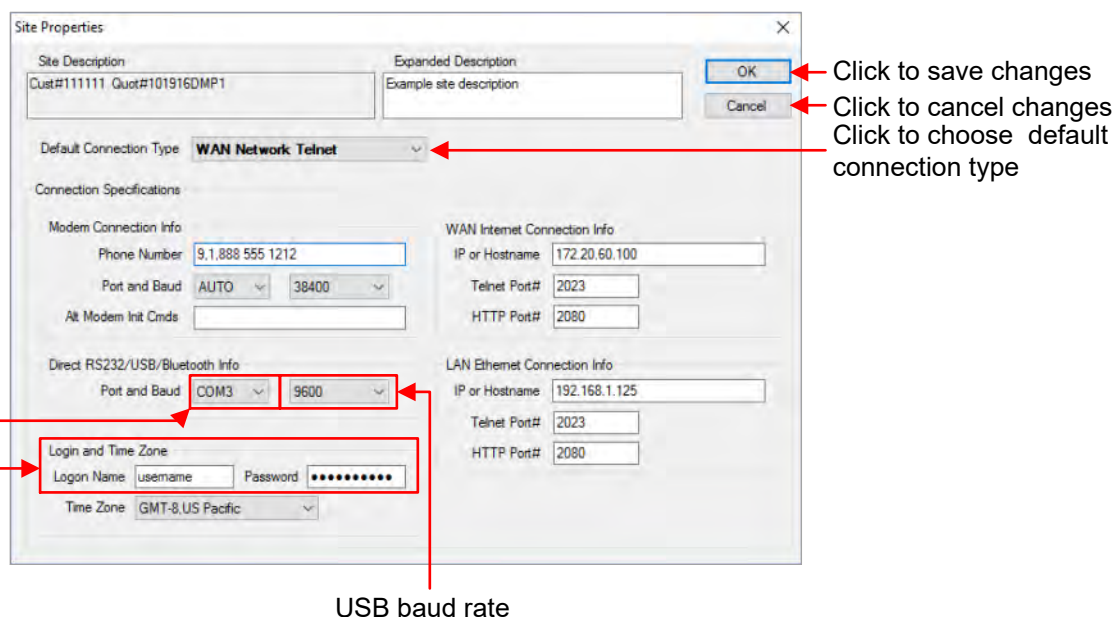


Figure 40: USB Connection Parameters

### 3.7.3 Configuring Network (WAN/LAN) and Optional Cellular Connections

The user may be co-located or physically remote from the ATRTU-TCOM installation site when using network connections. The network connection can be hardwired using a network cable plugged in to the RJ45 Ethernet connector on the ATRTU-TCOM controller or via an optional wireless cellular module (see Figure 1 on page 7).

The ATRTU-TCOM controller includes one built in Ethernet port which can be assigned a single IP address. This port can be connected to either a “Local Area Network (LAN)” or a “Wide Area Network (WAN)”. Typically, corporations have internal networks (LAN) that are isolated from the public internet (WAN). Routers connecting an internal LAN to a public network such as the internet typically remap the internal IP address to a publicly visible IP address.

In addition to the IP address each ATRTU-TCOM controller may be assigned a telnet port number and an HTTP port number. The telnet port is used by the TCOM Viewer software to communicate with the controller. The HTTP port is used to connect a web client to the internal web server. The network administrator determines the IP address, the telnet port number, and the HTTP port number.

If the ATRTU-TCOM system is connected to a local network, any routers connecting the local network to a public network must be configured to enable port forwarding for the telnet and HTTP ports. For more information on configuring ATRTU-TCOM controllers for remote access over the internet, see Orenco Controls document number EIN-CP-TCOM-19.

Support personnel may need to connect to a ATRTU-TCOM controller from the internal LAN while at their office or possibly from a public network if not at their office. If the optional cellular module is installed and connected to a cellular service provider it will be assigned an IP address which will be different than the IP address assigned to the internal Ethernet port. Each device connected to a network must have an assigned IP address.

Therefore, each ATRTU-TCOM controller may be assigned:

- IP address field left blank.
- One IP address which may map to the internal Ethernet port or to an installed cellular module.
- Two IP addresses where one maps to the internal Ethernet port and the other maps to an installed cellular module.

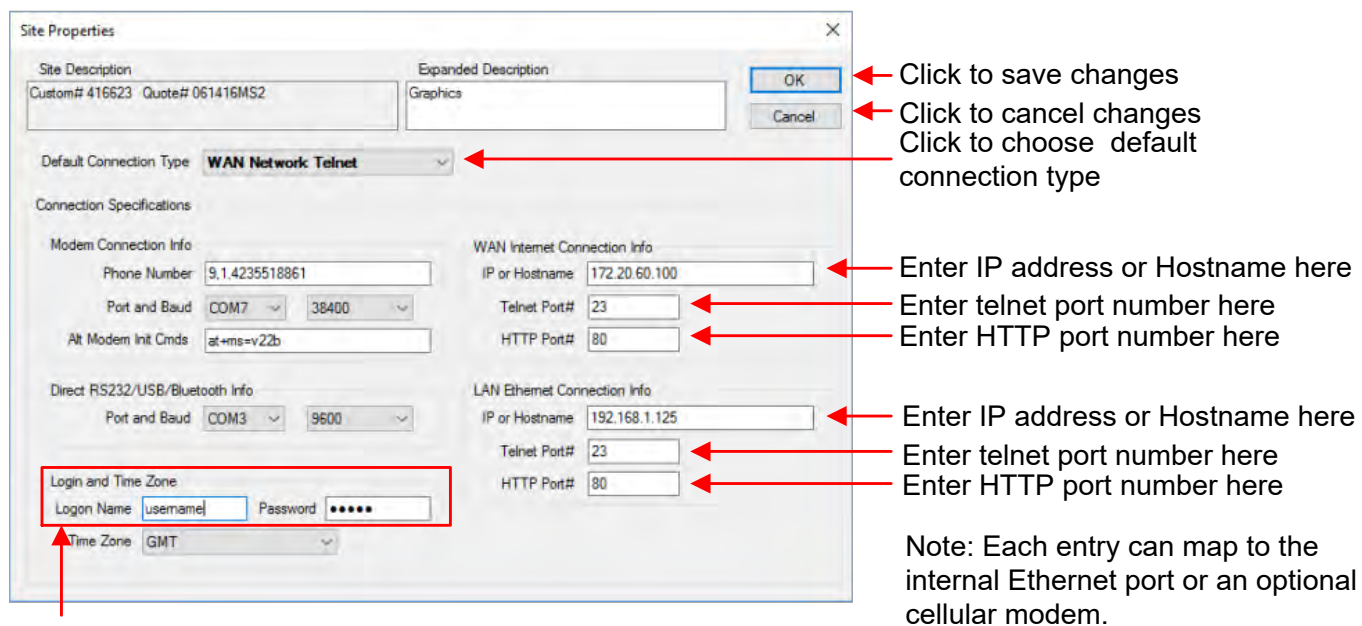
The TCOM Viewer application allows the user to configure a total of two sets of IP address, telnet ports, and HTTP port mappings for each ATRTU-TCOM controller. One configuration is labeled the WAN connection and the other is labeled the LAN connection. Either the WAN or LAN configuration can be used to connect to the internal 10/100 Base-T network or the optional cellular module. The telnet port number and HTTP port number of the selected configuration match the settings in the ATRTU-TCOM controller.

#### **Basic Requirements to Use the Internal Ethernet Port:**

- An IPV4 IP address must be assigned to the controller.
- To connect with TCOM Viewer a telnet port number must be assigned to the controller.
- To connect to the web server an HTTP port number must be assigned to the controller.
- The Ethernet port must be connected to a local network.
- The local network may or may not be connected to a public network such as the internet.
- The user must be connected to a network.
- There must be a functioning connection from the network that the user is connected to and the network that that the ATRTU-TCOM controller is connected to. Depending on the network topology, this may require a VPN connection and/or specific access permissions configured by the network administrator of the network the ATRTU-TCOM controller is connected to.
- Use of the network subsystem must be enabled within the ATRTU-TCOM controller.
- The user must know the IP address, telnet port number, and HTTP port number of the target controller.

**Basic Requirements to Use the Cellular Module**

- An IPV4 IP address must be assigned to the module. The IP address is determined by the cellular provider, associated with the phone number of the cellular module, and provided to the cellular module when it connects to the cellular network.
- The cellular module must be within range of a compatible cellular tower.
- The cellular module must be enabled and connected to the cellular network.
- To connect with TCOM Viewer a telnet port number must be assigned to the controller.
- To connect to the web server an HTTP port number must be assigned to the controller.
- The user must know the IP address of the cellular module and the telnet port number and HTTP port number assigned to the ARTTU-TCOM controller.



The screenshot shows the 'Site Properties' dialog box with the following fields and annotations:

- Site Description:** Custom# 416623, Quote# 061416MS2
- Expanded Description:** Graphics
- Default Connection Type:** WAN Network Telnet (indicated by an arrow pointing to the dropdown menu)
- Connection Specifications:**
  - Modem Connection Info:** Phone Number (9,14235518861), Port and Baud (COM7, 38400), Alt Modem Init Cmds (at+ms=v22b)
  - WAN Internet Connection Info:** IP or Hostname (172.20.60.100), Telnet Port# (23), HTTP Port# (80)
  - Direct RS232/USB/Bluetooth Info:** Port and Baud (COM3, 9600)
  - LAN Ethernet Connection Info:** IP or Hostname (192.168.1.125), Telnet Port# (23), HTTP Port# (80)
- Login and Time Zone:** Logon Name (username), Password (masked with dots), Time Zone (GMT)

Annotations with red arrows point to the following elements:

- OK button: Click to save changes
- Cancel button: Click to cancel changes
- Default Connection Type dropdown: Click to choose default connection type
- WAN IP or Hostname field: Enter IP address or Hostname here
- WAN Telnet Port# field: Enter telnet port number here
- WAN HTTP Port# field: Enter HTTP port number here
- LAN IP or Hostname field: Enter IP address or Hostname here
- LAN Telnet Port# field: Enter telnet port number here
- LAN HTTP Port# field: Enter HTTP port number here
- Logon Name and Password fields: Username and password

Note: Each entry can map to the internal Ethernet port or an optional cellular modem.

**Figure 41: Network Connection Parameters**

### 3.7.4 Determining IP Addresses, Telnet Port Numbers, and HTTP Port Numbers

There are several approaches to determining the IP address, telnet port number, and HTTP port numbers assigned to the internal Ethernet port and, if installed, the optional cellular modem. Note that the internal Ethernet port and the optional cellular modem will have different IP addresses. The same telnet port number and HTTP port numbers are used for both the internal Ethernet and optional cellular modem interface.

The required information is:

- 1) The IP address assigned to the internal Ethernet port.
- 2) The IP address assigned to optional cellular modem if installed.
- 3) The telnet port number to use.
- 4) The HTTP port number to use.

The recommended sequence is:

- 1) Contact the network administrator for the installation site and ask them for the required information.
- 2) Connect to the target ATRTU-TCOM system using a non-network interface such as a modem or USB connection and use TCOM Viewer and the "Terminal Mode".
- 3) Contact Orenco Controls for Support. Note that Orenco Controls does not control the network configuration but may be able to help the customer determine how the system is configured.

### 3.7.5 Determining Modem COM Port Numbers on Windows® 7/8/10

When a computer running the Microsoft Windows® operating system detects that a modem has been connected to the computer, Windows® automatically assigns a COM (communication) port number to the modem.

To find the COM port number for your modem, follow the instructions in section 3.7.6 "Determining Assigned USB COM Port Numbers on Windows® 7/8/10" on page 62 and, instead of looking for the "Orenco USB serial Port" instead look for the manufacturer's name and/or model number associated with the modem installed or connected to the user's computer.

### 3.7.6 Determining Assigned USB COM Port Numbers on Windows® 7/8/10

When a computer running the Microsoft Windows® operating system detects that a USB cable has been connected to an ATRTU-TCOM controller it automatically assigns a COM (communication) port number to the ATRTU\_TCOM controller.

The user needs to know the assigned COM port number to successfully establish a connection between TCOM Viewer and the ATRTU-TCOM controller. Refer to the instructions below to find the COM port number.

#### All Systems

- 1) Ensure power is applied to the ATRTU-TCOM controller.
- 2) Connect a USB cable to the ATRTU-TCOM controller's client USB port (see Figure 1 on page 7).
- 3) Connect the other end of the USB cable to the user's computer.

#### Windows® 7

- 1) Click on the start menu and right click on "Computer" and select "Properties" from the pop up menu.
- 2) Click on "Device Manager" at the top left of the window.
- 3) Click on the reveal triangle button next to "Ports (COM & LPT)". The COM port should be listed next to "Orenco USB Serial Port".

#### Windows® 8/8.1/10

- 1) Right click on the Start button and select "Device Manager".
- 2) Click on the reveal triangle button next to "Ports (COM & LPT)". The COM port should be listed next to "Orenco USB Serial Port".

### 3.8 Operating TCOM Viewer

This section focuses on interactions with TCOM Viewer and assumes all necessary system configuration has been completed.

A typical interaction involves:

- 1) Establishing a connection to the target ARTTU-TCOM controller.
- 2) Interacting with the TCOM Viewer user interface as desired to view or modify system state and settings.

The main screen is presented to the user when TCOM Viewer starts. Major components of the main screen include the main menu bar, the tab menu bar, a list of sites, options to add, edit, and delete site information, buttons to initiate a connection, and connection status. The list of sites displayed will vary from user to user and is determined by which site configurations the user has added to their system. The user can change the site list sort order by clicking on the column headers of the site list.

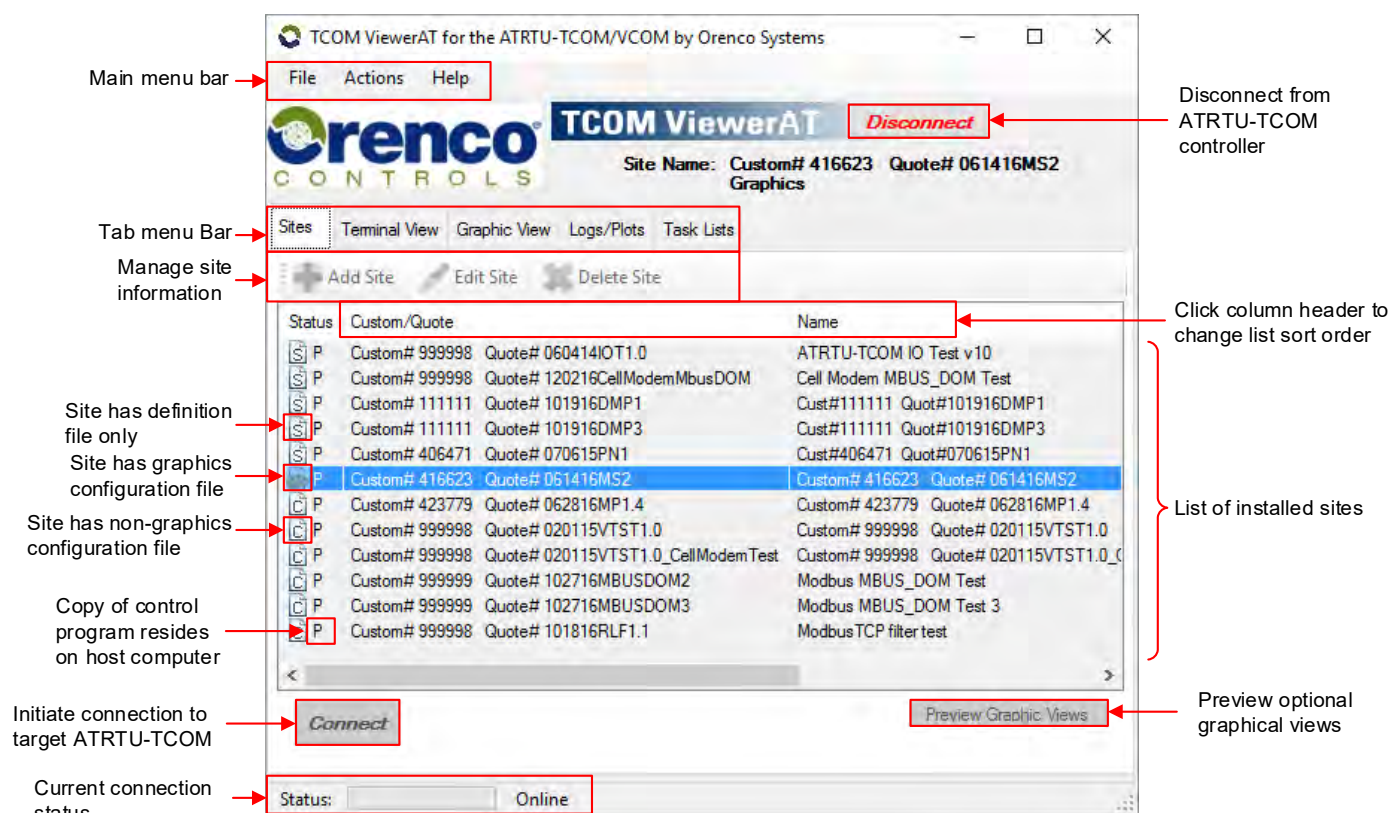


Figure 42: TCOM Viewer Main Screen

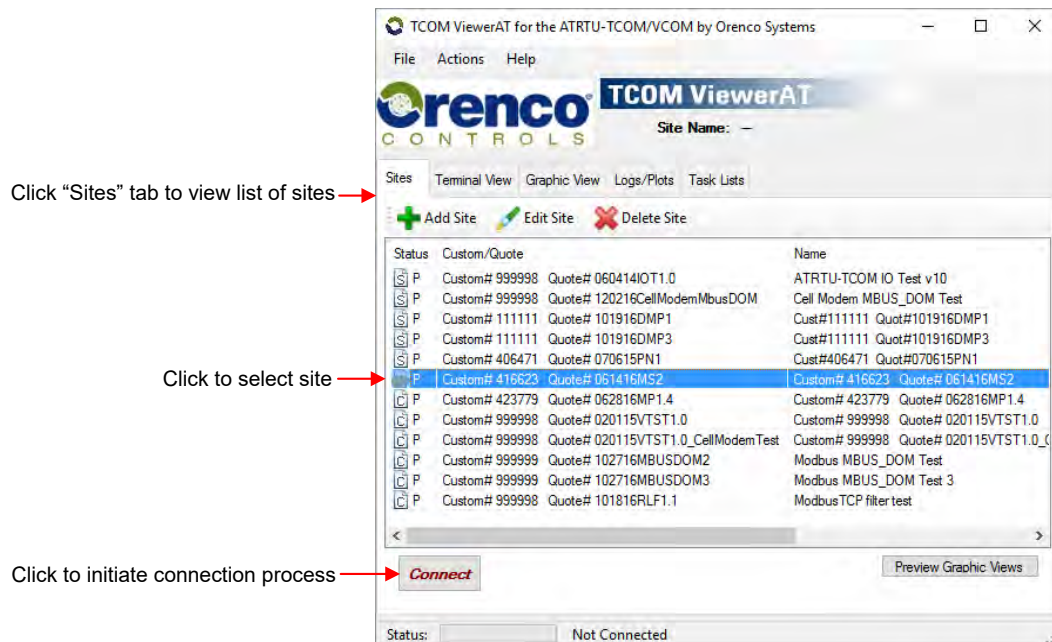
#### Site List Status Icons:

- This symbol indicates there is a site definition file, but the site does not have a configuration file and does not have a graphics configuration file.
- This symbol indicates there is a site definition file and a configuration file, which gives the user the names of log files and points.
- This symbol indicates there is a site definition file and a graphics configuration file which gives the user the names of log files and points plus graphics screens built to show the status of the system.
- P** Indicates a copy of the control program resides on the computer that TCOM Viewer is running on. Note: this is not required and typically used by Orenco for internal use.

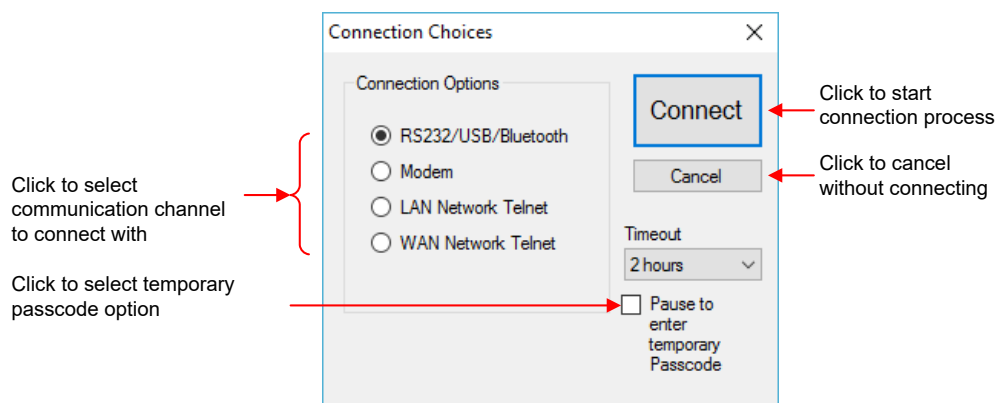
### 3.8.1 Logging On to an ATRTU-TCOM System

To establish a connection to an ATRTU-TCOM system the user must:

- 1) Select the target installation site from the TCOM Viewer main window.
- 2) Click the "Connect" button.
- 3) Select the communication channel to use for the connection.



**Figure 43: Initiating a Connection Between TCOM Viewer and an ATRTU\_TCOM Controller**



**Figure 44: Start Connection Process**

The "Connection Choices" dialog box also provides an option to "Pause to enter temporary Passcode during logon". If a valid user name and password is not available or has not been entered into the site configuration settings, connection attempts will fail. To gain temporary access contact Orenco Controls to acquire a temporary pass code.

Enabling this option during a logon attempt will cause the software to pause after connecting to the remote site and show a window that contains a current passkey which is a string of numbers and letters. Using this current passkey, an Orenco Engineer can compute a corresponding passcode which is also a string of number and letters. The user then enters the passcode value into the logon window. This allows the software to complete the authorization phase of the logon and grant the user access to the site. Consult Orenco if the passcode sequence is required.

### 3.8.2 Connection Status

When TCOM Viewer is attempting to establish a connection to a target ATRTU-TCOM system, the status of the connection process is displayed at the bottom of the Main window along with a sliding bar to indicate that the software is working on the last command.

Typically, the connection status sequence is:

<b>Connecting/Authorizing/Dialing</b>	Indicator depends on the communications method chosen.
<b>Logon 1, 2, 3, 4, 5</b>	Indicates logon states as the connection is established and the proper authorization is submitted.
<b>Online</b>	Indicates the connection has been successfully established.
<b>Disconnecting</b>	After clicking the “Disconnect” button, or the system times out due to inactivity, the status indicator returns to the “Not Connected” state.

If an error occurs, an error code will be displayed and the status indicator will return to the “Not Connected” state.

Once a successful connection has been made, TCOM Viewer will automatically display either the “Graphic View” or the “Terminal View”. A preference for the starting view can be set in the TCOM Viewer Setup. If a site does not have a configuration file with graphics it will always start in the terminal view.

When in the “Online” state, operations such as updating real-time data values or retrieving log data will cause the status information to change rapidly. This is normal.

While connected, the user can select any of the tabs for “Terminal View”, “Logs/Plots”, and “Graphic View” to monitor panel status and download log information.

### 3.8.3 Logging Off from an ATRTU-TCOM System

To log off, simply click the “Disconnect” button next to the TCOM Viewer logo at the top of the main window (see Figure 42 on page 63). After a few seconds, the status indicator at the bottom of the window will show “Not Connected”.

The TCOM Viewer software will automatically log a user off if there is no activity. The user can configure the timeout value using the TCOM Viewer setup window (see section 3.6 “TCOM Viewer Setup” on page 55).

The user must disconnect prior to connecting to any other Site.

### 3.8.4 Using “One Time Connect” Feature to Establish a Connection

When site specific information is added to TCOM Viewer, it is typically saved for future use. The “One-Time Connect” feature is used for temporary access to a site, requires minimal connection information, and is not saved.

To initiate a “One-Time Connect”, click “Actions” from the main menu bar and then click “One-Time Connect” (Actions->One-Time Connect).


The “Site Properties” dialog window will appear. The user only needs to enter parameters for the communication channel used for the connection. See section 3.7 “Configuring TCOM Viewer Connection Parameters” on page 57 for more information.

### 3.8.5 Terminal View

Terminal mode refers to a menu driven text character based interface that can be accessed from TCOM Viewer by clicking on the “Terminal View” tab. Terminal mode can also be used without TCOM Viewer if the user has a compatible terminal emulation program installed on their computer. See section 4, “Terminal Mode” on page 74 for more information.

### 3.8.6 Graphic View

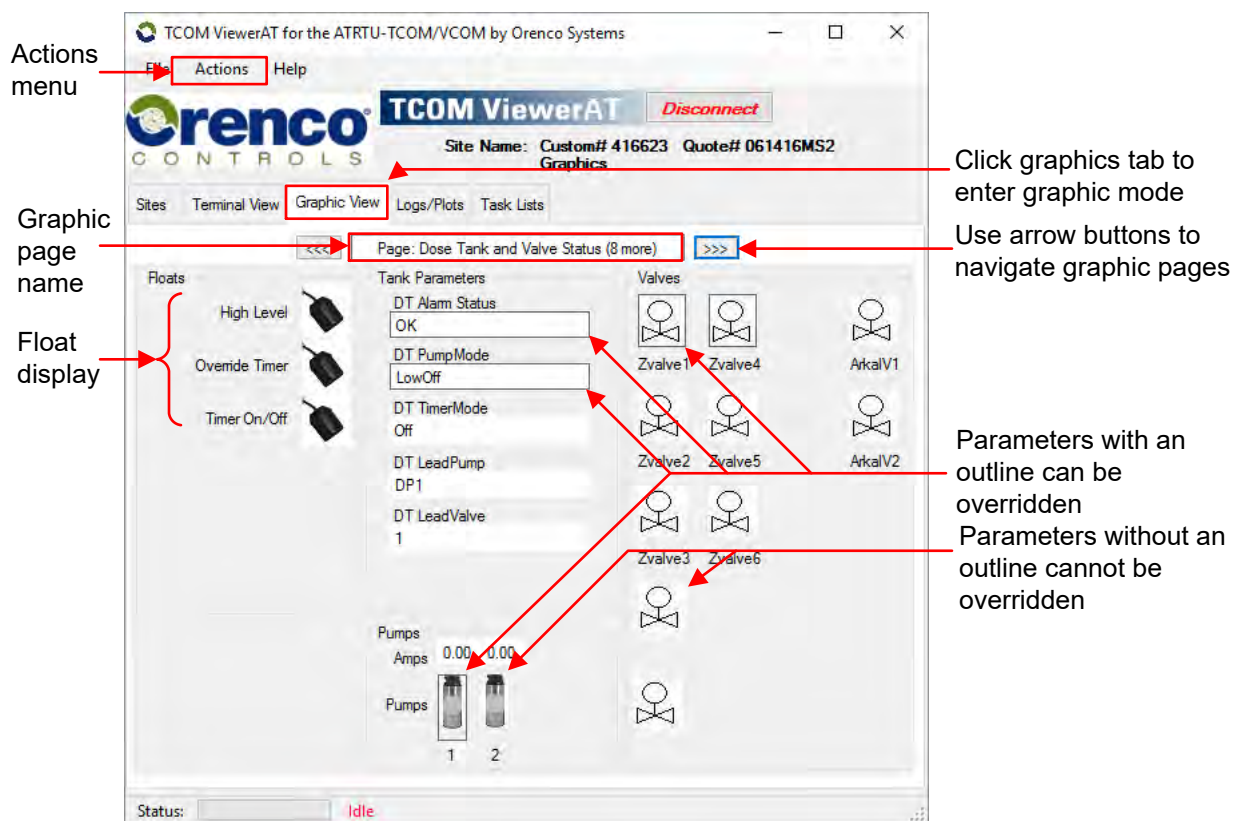
The ATRTU-TCOM system includes an optional feature called “Graphic View” that supports graphical display of system status and data plots. The “Graphic View” feature requires one or more graphics configuration files which are provided by Orenco Controls.

A small painters pallet icon (  ) is displayed in the status column of the site list menu for sites that have graphics configuration files (see Figure 42 on page 63). The user can also preview graphical views without being connected.

To enter the graphical view mode the user must first connect to a site that supports graphical views.

Depending on the setting in the TCOM Viewer Setup (see section 3.6 “TCOM Viewer Setup” on page 55) the graphic view may come up by default. If not, and a graphic view is available, the user can enter graphic view by clicking on the “Graphic View” tab. A window will pop up asking permission to switch to “Make Graphics View Active”. Click “Yes” and graphic view will be displayed. The data and animated objects on the graphic view will update their values/appearance approximately every 5 seconds. Standard format views of floats and pumps will change appearance to reflect the current state of those devices.

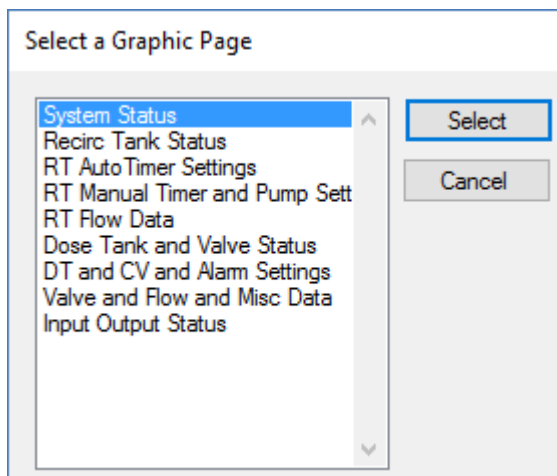
Graphics views are customized to each installation site and will vary from site to site.



**Figure 45: Example Graphic View**

If the user is using a network connection, graphic views can also be opened by clicking on the “Action” menu and then selecting “Open Separate Graphics Window”. The user will be prompted to select the network configuration to use and then prompted to select the graphic page to open.

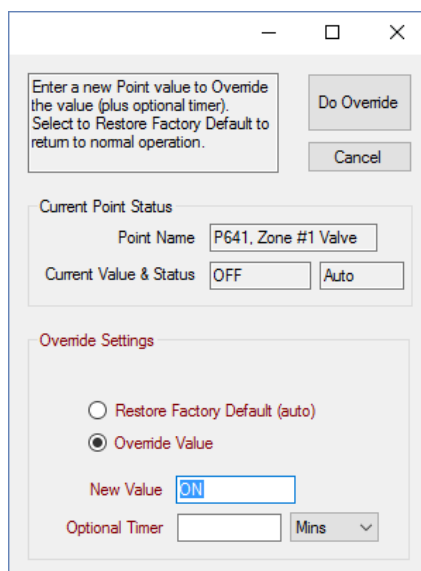
The main TCOM Viewer window will be used for terminal mode monitoring, log retrievals, plotting, and tasks using the telnet connection. The separate graphic window uses an HTTP to display and update the selected graphics page.



**Figure 46: Select a Graphics Page to Open in Separate Window**

Values that can be overridden are displayed with outlined borders around them in the graphic view (see Figure 45 on page 66). To apply an override, click within the outlined area of the value to change.

Parameters that permit the user to override them or modify their values will be shown with a black outline around them and will respond to being clicked with the left mouse button. Hovering the mouse cursor over an object will display a description and whether the object is overrideable. Parameters that have been overridden will have the text “OVR” next to them. Devices that have been overridden will have an “O” next to them. When an object that can be overridden is clicked, an Override Dialog window will appear.



**Figure 47: Override Dialog window**

The top section of the Override Dialog window shows the current value and override state of the point. The example shown corresponds to point number 641 which is a digital point that is currently OFF, and it is in “Auto” mode meaning there is no override applied.

The “Current Point State” may be any of the following:

**Auto** The value of a point in automatic mode is determined by the control program logic.

- Const** A point with a constant override applied is set to the applied value and does not change.
- Ovr** Means overridden to ON or OFF. The point value is either ON or OFF and does not change.
- Ovr/Timer** Means timed override. A point with a timed override applied is set to the specified value for the time interval specified. When the remaining time has expired, the point value and override state returns to the previous setting.

The override settings to apply are entered in the "Override Settings" region of the dialog box. Once the desired adjustments have been entered, click "Do Override" to implement the changes or click "Cancel".

- Override Types** Several types of override are possible. "Normal" is a constant/permanent value change that becomes part of the control program. "Touch" is a temporary override that is latched and remembered by the application program logic. "Timed-only" is a temporary override with a programmable time period.
- Restore Factory Default** Used to return the point to the factory default setting, which may result in a specific value being set or returning the Point to automatic status.
- Override Value** Used to specify a new value to be used for overriding the point.
- Optional Timer** Used to specify a time interval to apply the override for. After the time duration elapses, the point value will revert to the previous setting. Depending on the point being adjusted this entry may be required, optional, or not available. When not available, or the timer value is left blank, the new value specified for the point will be permanent.

**CAUTION:**

Applying an override without specifying a time interval could result in critical devices such as a pump remaining on or off permanently. It is generally safe to set any point using the "Restore Factory Default" option as the control program logic ensures that a reasonable value is applied.

### 3.8.7 Logs and Plots

To view a log or plot, click on the “Logs/Plots” tab in the main TCOM Viewer window. To select the type of log or plot to view, click on the name of the log or plot. A dialog box pops up allowing the user to choose to clear the log or view the log.

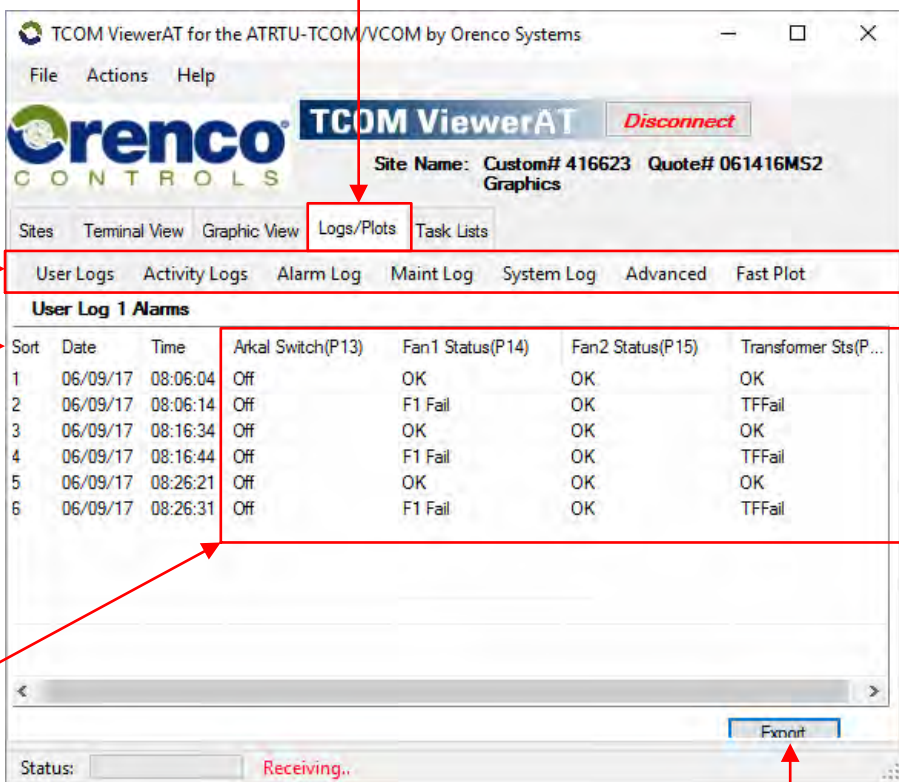
When the view log option is selected, another dialog box pops up prompting the user for more input. For log types that may have multiple logs, such as activity logs the user is prompted to specify which log to view. The user is also prompted to select a time span to view. Click “OK” to start the log download process or “Cancel” to stop the process without downloading a log.

As the log is downloaded the status bar at the bottom of the screen will update the progress until the download has completed. The log download process can be cancelled using the “Abort Current Task” command found under the “Actions” menu.

Click the “Export” button to save the log data currently displayed on the screen to a comma separated value file. The default location for saving the exported file is the site folder but any location can be specified. Comma separated files may be loaded into Microsoft Excel, Microsoft Internet Explorer, and many other commercial applications for further use. To easily locate the folder for the current site (where the CSV files are saved by default), select “Explore Site Files” under the “File” menu.

Click the “Sort” column header to change the order the log data is displayed in. Column widths are adjustable.

Click to enter Logs/Plots View



Click text to select log or plot

Click to change sort order

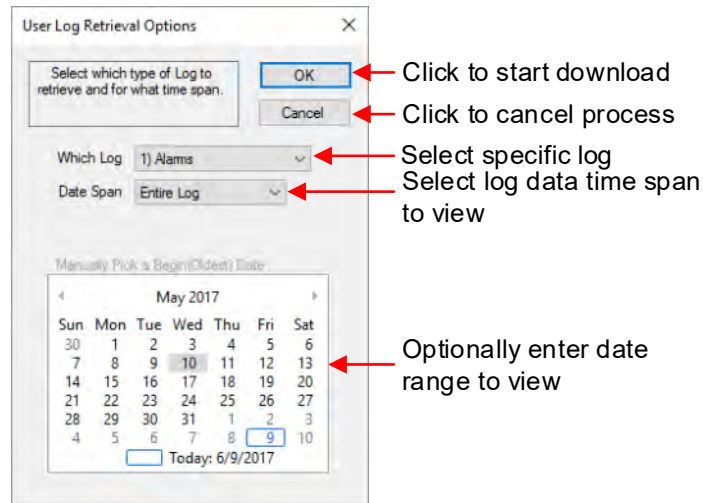
Events logged with date and time stamp

Control program determines data logged

Click to save log data

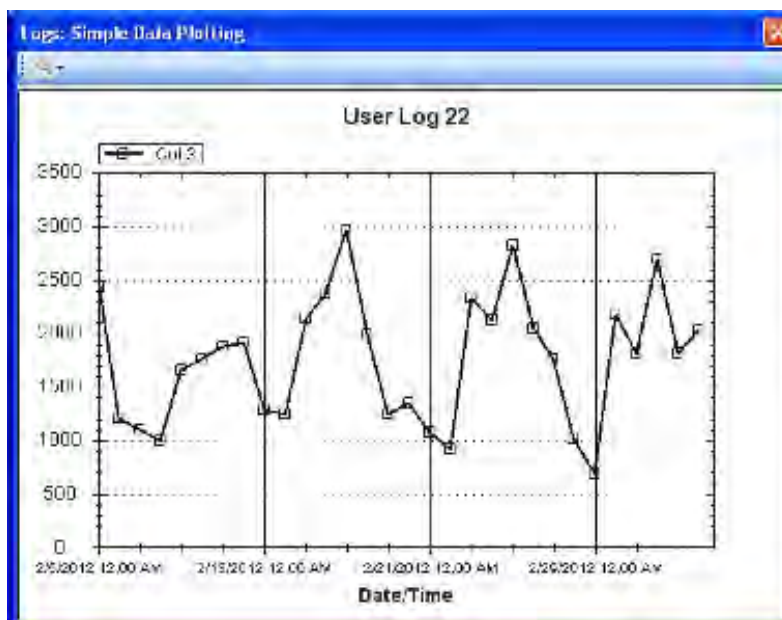
Sort	Date	Time	Arkal Switch(P13)	Fan1 Status(P14)	Fan2 Status(P15)	Transformer Sts(P...
1	06/09/17	08:06:04	Off	OK	OK	OK
2	06/09/17	08:06:14	Off	F1 Fail	OK	TFFail
3	06/09/17	08:16:34	Off	OK	OK	OK
4	06/09/17	08:16:44	Off	F1 Fail	OK	TFFail
5	06/09/17	08:26:21	Off	OK	OK	OK
6	06/09/17	08:26:31	Off	F1 Fail	OK	TFFail

Figure 48: Logs/Plots View



**Figure 49: Selecting Log Data Time Span**

Fast plotting allows a simple plot to be generated automatically based on the data log currently displayed in the Logs/Plots Tab window. Click the “Fast Plotting...” button to create a plot. If a user log is displayed, the user may select which or all of the data values to be plotted together on a single plot versus time. If an activity log is displayed, the single data item will be plotted with respect to the beginning and ending dates.



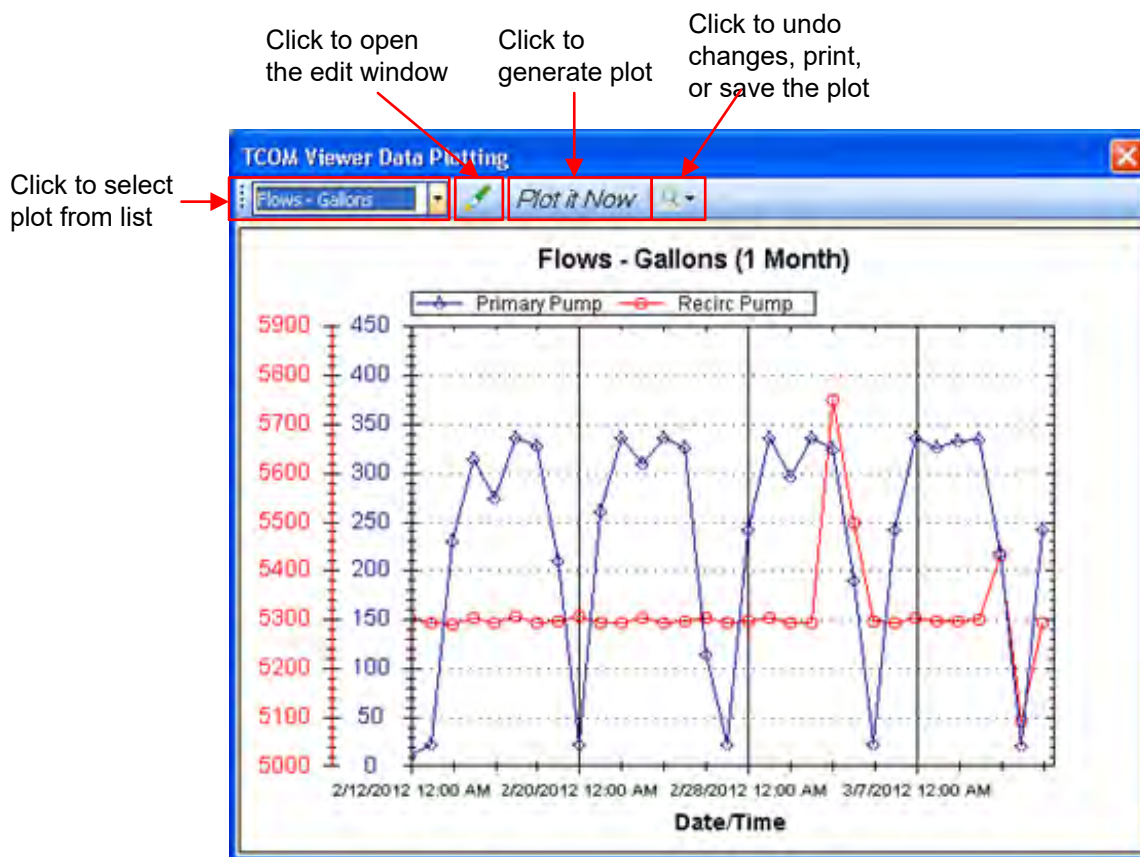
**Figure 50: Fast Plot Example**

- Zoom** Click, hold, and drag the left mouse button to select a region on the plot to zoom in to.
- Pan** Simultaneously click and hold both the control key (“Ctrl”) and the left mouse button and move the mouse left or right to shift the plot left or right.
- Undo/Print/Save** Click the spyglass icon above the plot to open a submenu that can be used to undo any zoom and print or save the plot as a graphic object for future use.

Enhanced log plots called “defined plotting” allow more complex plots to be pre-defined for analysis of system performance. Up to eight data values can be plotted. This feature requires either a graphics or non-graphics site configuration file that can be obtained from Orenco Controls.

Click on the pull-down on the left to select the desired plot from a list of available plots. The date range, pen color, and style for a defined plot can be modified. After selecting a plot, click the pen icon to open the edit window, make the desired selections, click “Save” to save the changes, or click “Cancel” to exit without saving.

To generate a plot, first select the plot of interest and then click the “Plot it Now” button. TCOM Viewer will download the files required to generate the plot. This may take up to several minutes depending on the data to build the plot. The process can be cancelled at any time by using the “Abort Current Task” command found under the “Actions” menu



**Figure 51: Defined Plot Example**

**Zoom** Click, hold, and drag the left mouse button to select a region on the plot to zoom in to.

**Pan** Simultaneously click and hold both the control key (“Ctrl”) and the left mouse button and move the mouse left or right to shift the plot left or right.

**Undo/Print/Save** Click the spyglass icon above the plot to open a submenu that can be used to undo any zoom and print or save the plot as a graphic object for future use.

### 3.8.8 Task Lists

A limited set of routine operations that are performed periodically can be automated using the “Task List” feature which allows a user to define one or more specific tasks and collect them in a list.

When the listed tasks need to be performed, a process called running the task list is initiated. The user must be online, select a task list, and initiate the run process. Once the process is initiated, each task in the selected list is executed automatically.

A valid site configuration file is required to use the task list feature.

Tasks types that can be defined include:

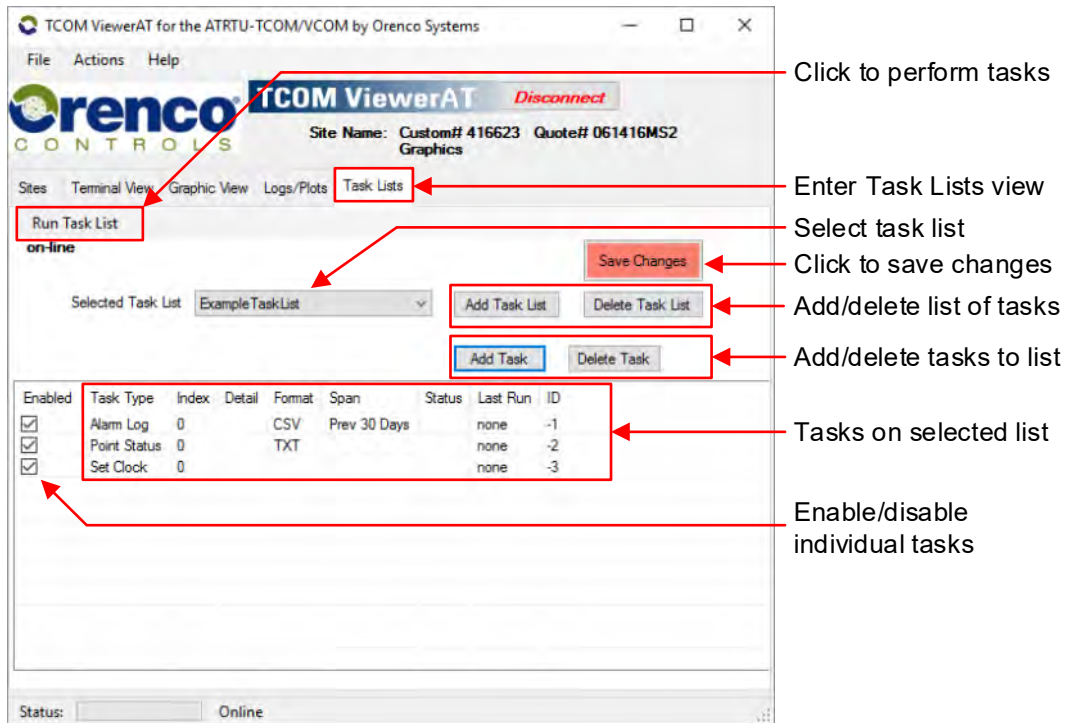
- Retrieve user logs with a user selected format and span.
- Retrieve activity log with a user selected format and span.
- Retrieve alarm logs with a user selected format and span.
- Retrieve the maintenance log with a user selected format and span.
- Retrieve the system log with a user selected format and span.
- Retrieve a point status report in text format.
- Set the ATRTU-TCOM system clock to the current time of the users computer.
- Apply a point override.

The user must be connected to an ATRTU-TCOM control to define or modify a task list. New task lists are added by clicking the “Add Task List” button and entering a new task list name. If the new name duplicates one already defined for the site, a warning message will be shown. When a task list is selected, all of the defined tasks within the list are displayed.

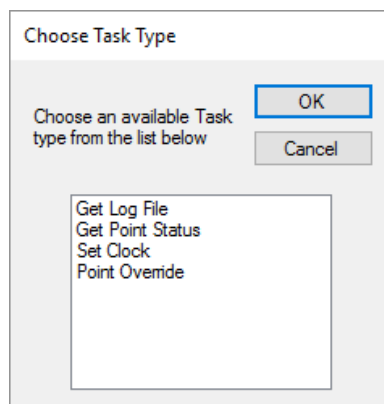
Each task within a list has an “Enabled” check box that can be used to enable or disable selected tasks. The state of this check box is saved whenever the “Save Changes” button is clicked. The “Save Changes” button will change it’s color to red whenever a task or task list has been added or deleted. If the user attempts to “Disconnect” while the “Save Changes” button is red, a warning message is displayed prompting the user to save the changes.

Click on “Run Task List” to perform all of the enabled tasks on the selected list of tasks. When the “Run Task List” sequence begins, the “Status” column of the list of tasks will change to “Queued”. As each task is completed, the “Status” indicator changes to “Done”. The “Last Run” date will be saved for each task when the entire list is completed successfully.

If one of the tasks fails due to communications errors the “Run Task List” sequence will stop running and the TCOM Viewer will log off. The process can be restarted after logging back on. To abort the “Run Task List” sequence, click the “Disconnect” button and log off.



**Figure 52: Task List Example**



**Figure 53: Available Tasks**

## 4 Terminal Mode

The ATRTU-TCOM terminal mode interface is a textual menu driven interface. The ATRTU-TCOM controller generates the menus and processes all keyboard input. Terminal mode can be accessed using the TCOM Viewer “Terminal View” tab or by establishing a connection to the system using common terminal emulation programs such as HyperTerm, TeraTerm, ZTerm, PuTTY, etc. Many terminal emulation programs are available as free downloads and support a wide variety of devices and operating systems.

Due to the wide variety of terminal emulation programs the user is advised to refer to documentation provided by the application vendor to configure their application. Required connection parameters are described in section 3.7 “Configuring TCOM Viewer Connection Parameters” on page 57 of this document.

### 4.1 Terminal Mode Overview

To use terminal mode the user must be connected to the target ATRTU-TCOM controller and logged on with a valid username and password. TCOM Viewer can be configured to automatically log the user in. If using a terminal emulation program the user will be prompted to enter a username and password.

There are common items on most screens such as the menu name and the permission level of the user currently logged on. Some features may be disabled if the account permission level is not high enough. See section 1.4.4 User Accounts and Permission Levels on page 10 for more information regarding permission levels.

Firmware version

Menu Name

Permission level of user account log on (level 0)

Press letter/number key to select a menu item

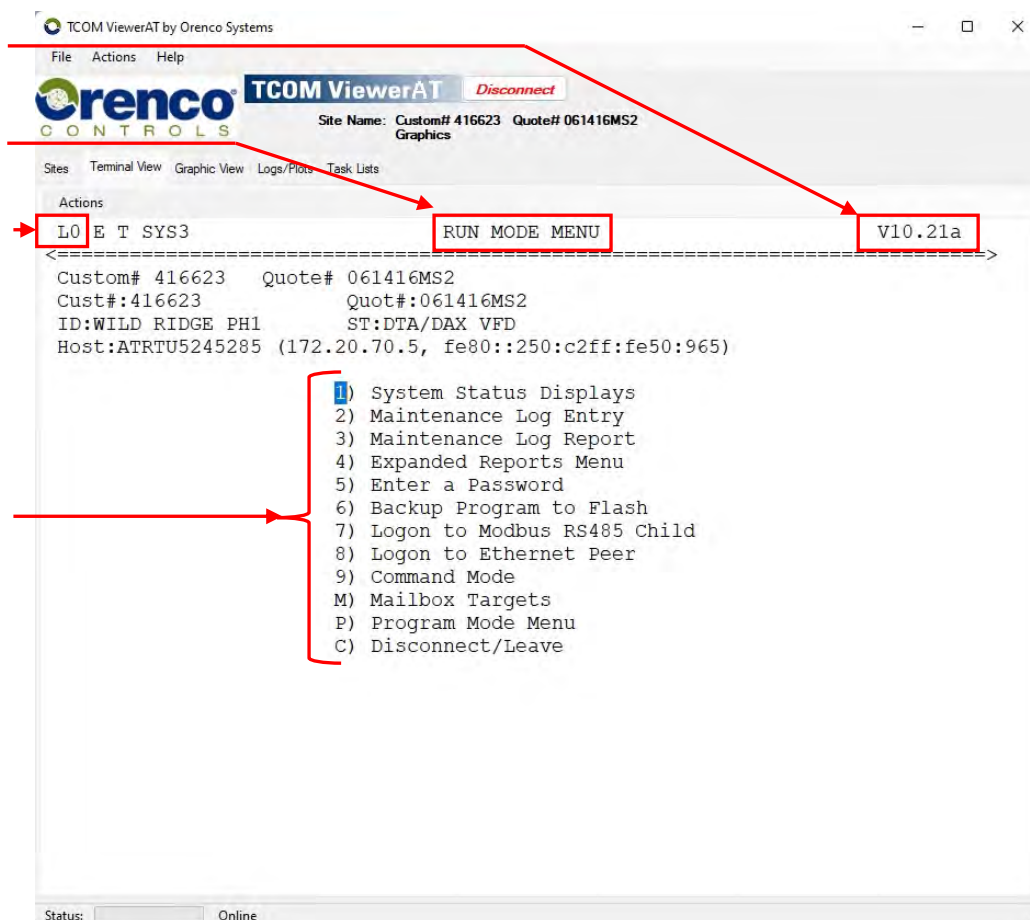


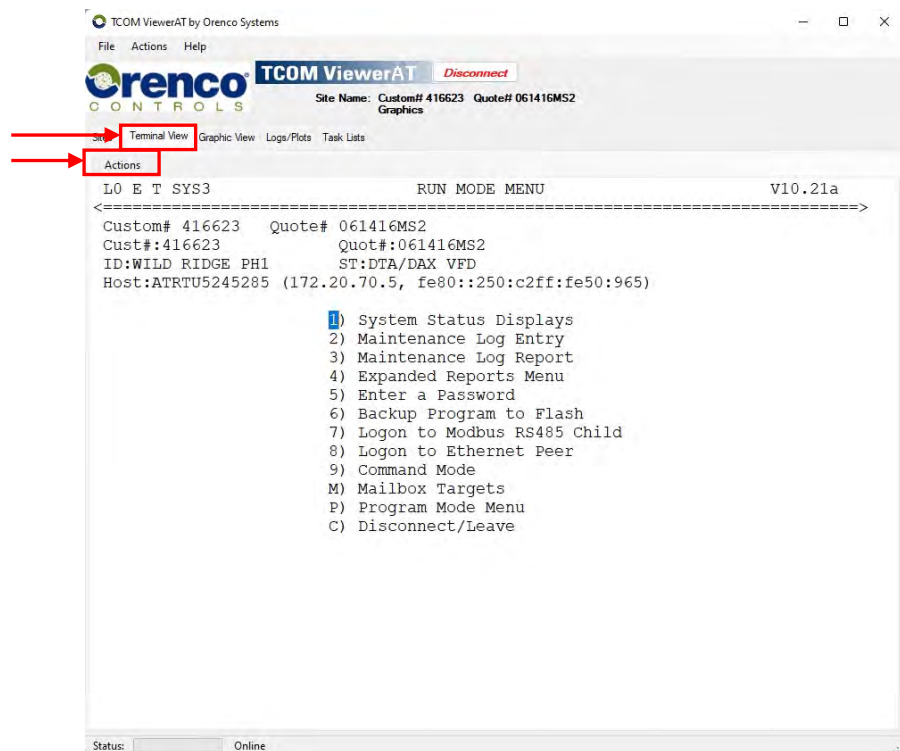
Figure 54: Terminal Mode Main Screen

The “Actions” sub menu can be used to clear the terminal screen on any menu page, select foreground and background colors, and print the current screen.

Color changes made via the “Actions” sub menu affect the current session only. See 3.6 “TCOM Viewer Setup” on page 55 to permanently set foreground and background colors.

Printed output is in text form and will be printed as black regardless of the terminal screen colors.

Click to enter terminal view  
 Actions sub menu



**Figure 55: Actions Sub Menu**

The keyboard is the primary means to navigate in terminal mode. There is some variation from menu to menu, but in general the following applies:

**ESC** The escape key is used to cancel an operation or return to the prior menu.

**TAB** The tab key is used to move from the current data entry field to the next field.

**Return/Enter** The return or enter key is used to accept a highlighted menu selection or typed in data.

Menu items with single character choices such as numbers or letters are selected by pressing the corresponding key (i.e., press “2” key to select menu option 2).

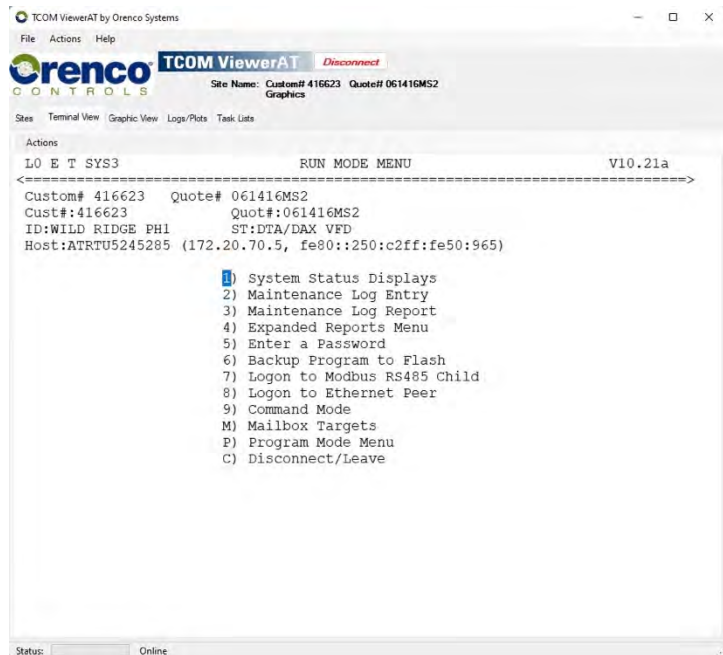
Double clicking with the left mouse button on a data entry field will cause the cursor to move to that field. The mouse pointer should be positioned over the first character in the field for this feature to work accurately.

The TCOM Viewer window can be resized by using the mouse to click and drag the corners or edges of the window similar to most other programs. The text size is adjusted when the windows is resized.

The last location in the terminal view menus may be lost when the resizing is done. If the terminal screen does not automatically refresh, try hitting the “ESC” key or use the “Clear Terminal Screen” from the “Actions” menu directly above the terminal area.

## 4.2 Run Mode Menu

The run mode menu is the top level menu. To select a menu option, press the corresponding letter or number next to the menu name. For example, press the “1” key to select the “System Status Displays” menu.



**Note** ◆

- To select a page, press the corresponding letter next to the desired page (e.g., press the **1** key for the System Status page). When upper and lower case letters are listed, page selection is case sensitive.

**Figure 56: Run Mode Menu**

### System Status Displays (1)

Provides access to a series of menus showing the panel's current activity. Viewing and adjusting parameters can be done in these screens.

### Maintenance Log Entry (2,3)

Allows changes or adjustments to the system to be manually logged for future reference.

### Expanded Reports Menu (4)

Provides access for viewing Activity, Alarm, and User Logs. Downloading and saving of log files on the computer can only be done using the options found under the **Logs/Plots** tab, when using TCOM Viewer.

### Enter a Password (5)

This logs out of the current session, and allows a new User Name and Password to be entered.

### Backup Program to Flash (6)

Allows the program to be backed up to non-volatile memory. Backing up the program is recommended whenever permanent changes to operational set-points have been made.

### Logon to Modbus RS485 Child (7)

This menu allows access to a Modbus child when multiple controllers are connected via a Modbus network

### Logon to Ethernet Peer (8)

When multiple panels are on an Ethernet network, this option allows access to an Ethernet peer.

### Enter Command Mode (9)

Allows the user to enter low level commands typically for diagnostic purposes.

### Mailbox Targets (M)

Allows user to enter mailbox information.

### Program Mode Menu (P)

Allows the user to view and modify configuration settings.


### Disconnect/Leave (C)

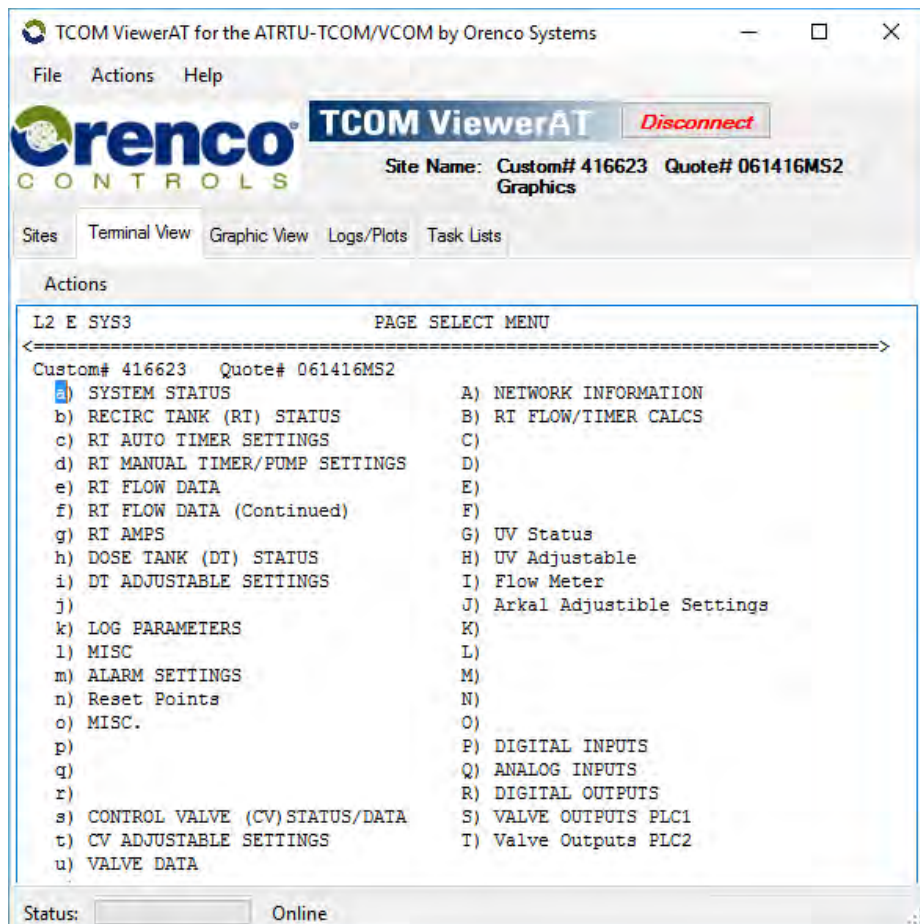
Disconnects the current session from the controller. Also returns to the main panel if logged on to a networked board.

### 4.3 Page Select Menu

The page select menu allows the user to select a group of up to 16 sequentially numbered points.

**Note** ◆

- To select a page of up to 16 points press the letter next to the desired page. Letters are case sensitive.
- Each point page contains up to 16 points.
- Letters with no page names next to them represent blank pages.
- **ESC** key exits the current page.
- **Tab**  moves cursor in sequence between control fields.
- **Enter** key executes desired command.



**Figure 57: Page Select Menu**

**System Status Page**

The System Status page provides an overview of the the entire system, including current alarm status, pump status, etc.

**Individual Status Page(s)**

Multiple status pages may be defined for your particular system. Individual status pages provide current information for major system components (e.g., recirc. tanks, dosing tanks, discharge tanks, final disposal, etc.).

**Settings**

Multiple setting pages may be defined for your particular system. Individual setting pages provide for viewing and adjusting the parameters for each application (e.g., timers, pump flow rate, local alarm delay, pager delays, etc.).

**Flow Data Page(s)**

Multiple flow data pages may exist for your system. These pages provide detailed flow data (e.g., pump cycles today, pump time today, flow today, etc.).

**Log Parameters/Misc.**

These pages contain logic involving the user logs and other processes. The points contained on these pages are maintained by Orenco.


**Inputs & Outputs**

Multiple input and output pages may exist for your system. These pages display the status of digital and/or analog inputs and outputs. Input signals come from devices that are being monitored and would typically include floats. Outputs are devices that are being controlled and would typically include pumps.

## 4.4 System Status Display (Page Definition and Layout)

All pages under the “System Status Display” menu have the same appearance and contain the fields depicted below.

**Note** ◆

- To see a specific point press **P** and the **Enter** key.
- The following tips apply to all screens within the TCOM system.
- **ESC** key exits the current page.
- **Page Up** key scrolls 16 points backward.
- **Page Down** key scrolls 16 points forward.
- **Tab**  moves cursor in sequence between control fields.
- **Enter** key executes desired command.

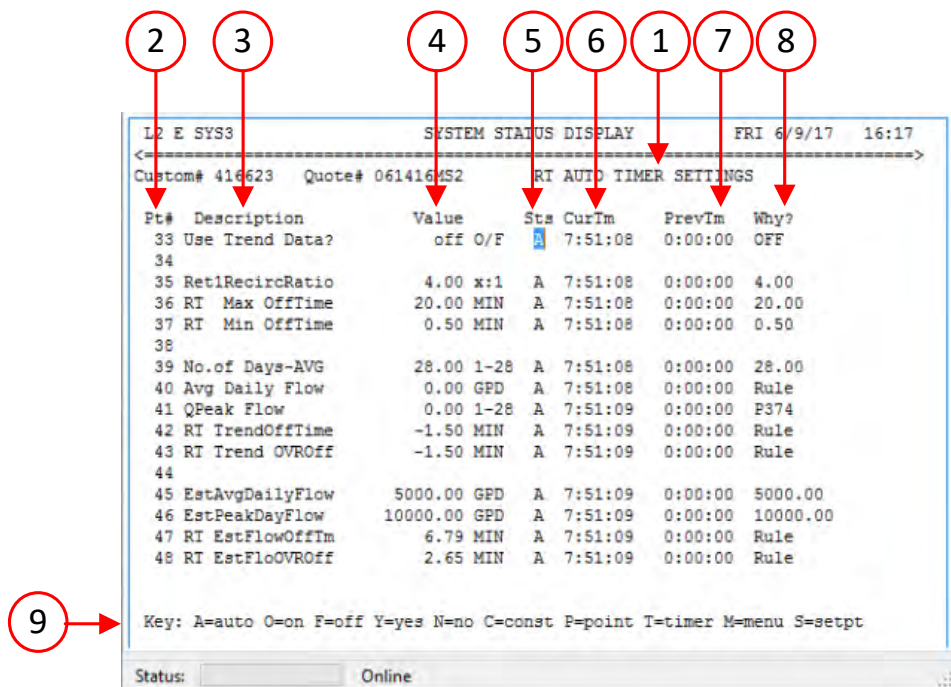


Figure 58: System Status Display Menu

**Page Description (1)**

Identifies which page is being viewed (e.g., Recirc. Tank Status).

**PT# (2)**

Identifies the program point number. Each page includes sixteen programming points.

**Description (3)**

Describes each program point used.

**Value (4)**

Displays the current value of the point. This can be displayed as a label (e.g., OK, HiLevel, OFF, OnCycle, etc.), a unit of measurement (e.g., min, gal, amps, etc.), a digital value (e.g., on or off), a date, or time.

**Sts (5)**

Indicates the operational status of a point (e.g. Automatic or Constant). If this column contains a letter, the point can be adjusted.

**CurTm (6)**

Indicates the time that has elapsed since the point has been assigned the current value.

**PrevTime (7)**

Indicates the time that elapsed while the point held a previous value.

**Why? (8)**

Gives the reason for the value, if available (e.g., rules, inputs, default value, etc.).

**Choices (9)**

These options can be entered in the Sts column to apply overrides.

### 4.4.1 Applying Point Overrides

TCOM panels are shipped with default settings. Some parameters may need to be adjusted to make permanent or temporary changes to the operation of a panel. Parameter adjustments are initiated by using the menu Choice Menu located at the bottom of the System Status Display screens.

A parameter can be adjusted if there is a letter listed under the Sts column. Depending of the type of point to be adjusted and some other factors, different choices may apply. The options for adjusting points are described on the following pages. To make sure the proper adjustment option is selected and that permanent changes are properly saved, please see the notes below regarding Program Backup and Special Considerations for TCOM Panels with Touch Screens or those tied to a SCADA system.

#### **Special Considerations for TCOM Panels with Touch Screens or those tied to a SCADA system**

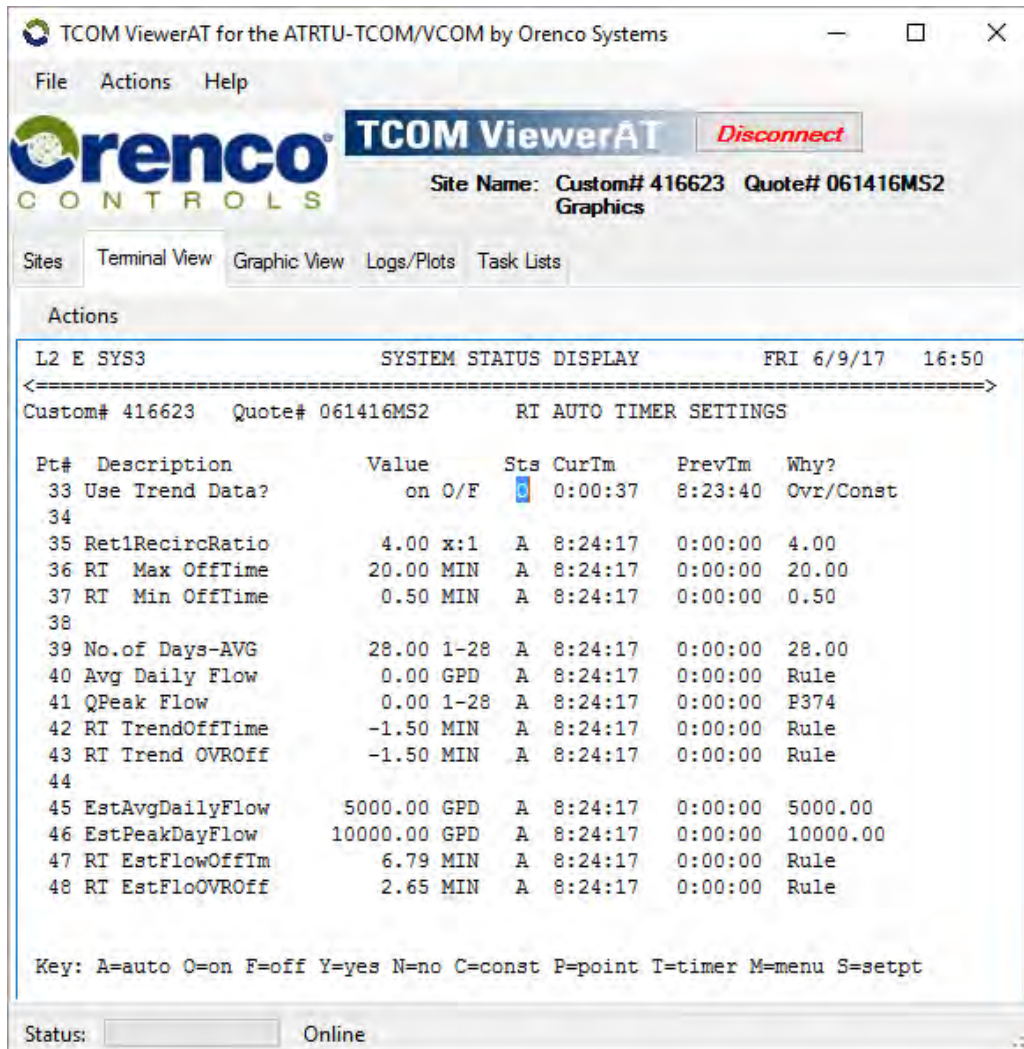
In cases where a TCOM panel includes a touch screen or is part of a SCADA system, care must be taken when making adjustments to the parameters through the terminal view, in order to prevent locking out access to parameter changes through the touch screen or SCADA software.

For these situations, the menu choices of C(Const), O(On), or F(Off) should be avoided as they will be treated with the highest priority and requests for parameter adjustments from elsewhere will be ignored. In most cases, the S(setpt) choice is recommended for adjustments.

The S(setpt) choice will send the requested parameter change for a short duration and then release the point to automatic, so that the touch screen or SCADA can have access to make changes. Some older panels may not have a S(setpt) choice, but the same result can be obtained by using the T(timer) option and specifying 10 seconds for the time duration of the override. In some panels, there may be points that are subject to adjustments from outside sources and some that are not.

If not sure, set the point to automatic first, using the A(auto) choice and observe the value under the "Why?" column. Once the screen updates, if the value found there is a reference to the same point number on the far left, the S(setpt) choice should be used. Otherwise, it should not be used.

4.4.1.1 Applying Override to Digital Point to Force it ON



**WARNING** ▲

- Changes to parameters must be made between screen updates or they will not be saved. This can be avoided by pressing the **Enter** key immediately after a letter is entered in the **Sts** column.
- Overriding point values can severely affect the operation of your system and will not allow the control program to modify the point value.

**Note** ◆

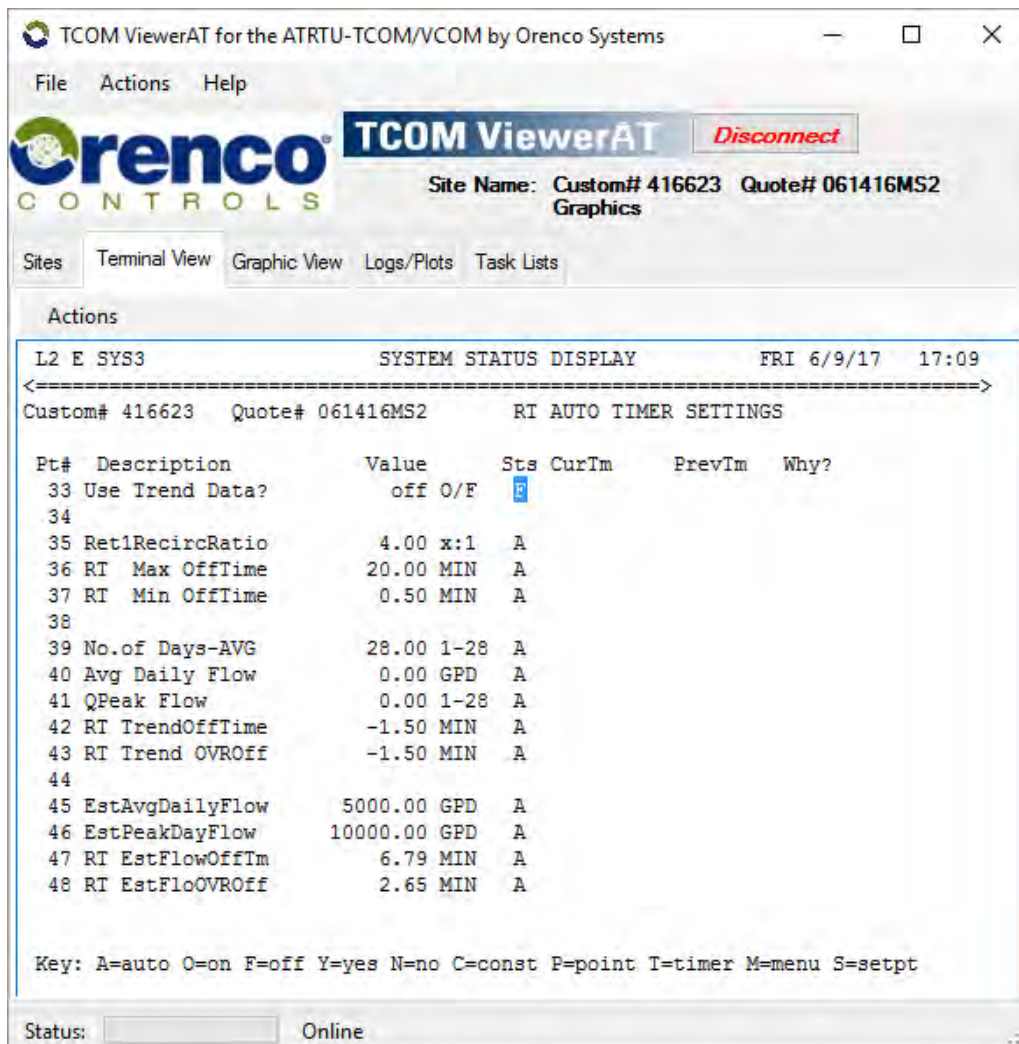
- If a mistake is made while changing a parameter, press the **ESC** key.
- To see a specific point, press **P** and the **Enter** key. Then enter the point number and press the **Enter** key.

Figure 59: Overriding a Digital Point On

To force a digital point ON:

- 1) Use the **Tab** key or Arrow keys to move the cursor to the **Sts** column to select the point to be overridden. Type **O** and immediately press **Enter** key.
- 2) In this example, point number 33 “Use Trend Data?” has been manually overridden to ON and will remain ON until another override is applied to this point.

### 4.4.1.2 Applying Override to Digital Point to Force it OFF



**WARNING** ▲

- Changes to parameters must be made between screen updates or they will not be saved. This can be avoided by pressing the **Enter** key immediately after a letter is entered in the **Sts** column.
- Overriding point values can severely affect the operation of your system and will not allow the control program logic modify the point value.

**Note** ◆

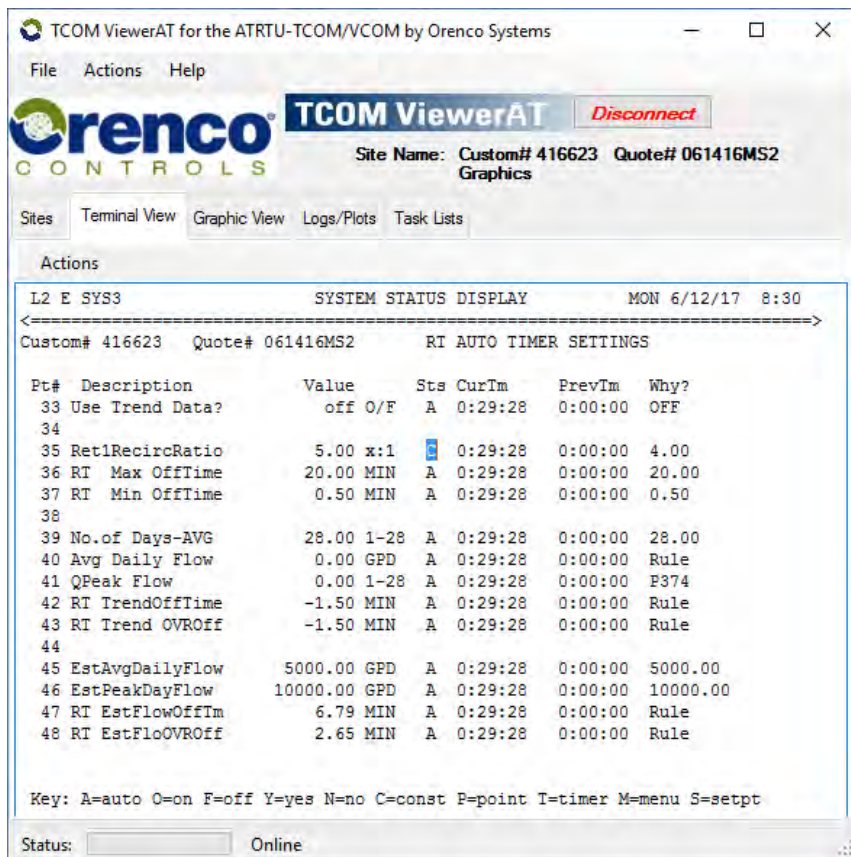
- If a mistake is made while changing a parameter, press the **ESC** key..
- To see a specific point, press **P** and the **Enter** key. Then enter the point number and press the **Enter** key.

**Figure 60: Overriding a Digital Point Off**

To force a digital point to OFF:

- 3) Use the **Tab** key or Arrow keys to move the cursor to the **Sts** column to select the point to be overridden. Type **F** and immediately press **Enter** key.
- 4) In this example, point number 33 “Use Trend Data?” has been manually overridden to OFF and will remain OFF until another override is applied to this point.

### 4.4.1.3 Applying Override to a Numeric Point



**WARNING** ▲

- Changes to parameters must be made between screen updates or they will not be saved. This can be avoided by pressing the **Enter** key immediately after a letter is entered in the **Sts** column.

**Note** ◆

- If a mistake is made while changing a parameter, press the **ESC** key.
- To see a specific point, press **P** and the **Enter** key. Then enter the point number and press the **Enter** key.

**Figure 61: Applying an Override to a Numeric Point**

To apply an override to a numeric point:

- 1) Use the **Tab** key to move the cursor in the **Sts** column to select the point to be overridden.
- 2) Press the **C** key and immediately press the **Enter** key.
- 3) Enter the new constant value and press the **Enter** key.

Point number 35 “Ret1RecircRatio” was changed from 4.0 to 5.0 in this example.

### 4.4.1.4 Applying Override to a Set Point

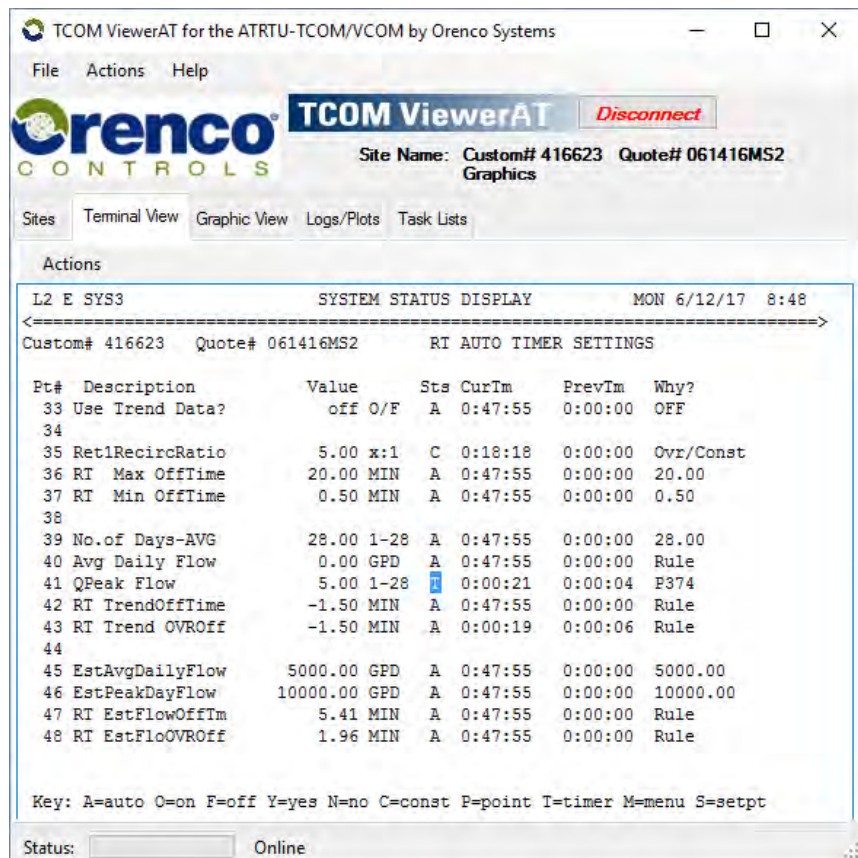
The **S (setpt)** option is recommended for adjusting points when a panel includes a touch screen or is part of a SCADA system. The Set Point function will change a point for a short interval and then release the point to automatic. Points that are suitable for using the **S(setpt)** option should appear similar to those shown in the example below where the point has a status of “**A**” and the point number is listed under the “**Why?**” column. If the **S(setpt)** option is not available in the choices the **T(timer)** option can be substituted and achieve the same result by specifying a time value of 10 seconds for the duration of the timer.

**WARNING** ▲

- Changes to parameters must be made between screen updates or they will not be saved. This can be avoided by pressing the **Enter** key immediately after a letter is entered in the **Sts** column.

**Note** ◆

- If a mistake is made while changing a parameter, press the **ESC** key.
- To see a specific point, press **P** and the **Enter** key. Then enter the point number and press the **Enter** key.



**Figure 62: Applying an Override to a Set Point**

To apply an override to a set point:

- 1) Using the **Tab** key, move the cursor in the **Sts** column to select the point to be overridden.
- 2) Type **S** and immediately press the **Enter** key.
- 3) Enter the new value and press the **Enter** key.
- 4) The point will show that it has been overridden with a timer for about 10 seconds and will then return to automatic. The new value should hold after the timer expires.

Point 41 “QPeak Flow” was changed to 5.0 in this example.

### 4.4.1.5 Applying a Timed Override

The **T (timer)** option allows an adjustment to a point for a specified time period. Depending on the type of point and logic associated with it, the point may return to a previous value or continue to hold the new value once the timer has expired. The **T (timer)** option is a good choice in many cases as the panel typically will be left in a stable state after the timer expires. This could be an important consideration when dealing with a remote connection that could get interrupted.

#### WARNING

- Changes to parameters must be made between screen updates or they will not be saved. This can be avoided by pressing the **Enter** key immediately after a letter is entered in the **Sts** column.

#### Note

- If a mistake is made while changing a parameter, press the **ESC** key.
- To see a specific point, press **P** and the **Enter** key. Then enter the point number and press the **Enter** key.

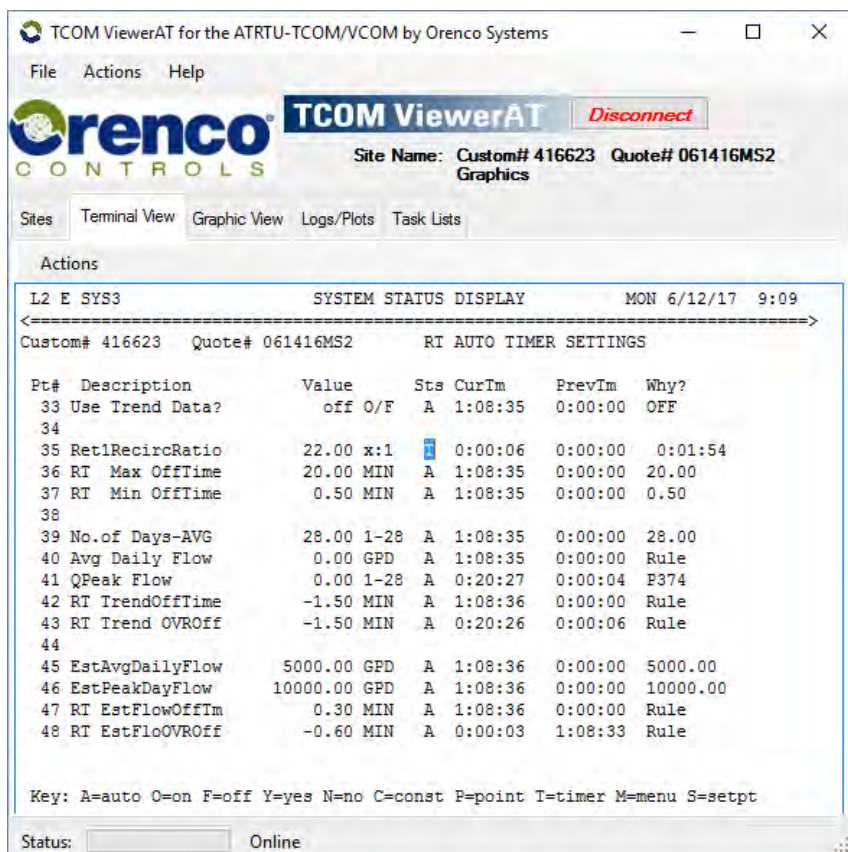


Figure 63: Applying a Timed Override

To apply a timed override:

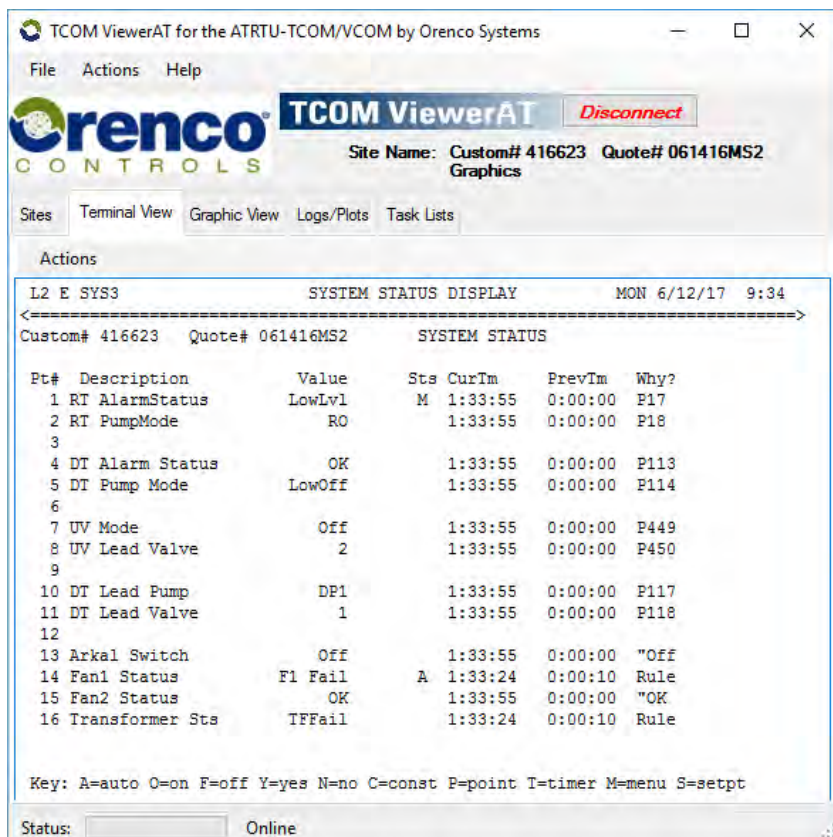
- 5) Using the **Tab** key, move the cursor in the **Sts** column to select the point to be overridden.
- 6) Type **T** and immediately press the **Enter** key.
- 7) Type the new value and press the **Enter** key.
- 8) Enter the length of time to apply the override and press the **Enter** key.

If seconds are needed enter the number of seconds (such as 120). If hours or minutes are needed enter the new value in HH:MM where “HH” represents the number of hours, “MM” represents the number of minutes, and the colon, is a separator between the hours and minutes fields. For example 12:34 specifies a time interface of twelve hours and thirty four minutes.

In this example, point number 35 “Tet1RecircRatio” will be set to the value “22:00” for 120 seconds and will then return to the previous state and value. As the timer counts down the remaining time will be shown under the “Why?” column.

### 4.4.2 Viewing Additional Point Detail

Additional point information can be evaluated in detail using the “Menu” listed in the key choices list at the bottom of the windows. The type of information presented is useful for various troubleshooting procedures. The cursor must be placed in the **Sts** column of the point for evaluation and then enter **M** to go to the next screen. Common functions are as follows:



**Note** ◆

- If a mistake is made while changing a parameter, press the **ESC** key.
- To see a specific point, press **P** and the **Enter** key. Then enter the point number and press the **Enter** key.

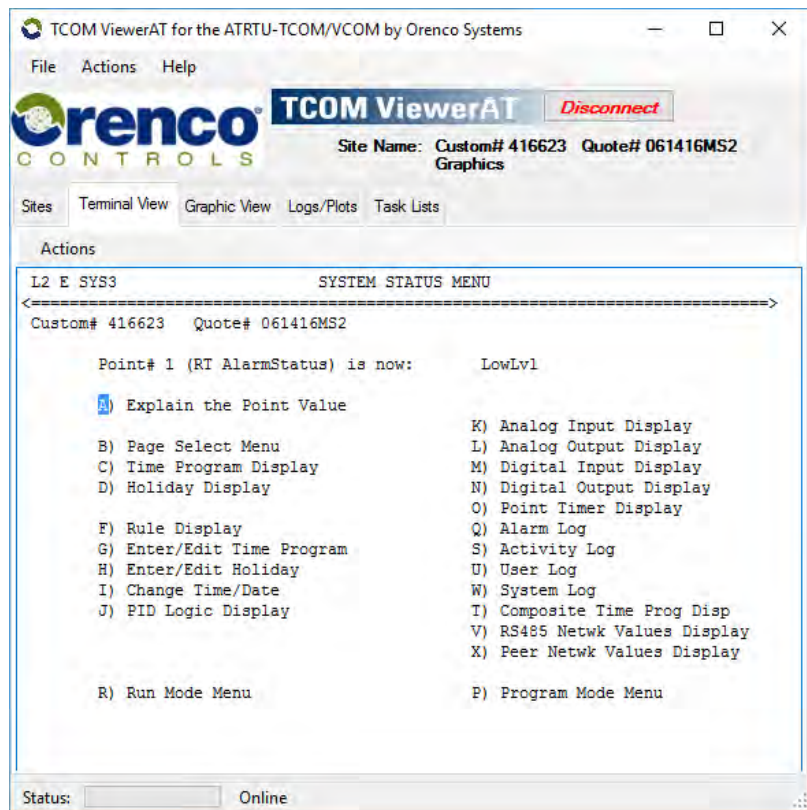
**Figure 64: Viewing Additional Point Details**

To View Details of a Specific Point:

- 1) Use the **TAB** or **Arrow** keys to move the cursor to the **Sts** column of the desired point.
- 2) Type **M** in the **Sts** column and immediately press the **Enter** key.
- 3) A new screen will be displayed that is specific to the point that was selected.

### 4.4.2.1 Individual Point Detail

This page allows the operator to focus on a single point and view information about it.



#### WARNING

- Options shown on this menu but not described are for use by Orenco Controls only.

#### Note

- If a mistake is made while changing a parameter press the **ESC** key.
- Press the **ESC** key at any time to return to the previous menu.

**Figure 65: View Details of a Specific Point**

#### Explain the Point Value (A)

Explains the control program logic currently responsible for the points value.

#### Rule Display (F)

The rules for the point can be displayed.

#### Change Time/Date (I)

Supports entering new date and time settings.

#### Input & Output Displays (K-N)

These pages will display the current values for the analog/digital inputs or outputs.

#### Logs (Q, S, U, W)

These pages will display the activity log, alarm log, system log, or a user log.

#### RS485 Network Values Display (V)

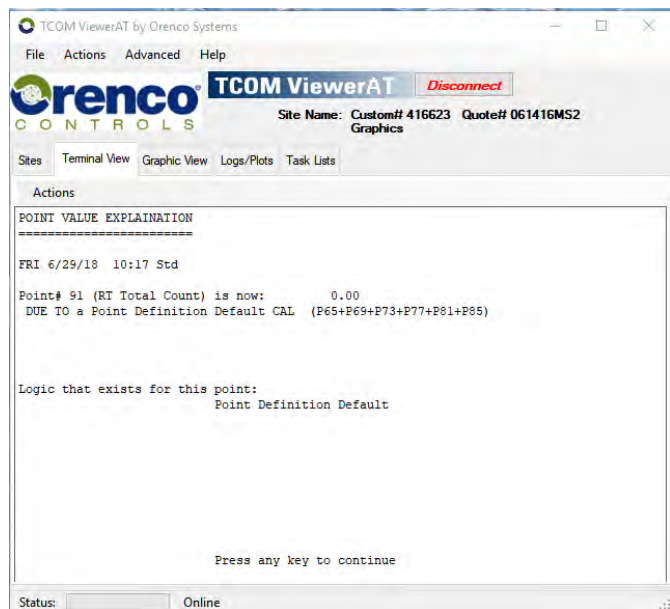
Displays information about other devices connected via a Modbus RS485 network.

#### Peer Network Values Display (X)

Displays information about other devices connected via a network and defined as peers to this device.

### 4.4.2.2 Point Value Explanation

The example shows that point number 35 “Ret1RecircRatio” currently has a value of 4.00 due to a point definition default value of 4.00. It also shows that this point can have a default value, or a manual override value applied to it.



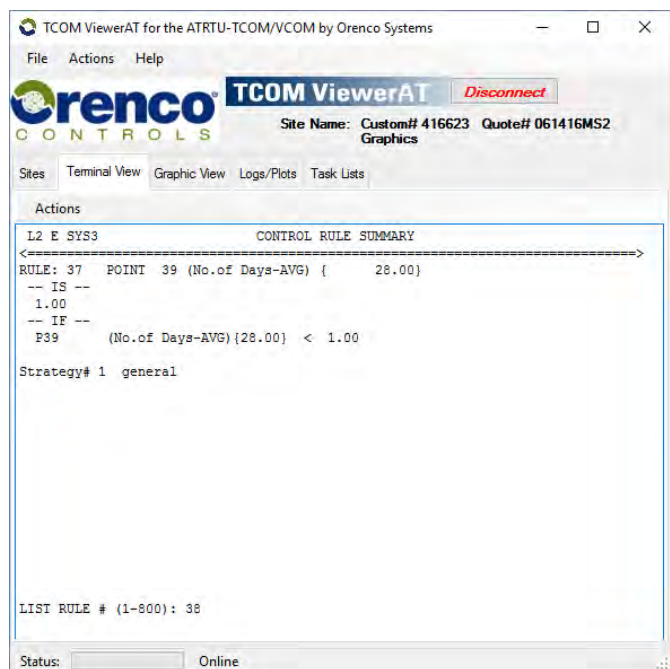
**Note** ◆

- Pressing the **ESC** key at any time will return to the previous screen.

Figure 66: Point Value Explanation

### 4.4.2.3 Rule Display (F)

The point rule display depicts the logic that controls the point and the current state of the rule.



**Note** ◆

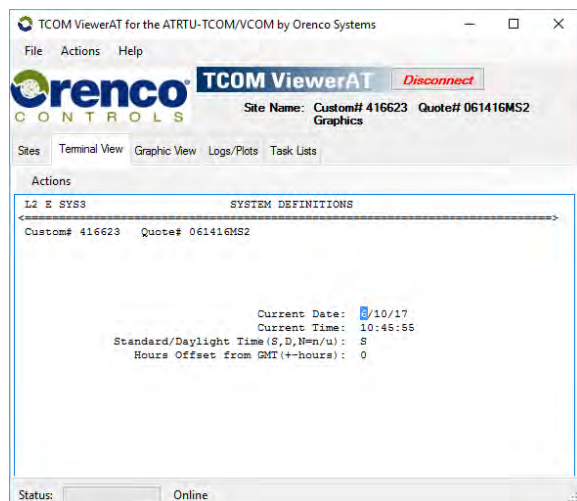
- Pressing the **ESC** key at any time will return to the previous screen.
- Pressing Enter again will display the next rule that is defined for this point. The lowest numbered rule that evaluates to true, will control the point value.

Figure 67: Point Control Rule Display

### 4.4.2.4 Setting the Date and Time

The user can set the date and time value using the display below. Date information is entered in MM/DD/YYYY format where MM is the month, DD is the day of the month, and YYYY is a year. The year can be entered in format and will be treated as an offset from the year 2000.

Time is entered in HH:MM:SS format where HH represents hours from 0-23, MM represents minutes 0-59, and SS represents seconds 0-59. It is not required to enter seconds.



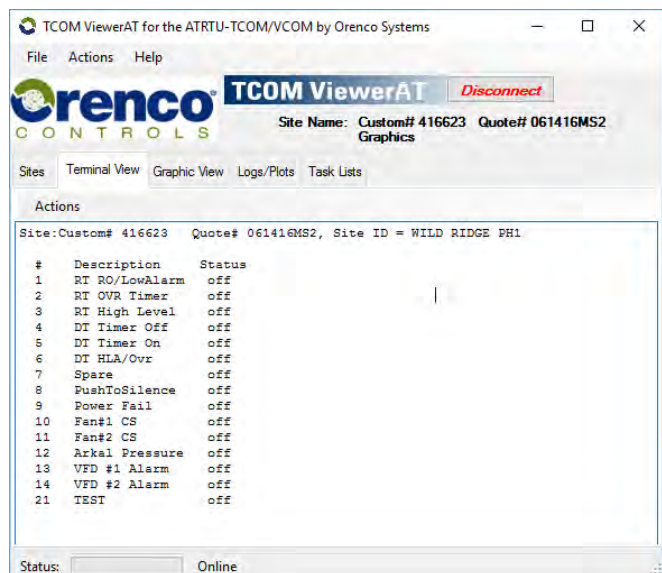
**Note** ◆

- Pressing the **ESC** key at any time will return to the previous screen.
- Date format: MM/DD/YY or MM/DD/YYYY
- Time format: HH:MM:SS

Figure 68: Entering Date and Time

### 4.4.2.5 Input and Output Displays (K-N)

The current value of analog and digital inputs and outputs can be viewed using selections K-N.



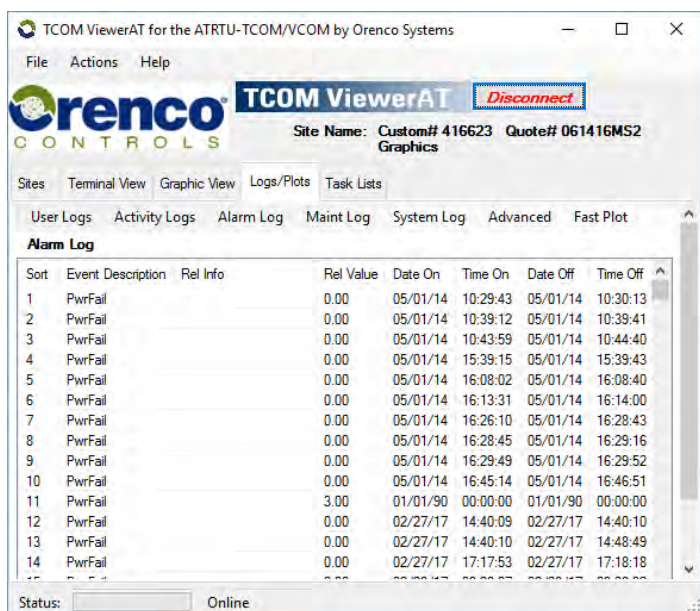
**Note** ◆

- Pressing the **ESC** key at any time will return to the previous screen.

Figure 69: Viewing Analog and Digital Inputs and Outputs

### 4.4.2.6 Logs (Q, S, U, W)

These pages will display the activity log, alarm log, system log, or a user log. See sections 1.4.6 “Logging Information” on page 14 and section 3.8.7 “Logs and Plots” on page 69 for more information.



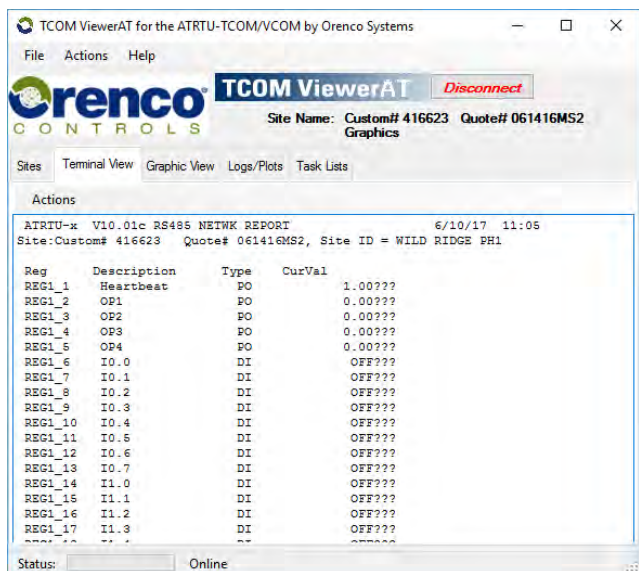
**Note** ◆

- If no data is available to report from the logs, a message of “No Data to Report” will be displayed.
- Pressing the **ESC** key at any time will return to the previous screen.

Figure 70: Logs

### 4.4.2.7 RS485 Network Values Display (V)

Displays information about other devices connected via a Modbus RS485 network. Examples include displaying Modbus register values along with information about the register.



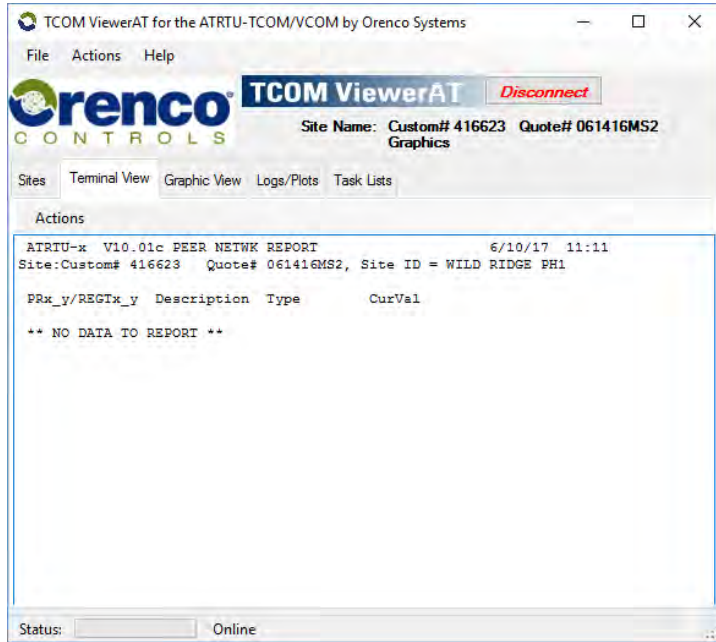
**Note** ◆

- No registers will be displayed if none are defined.
- Pressing the **ESC** key at any time will return to the previous screen.

Figure 71: RS485 Network Values Display (V)

### 4.4.2.8 Peer Network Values Display (X)

Displays information about other devices connected via a network and defined as peers to this device



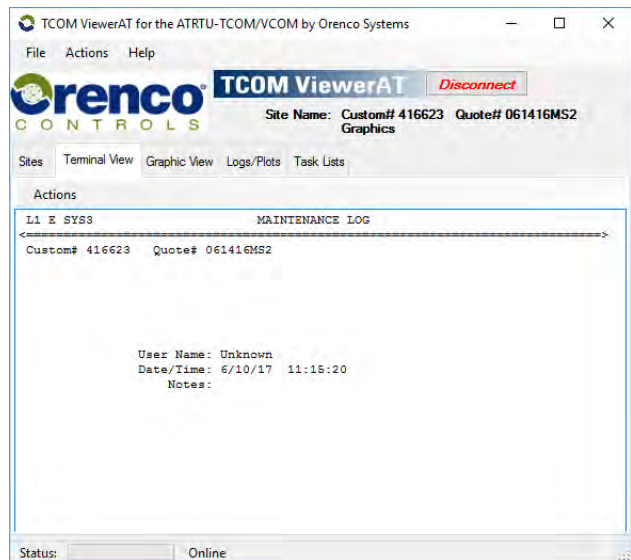
**Note** 

- No peer information will be displayed if no peers are defined.
- Pressing the **ESC** key at any time will return to the previous screen.

**Figure 72: Peer Network Values Display (X)**

## 4.5 Maintenance Log Entry

From the top level “Run Mode” menu the user can select number 2 which allows them to record changes made to a site. Example uses include replacing a part, routine service, clearing and alarm condition, etc.



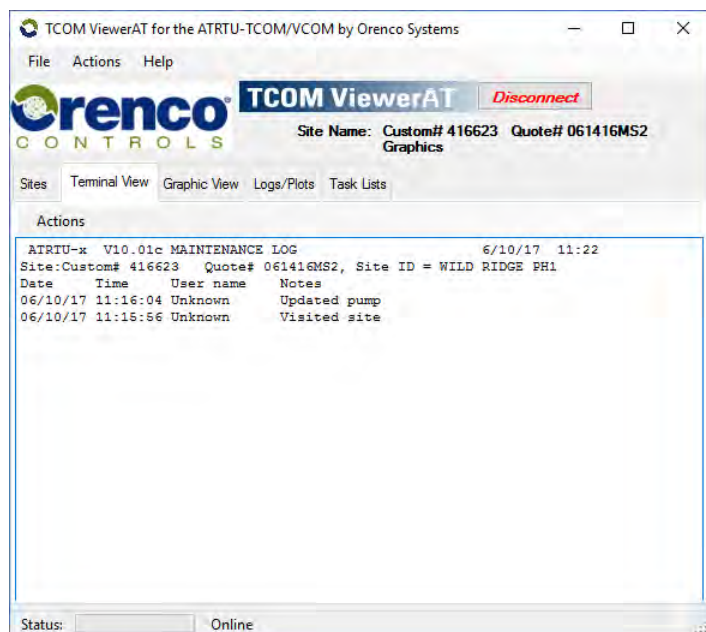
### Note

- Up to 50 characters are allowed for notes.
- Pressing the **ESC** key at any time will return to the previous screen.

Figure 73: Maintenance Log Entry

## 4.6 Maintenance Log Report

From the top level “Run Mode” menu the user can select number 3 which allows them to view maintenance log entries made to a site.



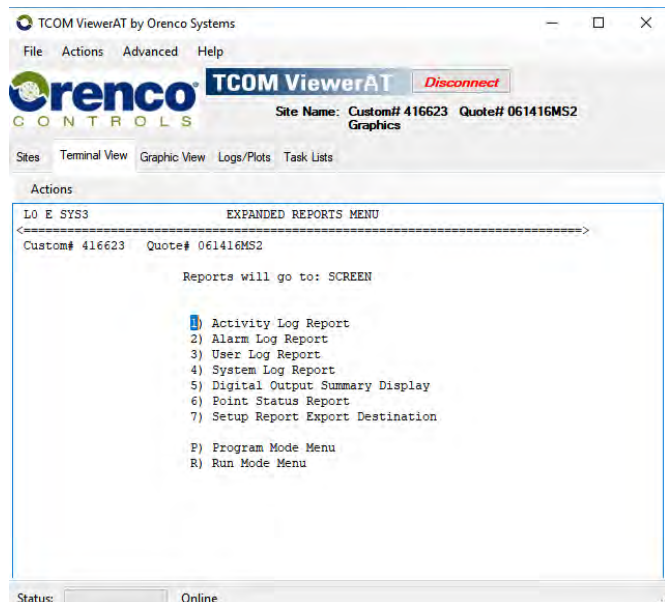
### Note

- Pressing the **ESC** key at any time will return to the previous screen.

Figure 74: View the Maintenance Log Report

## 4.7 Expanded Reports Menu

From the top level “Run Mode” menu, the user can select number 4 which allows them to view various logs. See section 1.4.6 “Logging Information” on page 14 for more information.



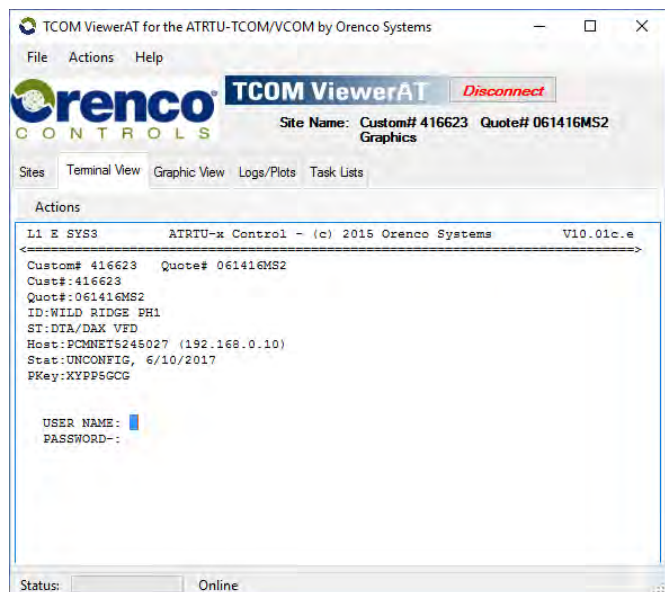
**Note** ◆

- Pressing the **ESC** key at any time will return to the previous screen.

Figure 75: Expanded Reports Menu

## 4.8 Enter a Username and Password

From the top level “Run Mode” menu the user can select number 5 which allows them to enter a user name and password combination. Typically a user is prompted to do this when connecting using a terminal emulation program and is done automatically when using TCOM Viewer. This feature enables the user to enter a new combination that may have higher or lower permissions levels. See section 1.4.4 User Accounts and Permission Levels on page 10 for additional information.



**Note** ◆

- Pressing the **ESC** key at any time will return to the previous screen.

Figure 76: Entering a Username and Password

## 4.9 Backup Program to Flash

The original factory control program is stored in non-volatile flash memory prior to shipment of the panel. During operation a copy of the control program is stored in a volatile RAM memory that is maintained through transient power interruptions. The volatile memory contents will be lost during long power outages. When power is re-applied, the system detects that that control program in the volatile memory is no longer valid and copies the program from the non-volatile flash memory into the volatile RAM memory.

When changes are made to the control programming they affect only the copy in the volatile RAM memory. The user must explicitly initiate the backup programming process to save the changes permanently in the non-volatile flash memory.

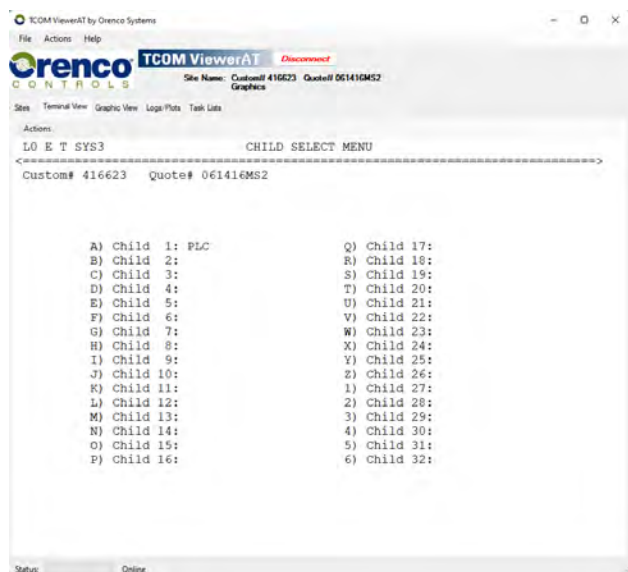
Select number 6 from the top level “Run Mode” menu to store changes in the volatile memory to the non-volatile flash memory.

It is recommended that the panel be in a stable condition (i.e. free of alarms) prior to using the “Backup Programming” command. The “Backup Programming” process saves all changes made to the control program. It is not necessary to save each individual change.

If an error message is received after selecting “Backup Programming”, please contact Orenco for assistance.

## 4.10 Logon to Modbus RS485 Child

From the top level “Run Mode” menu the user can select number 7 to logon on to Modbus RS485 child. This feature is only available at installation sites with multiple ATRTU-TCOM controllers connected with an RS485 Modbus network. If present, a user interacting with the Modbus parent system and an adequate permission level can log into child devices on the network.



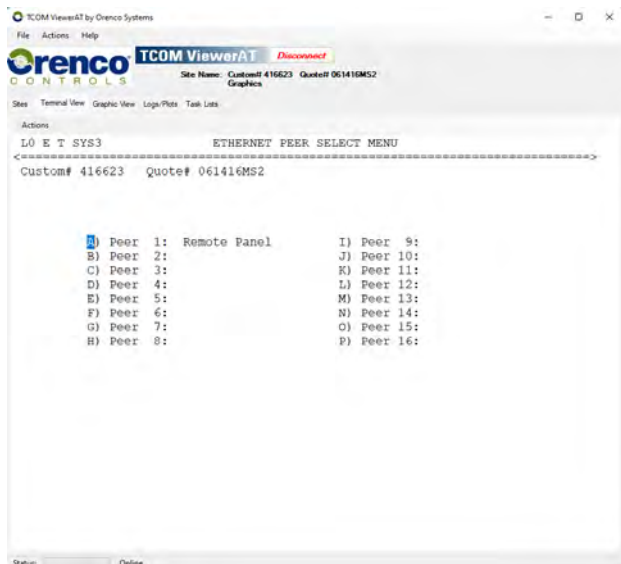
**Note** 

- Pressing the **ESC** key at any time will return to the previous screen.

**Figure 77: Logon to Modbus RS485 Child**

### 4.11 Logon to Ethernet Peer

From the top level “Run Mode” menu the user can select number 8 to logon on to other ATRTU-TCOM controllers on the network. A limited set of device types is supported. Use of this feature requires additional configuration steps. Contact Orenco Controls for more information.



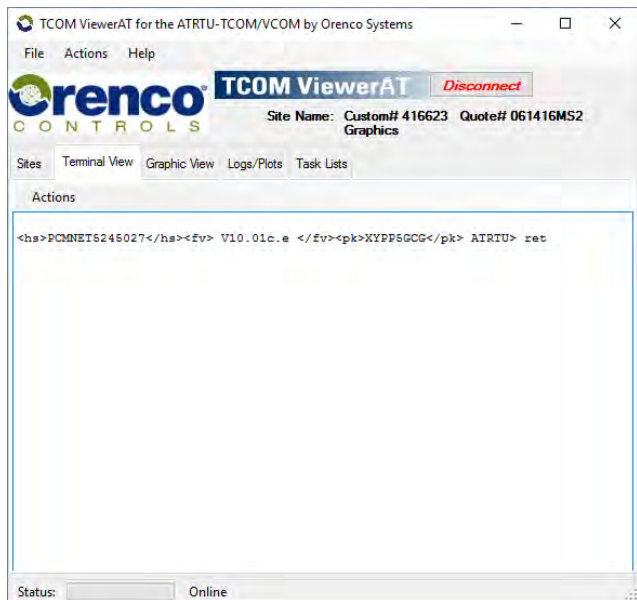
**Note** ◆

- Pressing the **ESC** key at any time will return to the previous screen.

Figure 78: Logon to Ethernet Peer

### 4.12 Command Mode

Command mode is intended for internal use by Orenco Controls. The user is advised not to enter command mode. However, if command mode is entered accidentally, the user can exit it and return to the run mode menu by entering “ret” and pressing the **Enter** key, or by entering “menu” and pressing the **Enter** key.



**Note** ◆

- Type ret and press the **Enter** key to exit command mode.

Figure 79: Exiting Command Mode

## 4.13 Mailbox Targets

The ATRTU-TCOM system supports event notification to a variety of external systems referred to as “mailboxes”. As described in section 1.4.7 “Event Notification Using Mailboxes” on page 15, multiple interacting subsystems are required for successful event notification using mailboxes.

User’s with a high enough permission level can select the letter M from the top level “Run Mode” menu to view and interact with mailbox settings. To configure a mailbox the user must enter information that is valid for the destination device and mailbox type.

For a pager, phone, or modem the user must enter the pager or phone number to call. No message information is required, and no message will be left. The notification is via caller ID. The phone number must be entered as it would be from the site location. This includes an area code or any other prefix numbers that are required by the phone system the panel is connected to. Five commas must be appended to the end of the phone number.

For example: “1800554444,,,,,”.

For an email, the user must enter the destination email address and a message. In some configurations, it may be possible to send an email to a wireless cellular network and have it converted into an SMS text message.

For a direct cellular SMS text, the user must enter the phone number and a limited message.

## 4.14 Program Mode Menu

From the top level “Run Mode” menu user’s with a high enough permissions level can select the letter P to enter program mode.

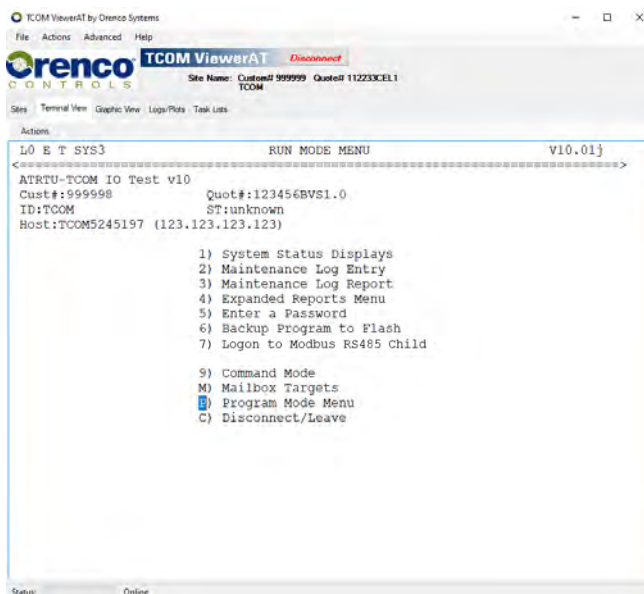
The program mode is typically reserved for internal use by Orenco Controls.

### 4.15 Changing Your Password

Orenco Systems ships each panel with a unique username and password that can be modified through the terminal mode interface. The initial username and password given by Orenco Systems can be modified and has the permissions to add more users. After more users have been added, the initial username has the capability to see all usernames and passwords, change their passwords, assign level permissions and give permission to other users to add more users. Each user added will only be able to see other user passwords of equal permission level, if permission is granted. User levels are arranged from 0-3, 0 being the highest-level permission.

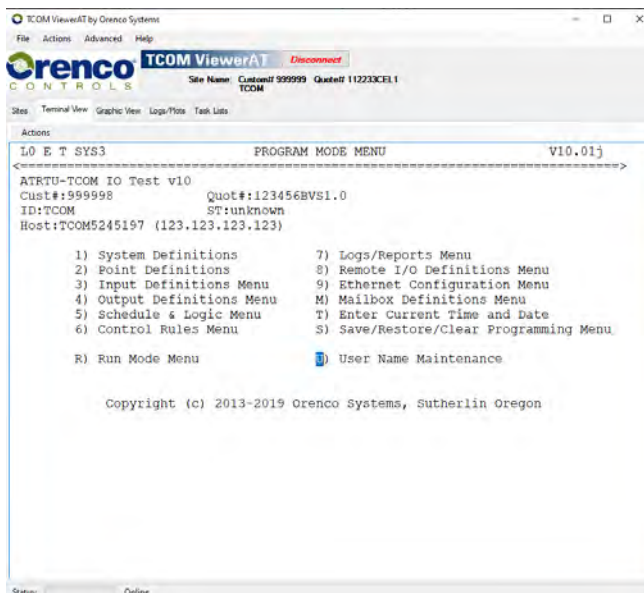
To change your username and/or password:

- 1) Log in to TCOM viewer with the temporary Username and Password provided by Orenco Systems.
- 2) Once logged in, select the option “**P) Program Mode Menu**”.



**Figure 80: Program Mode Menu**

- 3) In the program mode menu, select the option “**U) Username Maintenance**”.



**Figure 81: Username Maintenance**

4) Move the cursor to the desired Username and Password to be changed.

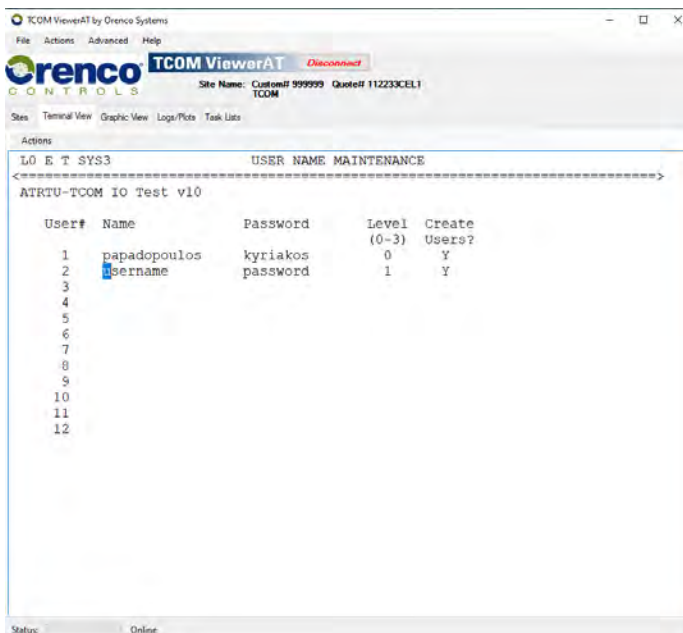


Figure 82: Current Username and Password

5) Enter the desired Username and Password. Username and Password are limited to 15 characters.

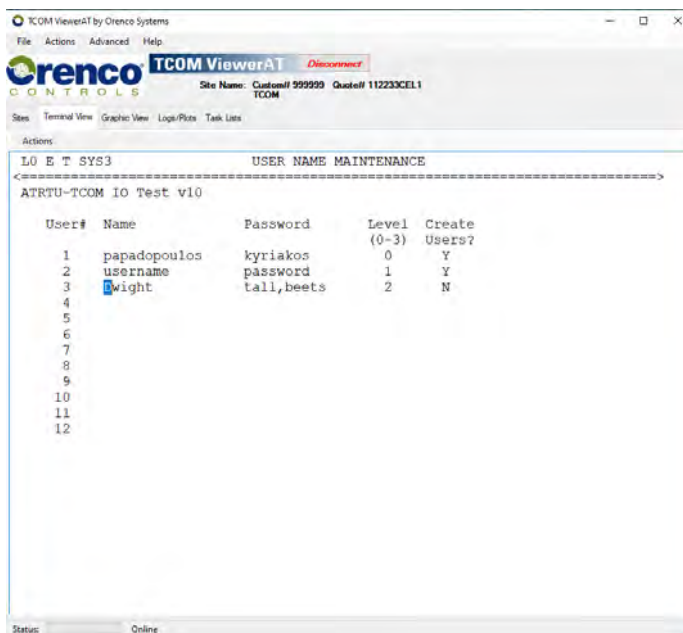
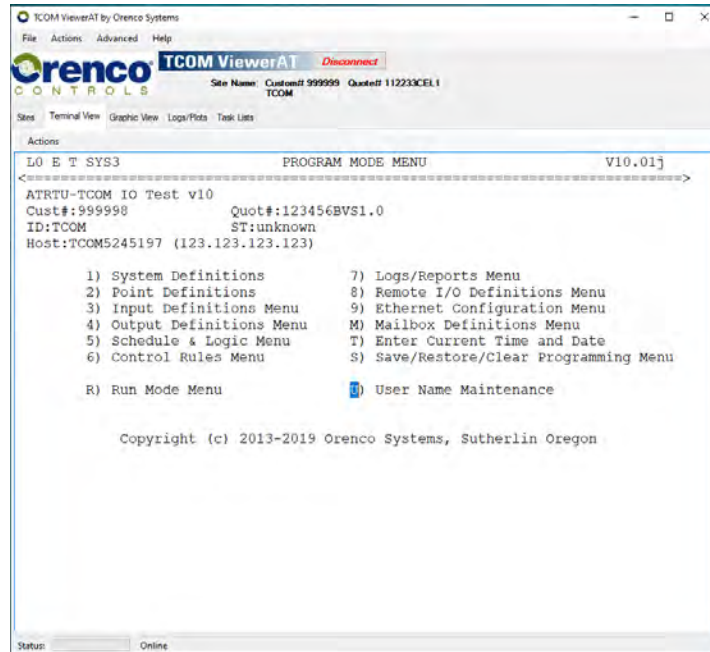


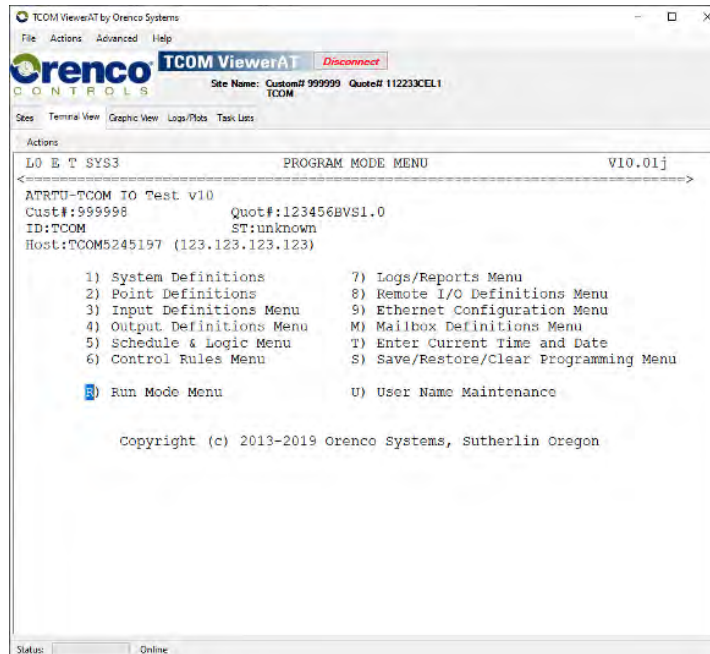
Figure 83: Entering New Username and Password

6) After changing the Username and Password press **Enter** and you will be returned to the previous window.



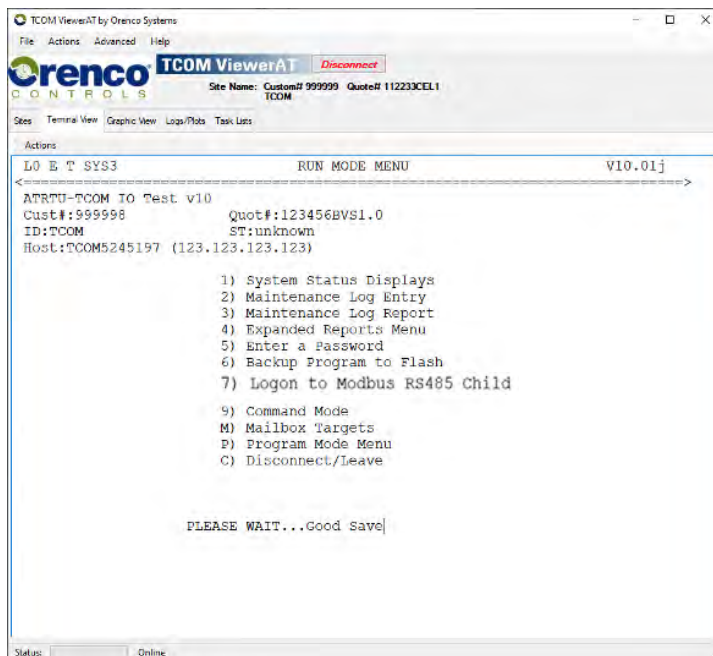
**Figure 84: Return to Program Mode Menu**

7) Return to “R) Run Mode Menu” (the last two steps are very important. If not followed properly, the new Username and Password will not be saved).



**Figure 85: Run Mode Menu**

- 8) In the RUN MODE MENU Select option “**6) Backup Program to Flash**” to save the changed new Username and Password. A message will be displayed at the bottom of the screen indicating that the program has been saved.



**Figure 86: Backup Program to Flash**

- 9) You have successfully changed the Username and Password.

## 4.16 Disconnect/Leave

From the top level “Run Mode” menu user’s can initiate a disconnect program by pressing the letter **C**.

## 5 LED's and Switches

There are several LED's and switches located on the ATRTU-TCOM main control board. Some of these are reserved for internal use by Orenco Controls. This section describes LED's and switches which can be used for limited system diagnosis.

### 5.1 LED's

The LED's provide limited visibility into the system state. If no LED's are lit or flashing, this typically indicates that there is no power applied to the board.

Name	Color	Component Silkscreen	Description
OK	Green	D2	When blinking at a rate of ~1 second, indicates the application firmware is running. When blinking rapidly in bursts of 2, 3, or 4 it indicates the application firmware is being reprogrammed. <b>DO NOT REMOVE POWER.</b>
PCI	Green	D5	When off, indicates no cellular modem is installed. When blinking at a rate of 1 second it indicates cellular modem is online.
Data	Green	D1	When flashing it indicates there's traffic on the optional cellular modem port.
Ethernet	Green	J2	When flashing it indicates there's traffic on the Ethernet port.

**Table 6: LED Indicators**

### 5.2 Switch Operation

Name	Silkscreen	Description
TEST	SW1	This switch is reserved for internal use by Orenco Controls.
RESET	SW2	When pressed and released, forces the core microprocessor to execute a reset sequence.

**Table 7: Switch Operation**

### Warning

The TEST switch is not intended for use in the field. Improperly manipulating this switch can result in incorrect system behavior and require a reset to recover.

## 6 Support Information

For additional support, contact Orenco Controls.

Phone: 541-459-4449

Toll Free: 800-348-9843

Fax: 541-459-6781

Internet: [www.OrencoControls.com](http://www.OrencoControls.com)

## 7 Glossary

Base Template	A TCOM Viewer or Web server page that graphic views are based on with a predefined set of objects that can be visible or hidden and mapped to internal ATRTU-TCOM resources.
BSP	Board Support Package.
Control Program	Refers to a set of logical operations used to monitor and operate ATRTU-TCOM control systems developed by Orenco Controls. Conceptually, it is a customized scripting language that is interpreted by another computer system and executed.
Firmware	A computer program that can be interpreted and executed directly by a microprocessor. Typically refers to a program tightly coupled to underlying hardware.
Graphics View	An optional feature that can be added to TCOM Viewer and/or the web server that provides a configurable set of user interface pages that graphically depict the current state of the target system and are refreshed periodically.
Hardware	Physical electronic devices. Typically comprised of a printed circuit board with integrated circuit devices soldered to it. May also refer to cables, switches, LED's, resistors, inductors, capacitors.
HTTP	Hyper Text Transfer Protocol. A set of rules for transferring files such as text, graphic images, and other multimedia files on the world wide web.
IP	Internet Protocol.
IP Address	Internet Protocol Address. Sequence of numbers identifying a device on a local network or a wide area network such as the internet.
IPV4	Internet Protocol Version 4 address. The fourth revision of the Internet Protocol (IP) used to identify devices on a network through an addressing system.
IPV6	Internet Protocol Version 6 address. The sixth revision of the Internet Protocol (IP) used to identify devices on a network through an addressing system.
LAN	Local Area Network. Private network either completely isolated or sometimes separated from public networks by a firewall and router.
LED	Light Emitting Diode. A semiconductor device that converts electrical energy into optical energy visible to humans.
NA	Not Applicable.
OSI	Orenco Systems Incorporated.
Override	Refers to changing or overriding the value of a specific point.
Override Type	Refers to the type of override applied to a specific point. The options depend on the type of point and whether the control program allows overrides. Possible options include "automatic", "permanent", and "timed". An automatic override basically means the point value is determined by the control program logic. A permanent override means the point is assigned a value that will not change until the override type is changed or the permanent value is changed. A timed override exists for a specified duration of time. When the time elapses, the point override value type returns to what it was before the timed override was applied.
Point	Refers to a control point in the control program monitoring and operating an Orenco Controls ATRTU-TCOM control system. Points can also be viewed as program variables, constants, or references to other points in the system.
Point Page	A group of points with a starting number that's an integer multiple of 16 and an ending number equal to the starting number plus 16. Basically a group of 16 points.
RTOS	Real Time Operating System. Typically multi-threaded.

Site	Reference to a geographic location where a ATRTU-TCOM controller is installed.
Software	A computer program that can be interpreted and executed directly by a microprocessor. Typically refers to an application that is abstracted and independent of the underlying hardware.
URL	Uniform Reference Locator. The address of a specific webpage or file on a computer on a network.
WAN	Wide Area Network. Public network, typically the internet.

## 21. Appendix 13 – Control Panel Wiring Diagram

DRAFT

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Project Name: Lake Bennett P2 Rsrt

Order Number: 563133

Quote Number: 052925SK1

Panel Model: TCOM-DAX/DDAX/S/DAX380 3Ø TSD XF LCFA (2)UV (2)CV fm  
(AUS/NZ)

Panel Ratings	
SCCR	5kA RMS Symmetric 380V
UL Type	4 Indoor

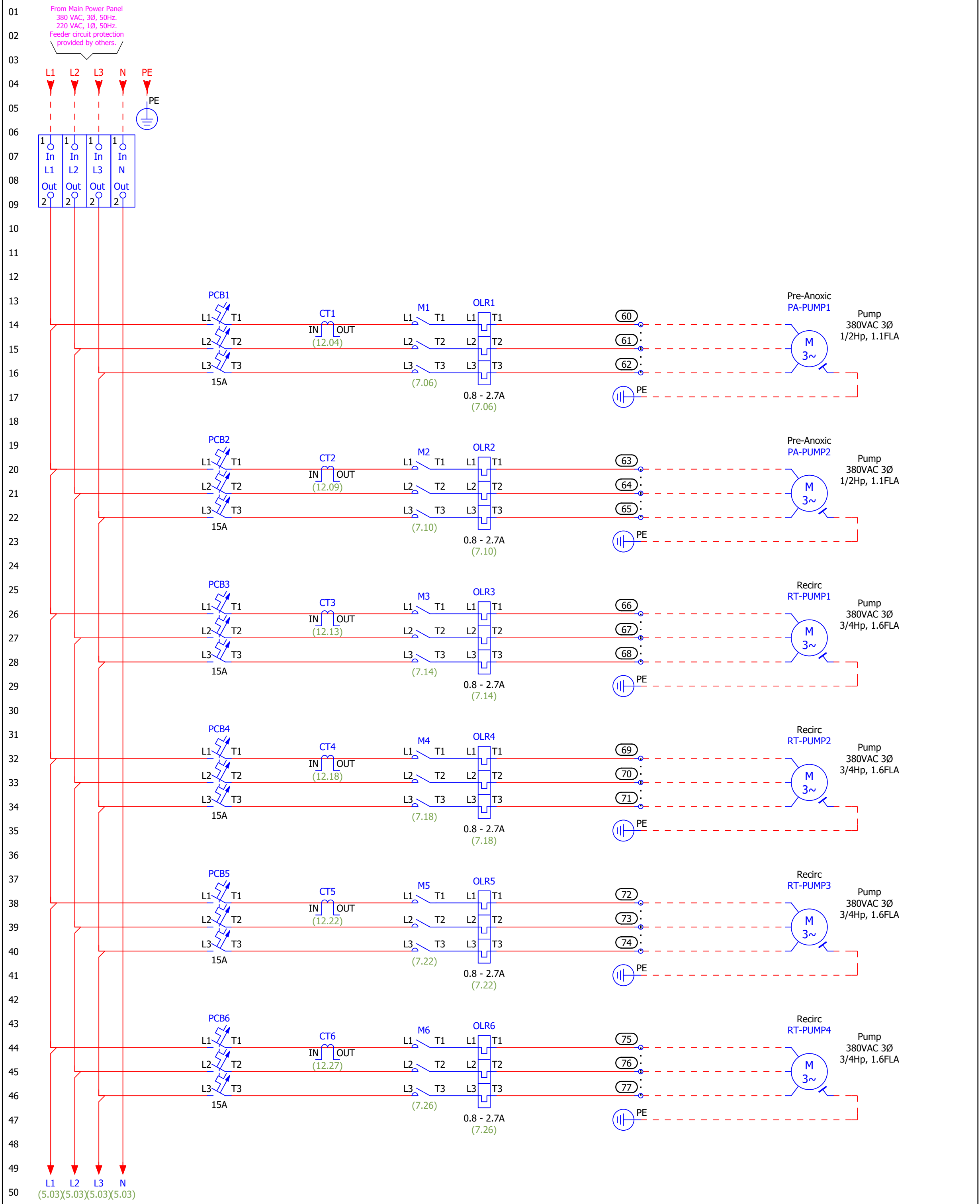
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Status	Approved		Project Name: Lake Bennett P2 Rsrt			

# Symbol Overview

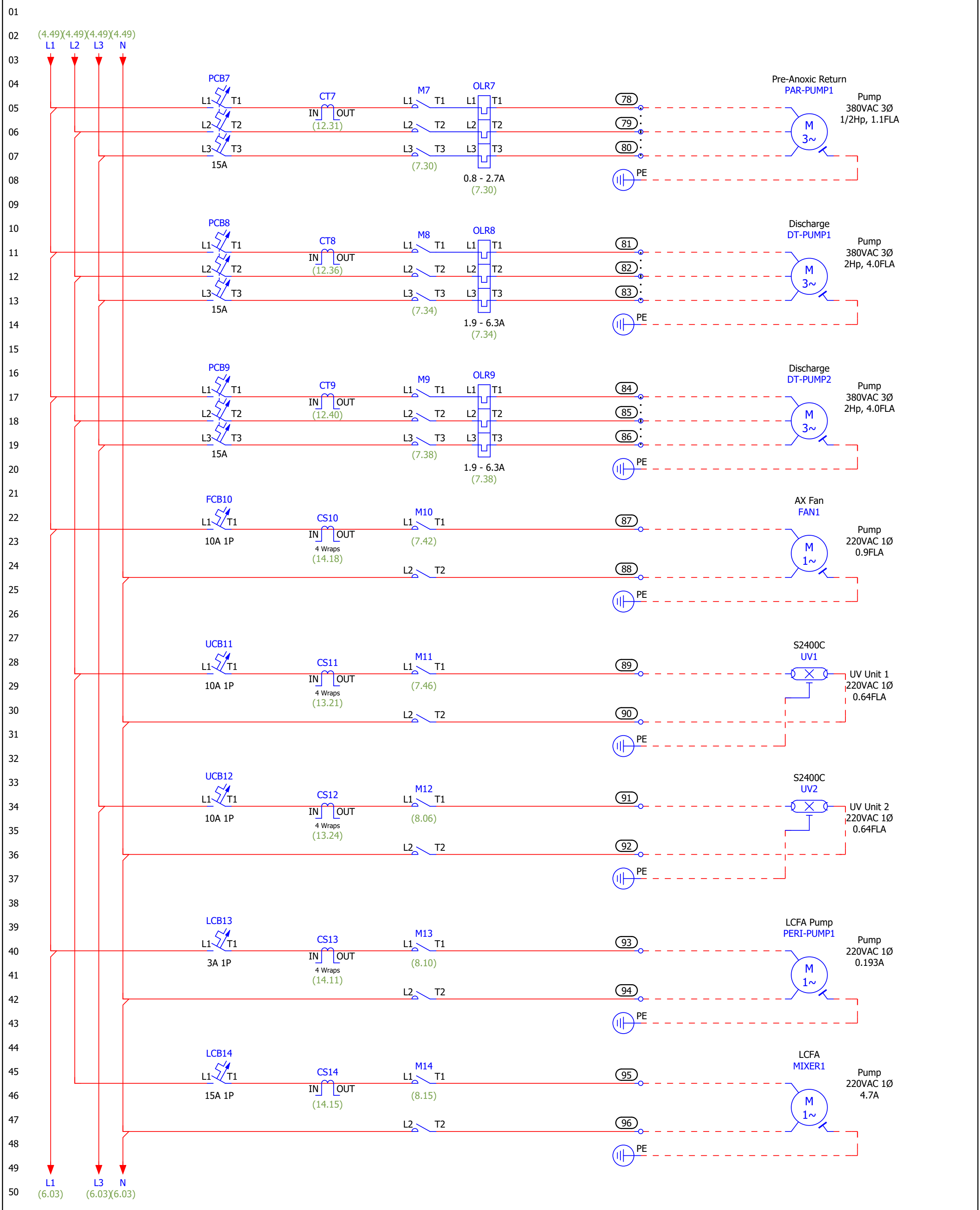
		Wire Types			
Field Terminal Connection Graphic		Panel wiring shown as solid lines. Field wiring shown as dashed lines.		Transformer	
Terminal		PE Ground Lug		Safety Fuse	1-Pole 2-Pole 3-Pole
Terminal Link		Toggle 3-Position On-Off-On		Circuit Breaker	1-Pole 2-Pole 3-Pole
Distribution Block		Illuminated Signal Lamp			
Distribution Terminals		Acoustic Signal Horn			
Power Contact Coil		3-Phase Motor With PE			
NO Power Contact	1-Pole 2-Pole 3-Pole	Overload Relay			
General Contact Coil		Switch Disconnecter 3-Pole			
NO Auxiliary Contact		Switch Disconnecter 3-Pole Fuseable			
NC Auxiliary Contact		NO Float Contact			
Change-Over Auxiliary Contact		Valve			
				Alternating Relay 2-Way	

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3	Table of contents	Table of contents	1.0	06/10/2025
4	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
5	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
6	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
7	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
8	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
9	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
10	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
11	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
12	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
13	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
14	Panel Wiring Diagram	Electrical schematic	1.0	06/10/2025
15	Panel Layout	Panel Views	1.0	06/10/2025
16	Panel Views	Panel Views	1.0	06/10/2025
17	Summarized Parts List	Summarized parts List	1.0	06/10/2025
18	Summarized Parts List	Summarized parts List	1.0	06/10/2025
19	Summarized Parts List	Summarized parts List	1.0	06/10/2025
20	Terminal diagram	Terminal diagram	1.0	06/10/2025
21	Terminal diagram	Terminal diagram	1.0	06/10/2025



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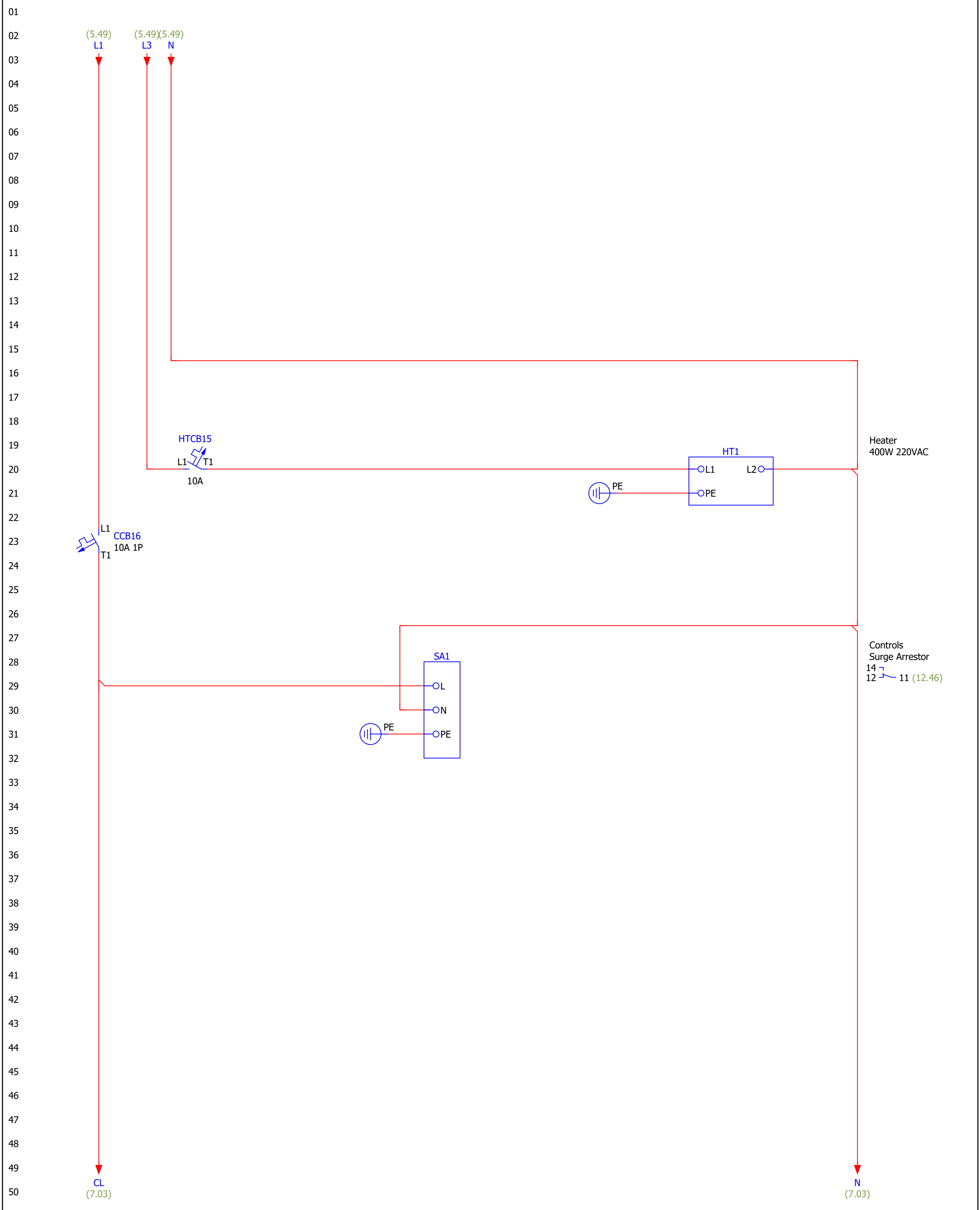
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Date	06/10/2025
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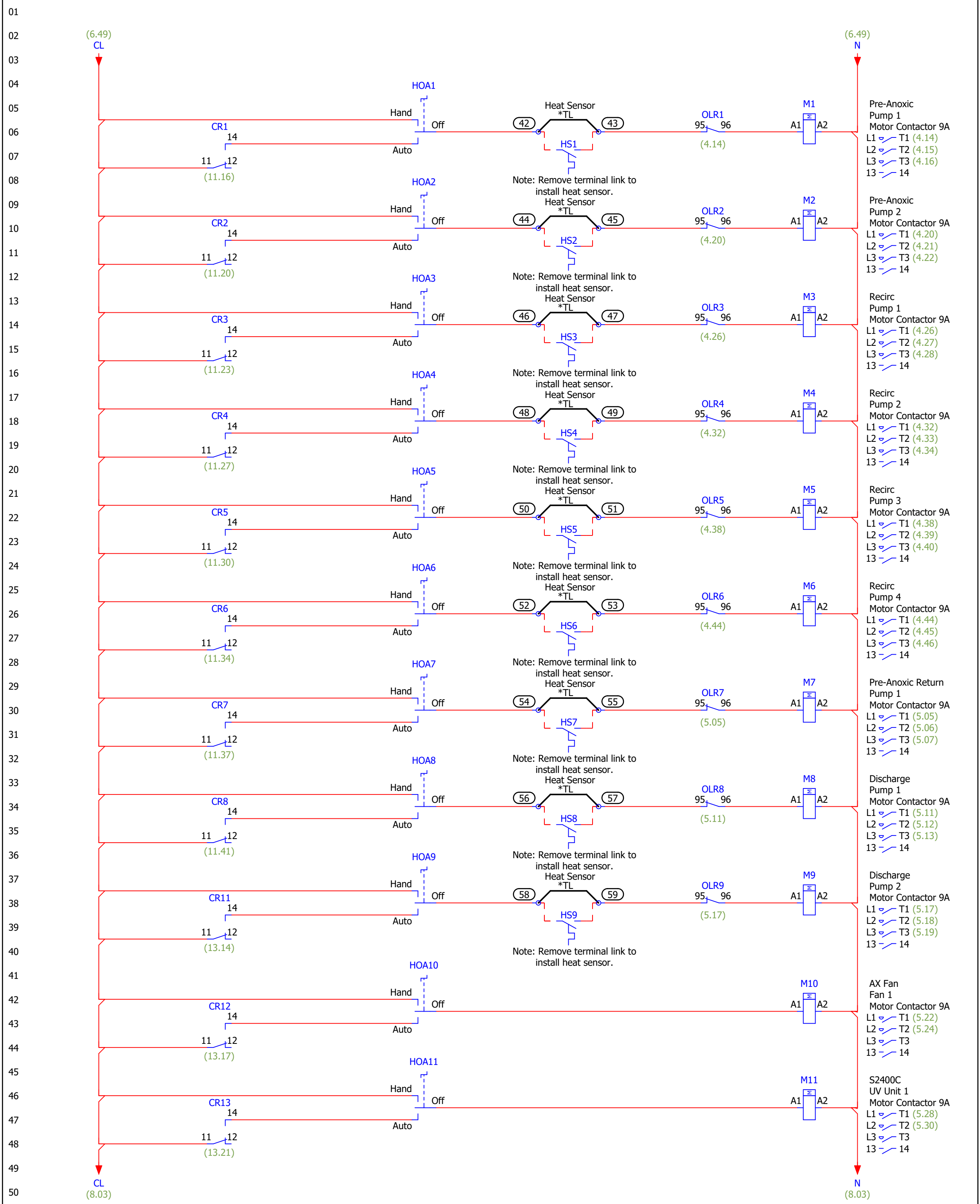
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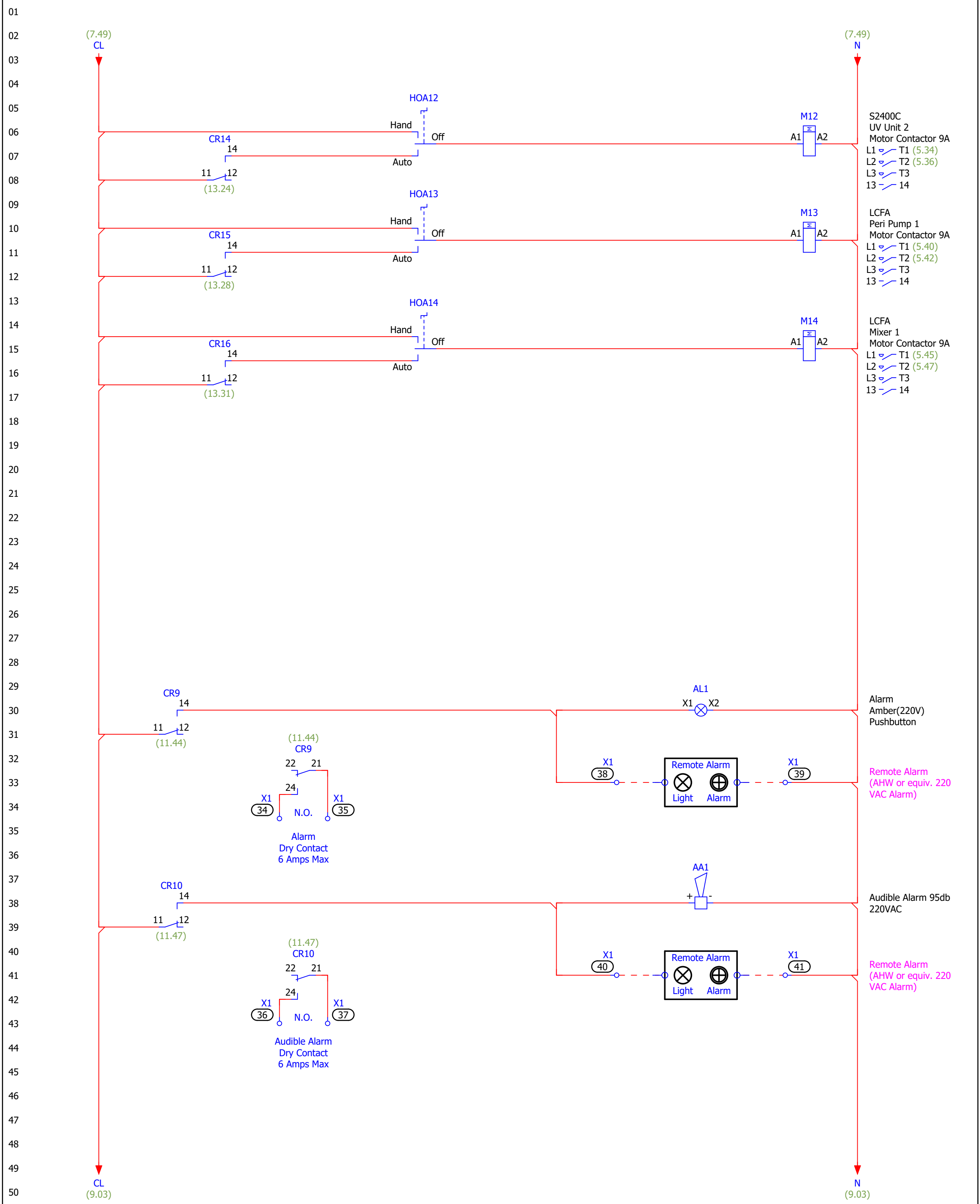
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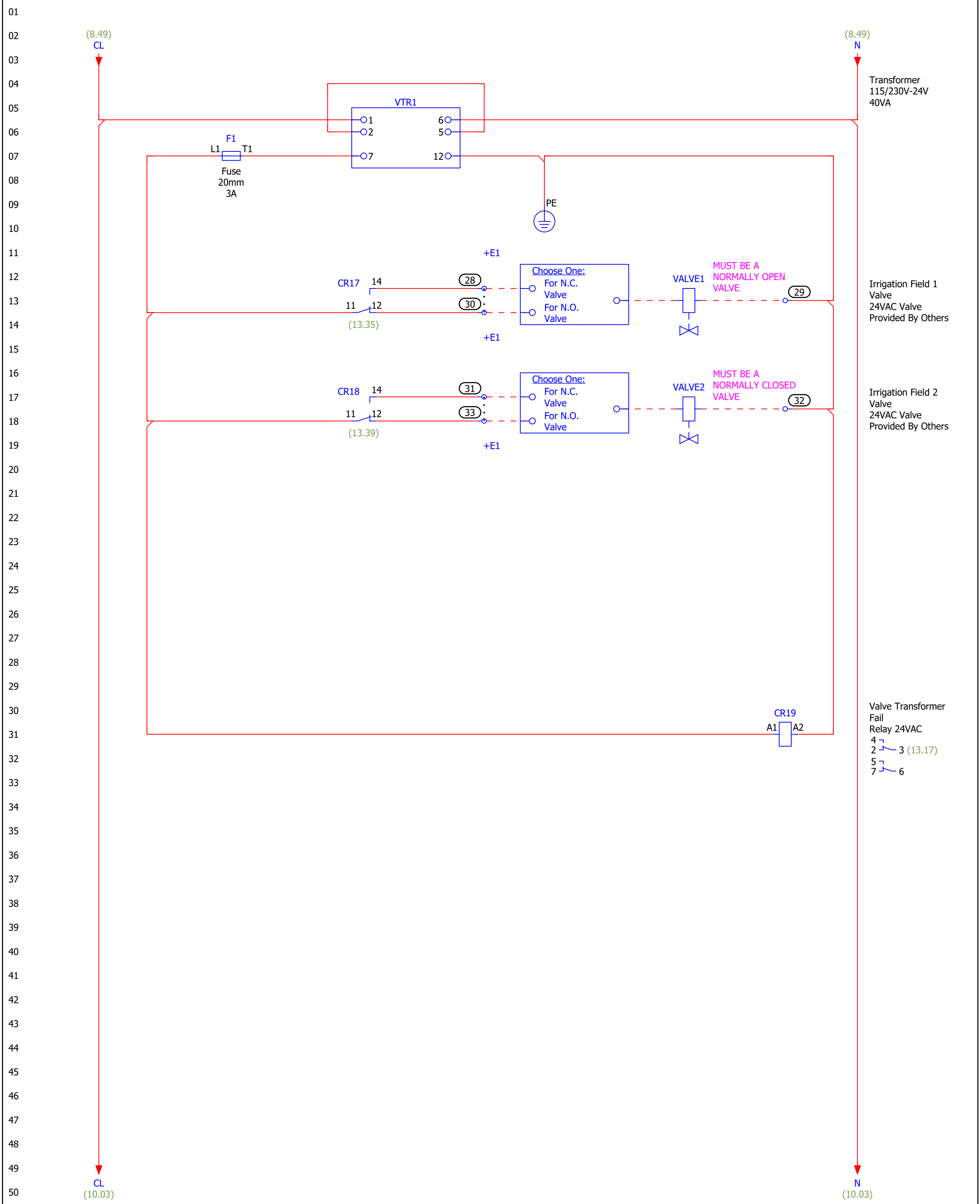




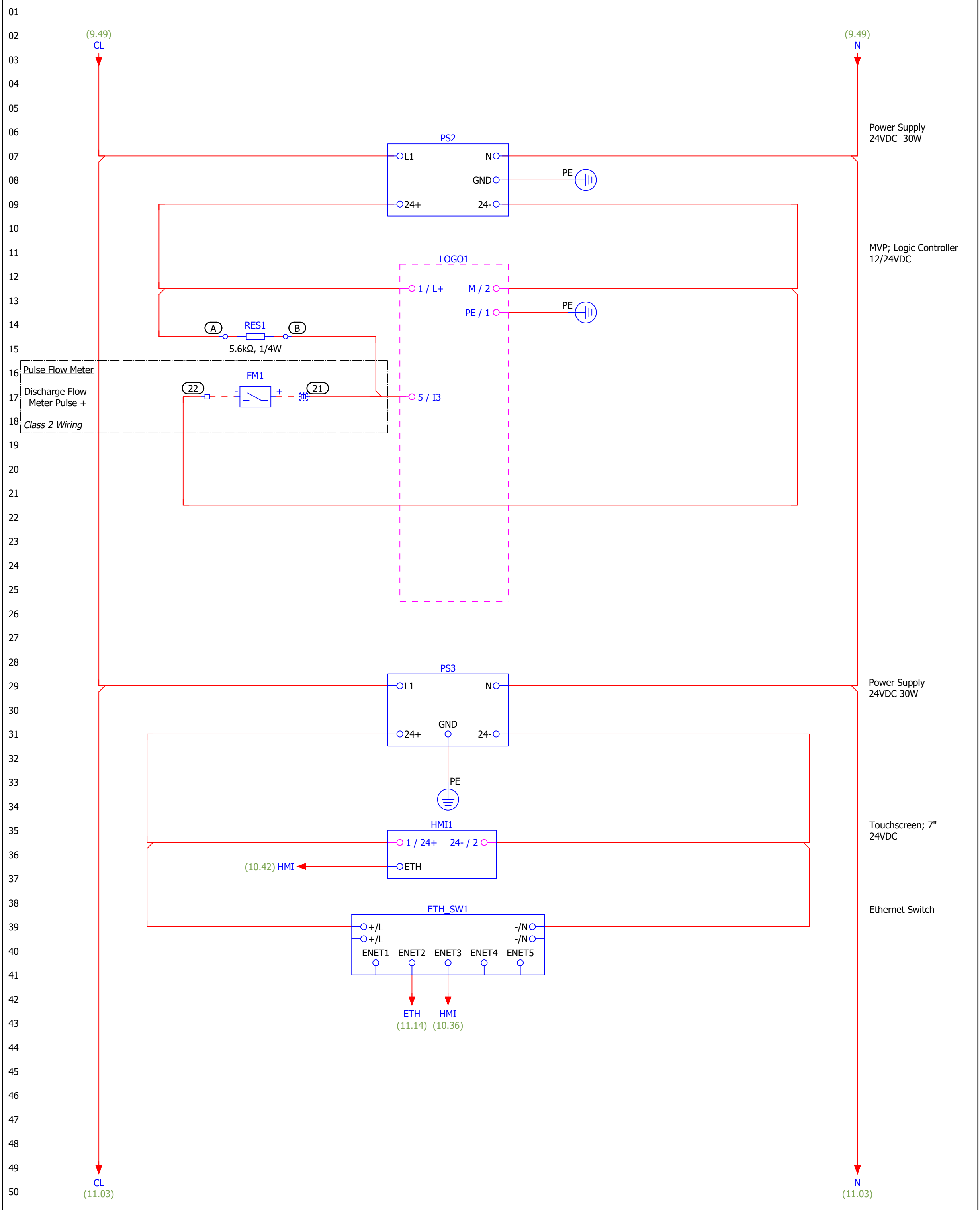
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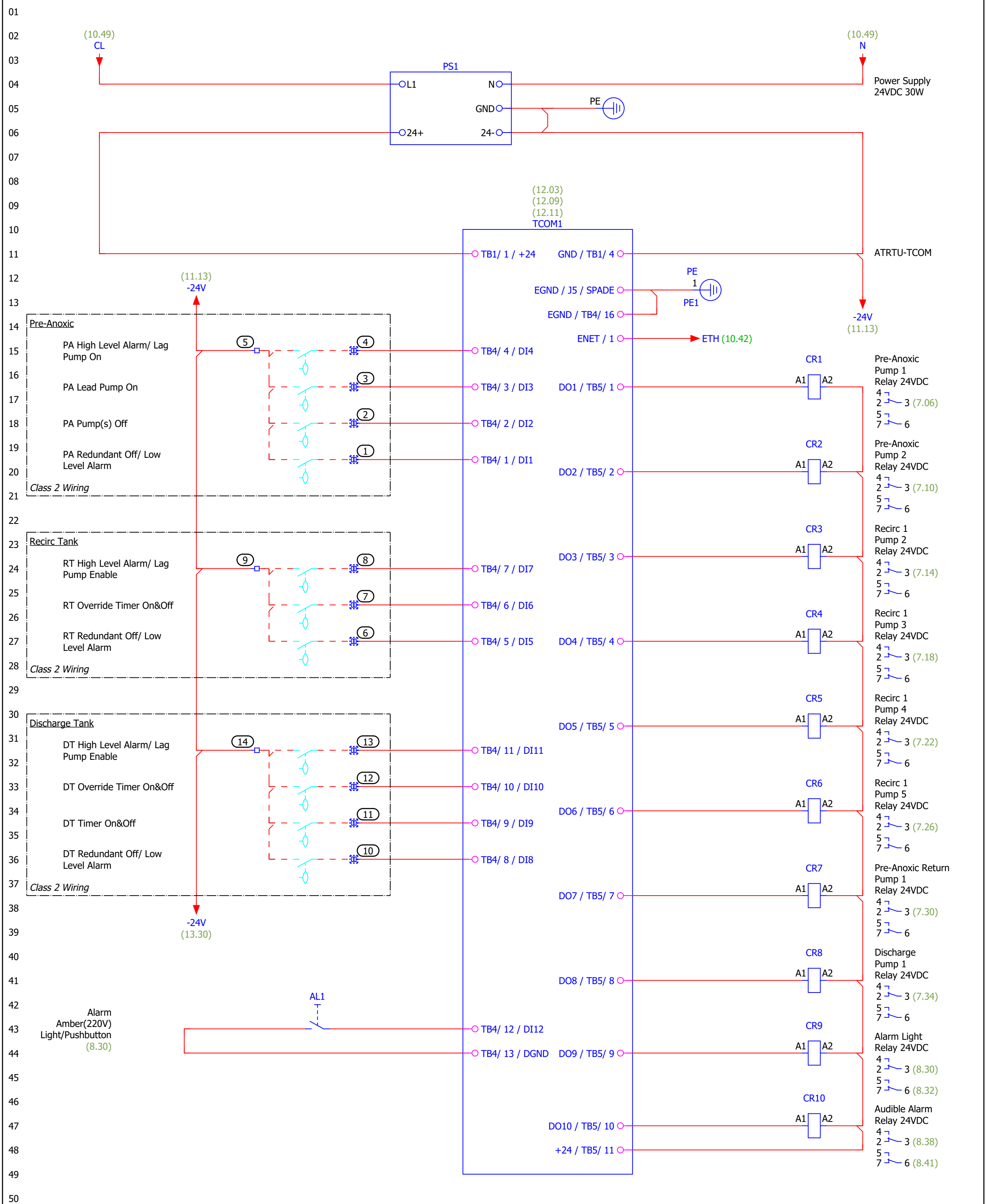
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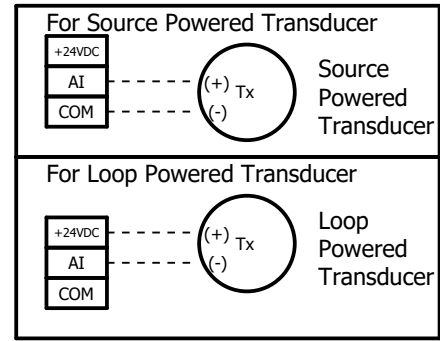
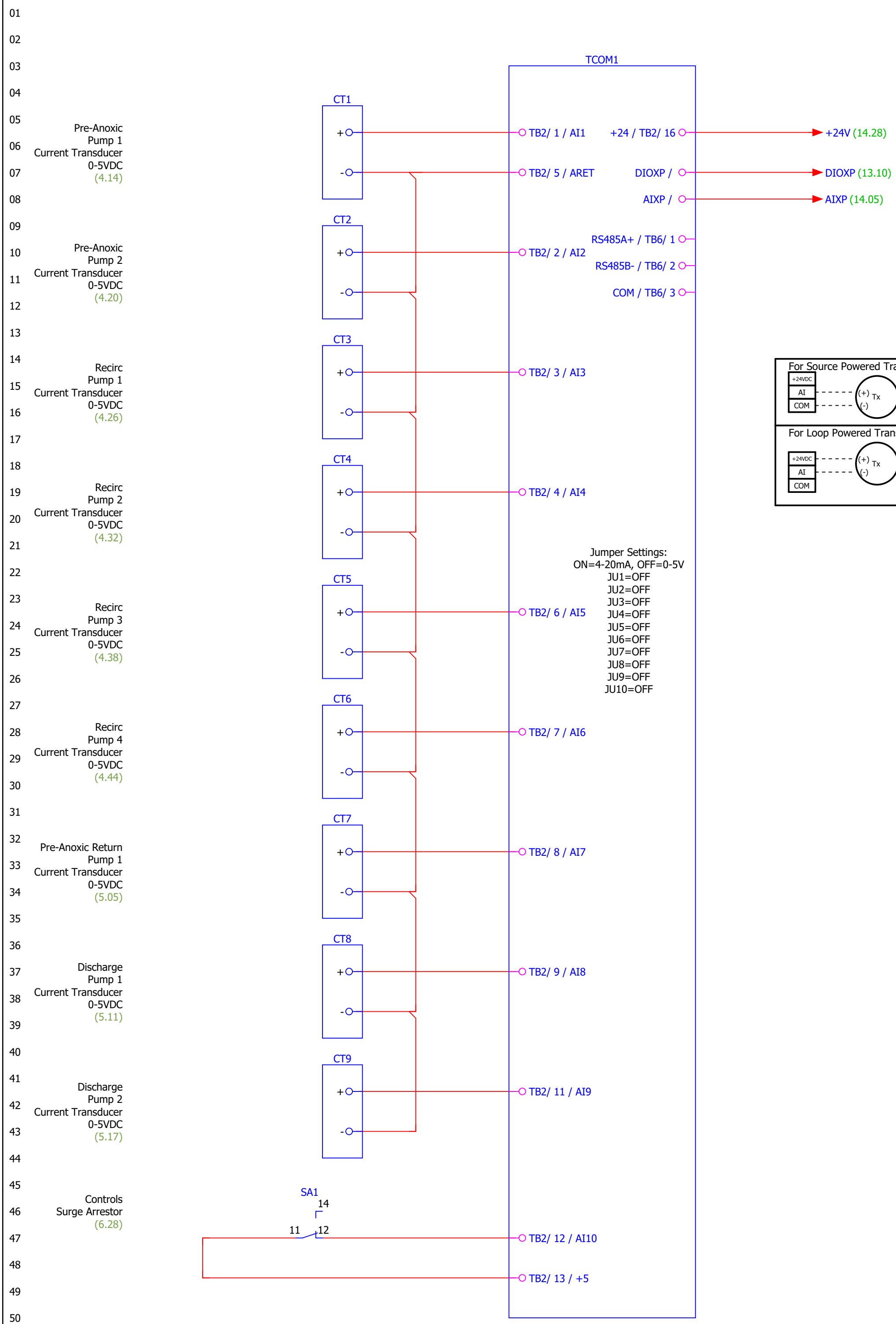
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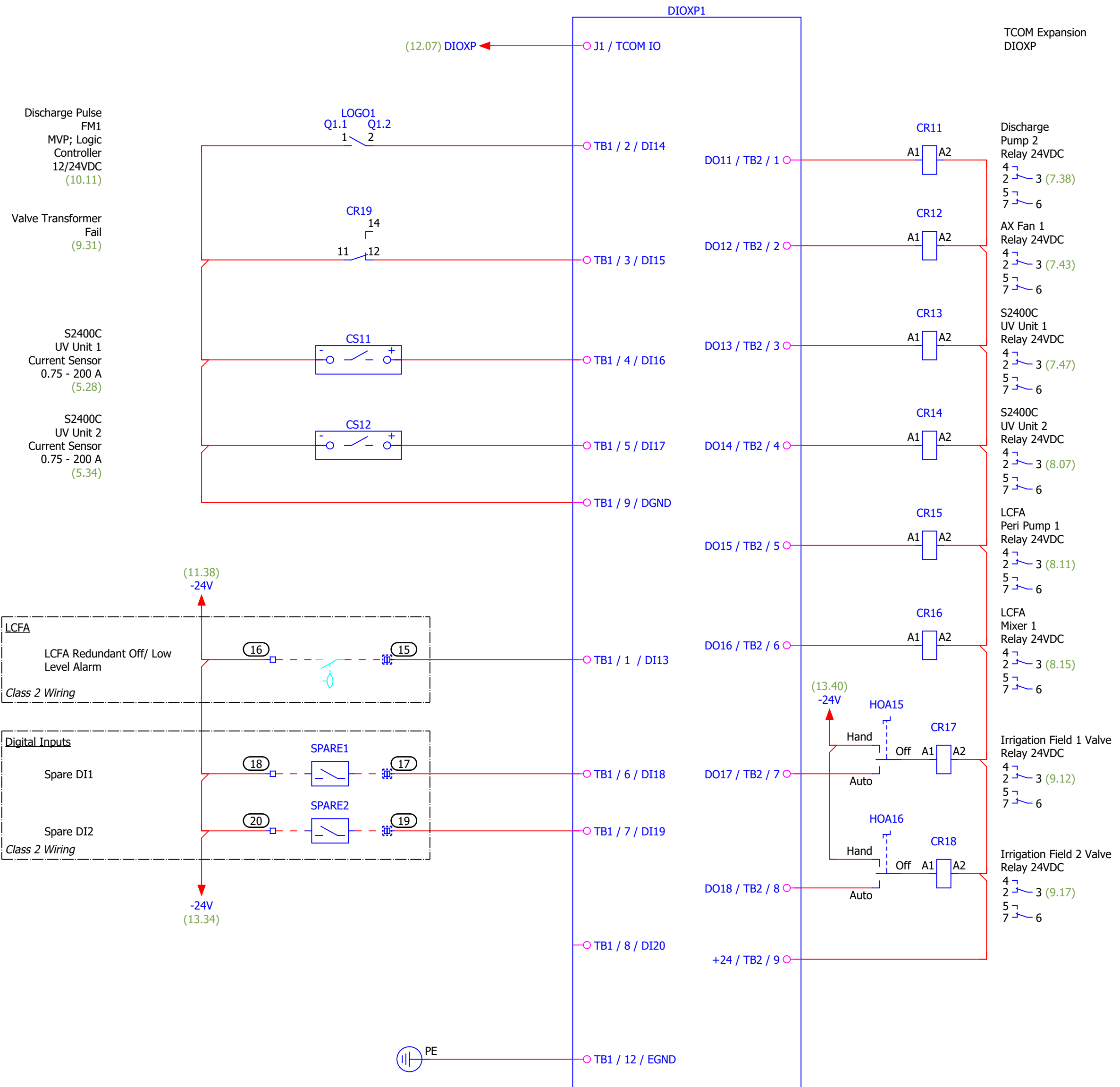
Order Number: 563133  
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Jumper Settings:  
 ON=4-20mA, OFF=0-5V  
 JU1=OFF  
 JU2=OFF  
 JU3=OFF  
 JU4=OFF  
 JU5=OFF  
 JU6=OFF  
 JU7=OFF  
 JU8=OFF  
 JU9=OFF  
 JU10=OFF

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Order Number: 563133  
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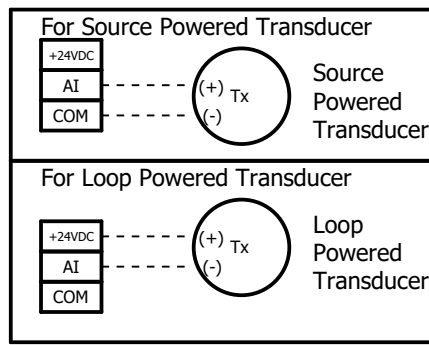
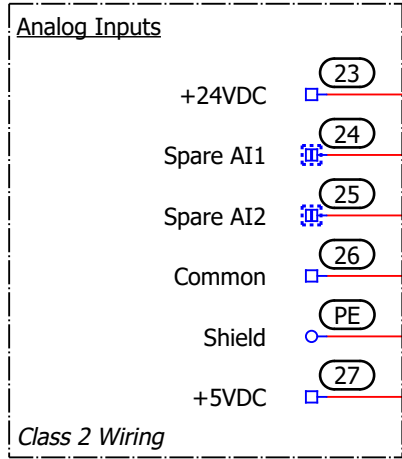
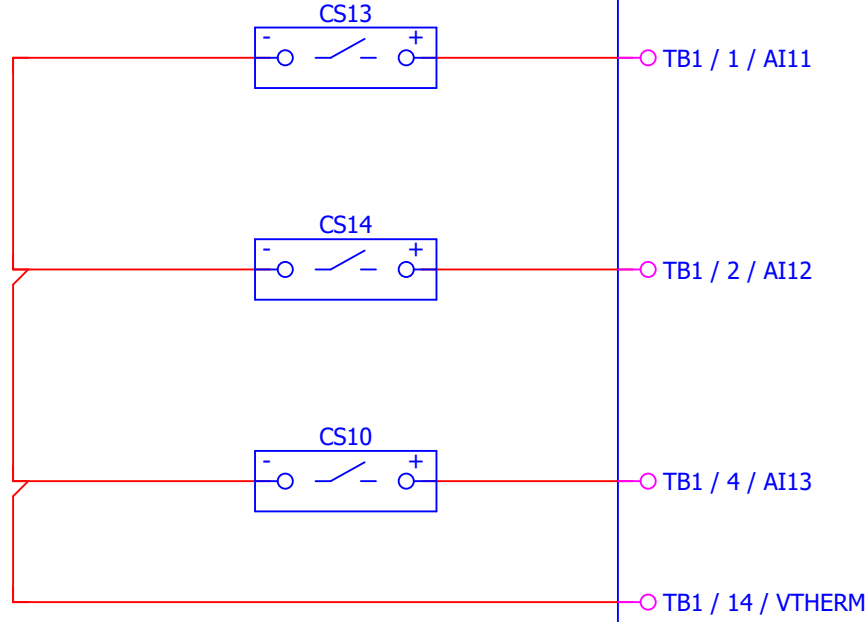
Tcom Expansion  
AIXP

(12.08) AIXP ← J1 / TCOM IO

LCFA  
Peri Pump 1  
Current Sensor  
0.75 - 200 A  
(5.40)

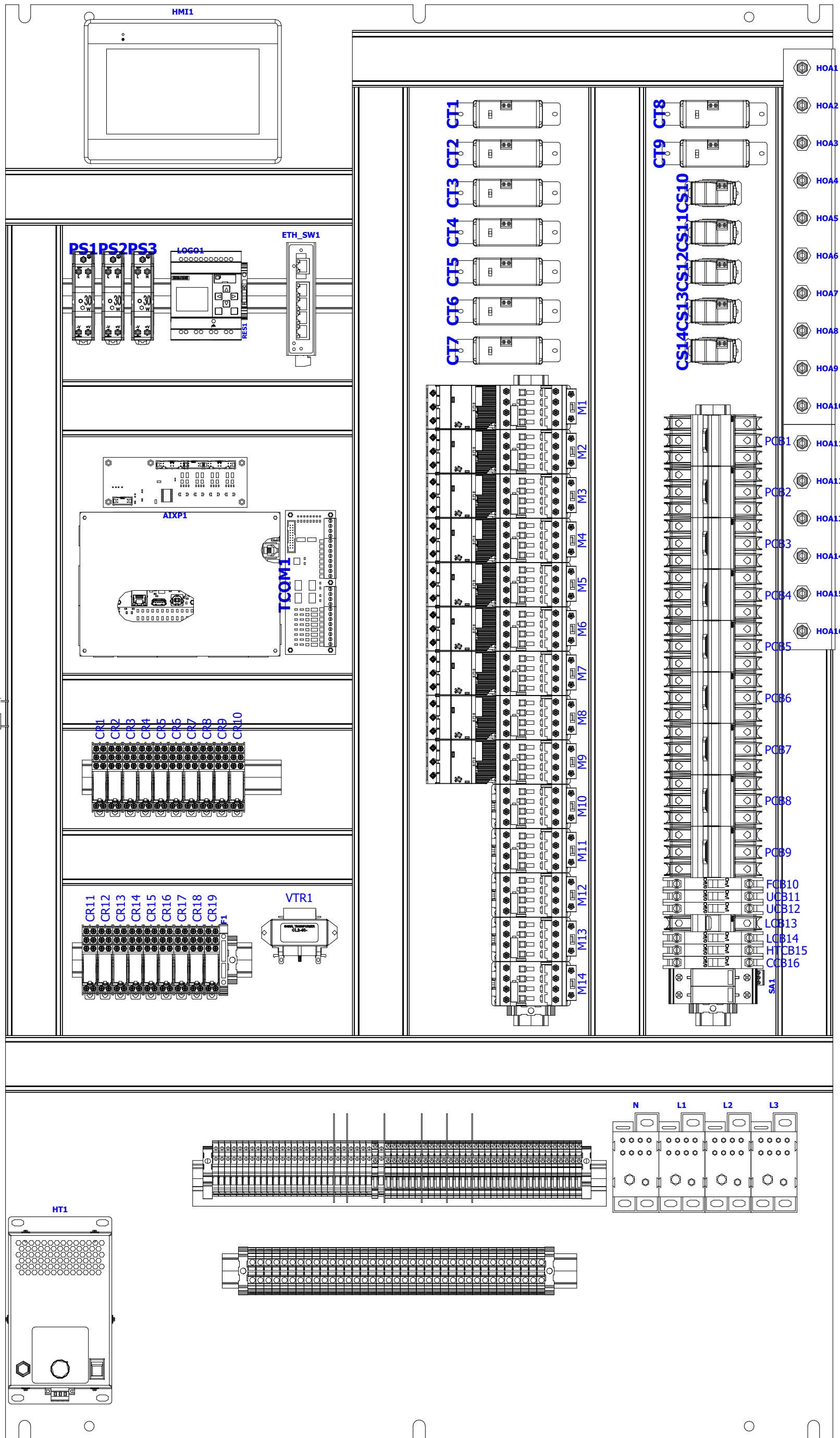
LCFA  
Mixer 1  
Current Sensor  
0.75 - 200 A  
(5.45)

AX Fan 1  
Current Sensor  
0.75 - 200 A  
(5.22)



Jumper Settings:  
ON=4-20mA, OFF=0-5V  
JU1=OFF  
JU2=OFF  
JU3=OFF  
JU4=OFF  
JU5=OFF  
JU6=OFF  
JU7=OFF  
JU8=OFF

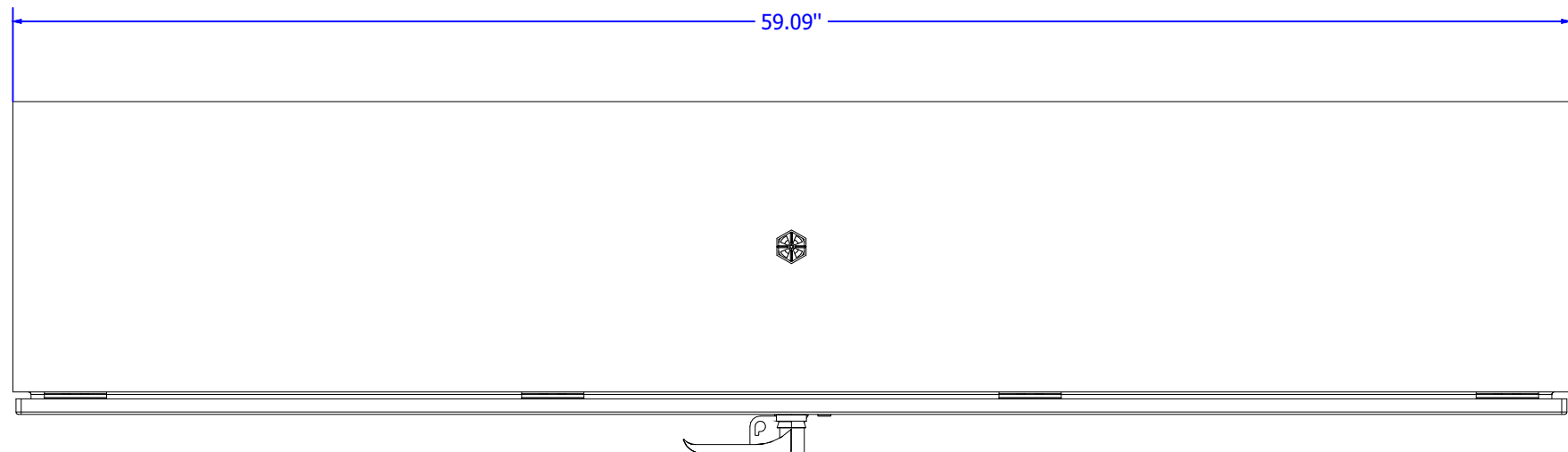
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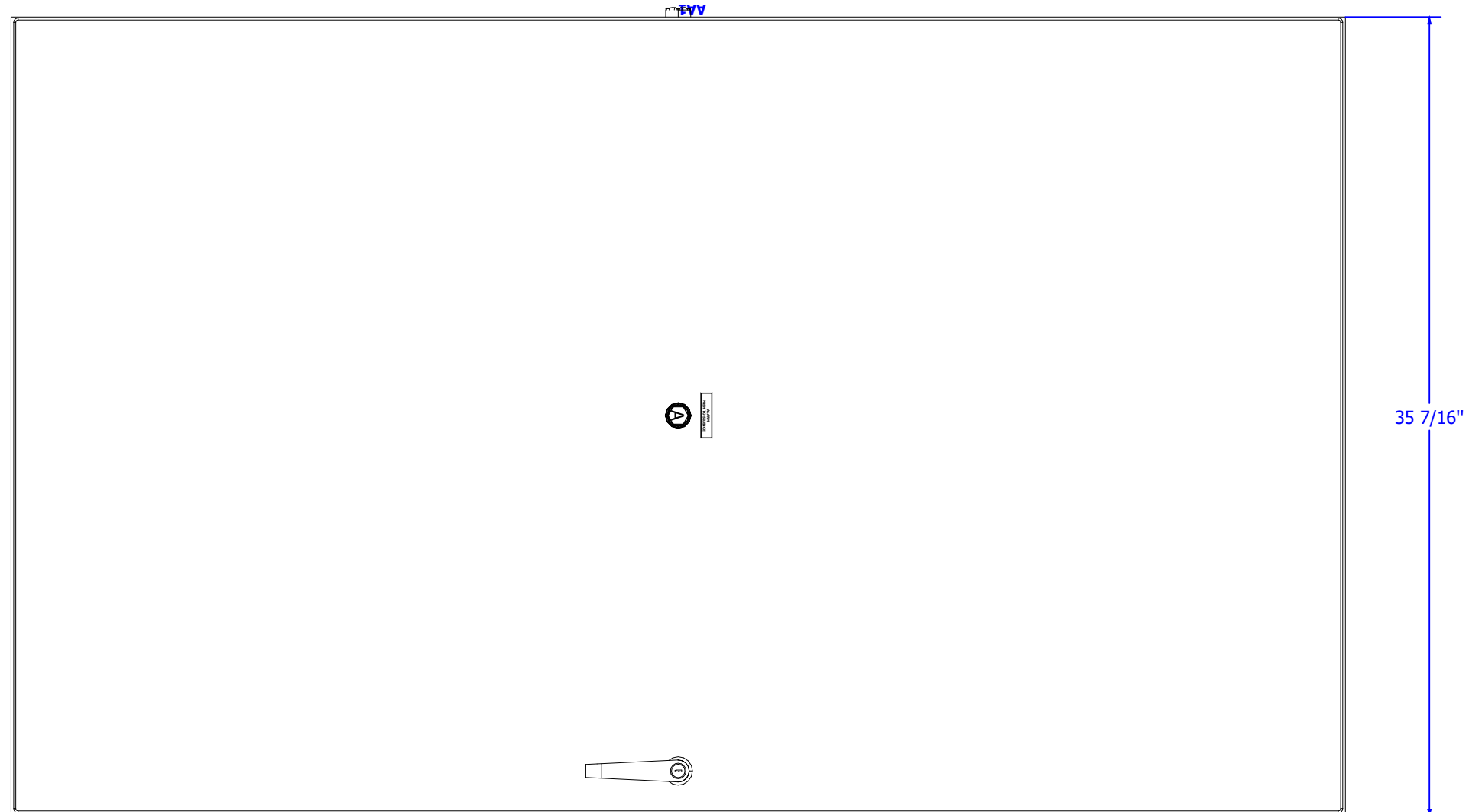
### Backplate View

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Panel Left Side



Panel Front



Panel Right Side

















# Summarized Parts List

ERP	Device Tag(s)	Manufacturer	Order number	Description		Quantity	Type
13-16-11-1474	LCB13	ABB	2CDS271317R0317	Circuit Breaker; 3A, 1P, 480Y/277V-UL approved	 	1	SU201M-K3
13-16-11-1416	PCB1...PCB9	ABB	2CDS273337R0457	Circuit Breaker; 15A, 3P, 480/277V	 	9	S203M-K15
13-16-16-1364	M1...M14	ABB	1SBL137001R1310	Contactor; 9A, 3P, 100-250V, 50/60Hz	 	14	AF09-30-10-13
13-16-46-1296	OLR1...OLR7	ABB	1SAX121001R1103	Overload Relay; Electronic, Setting Range: 0.8 - 2.7 A	 	7	EF19-2.7
13-16-46-1302	OLR8;OLR9	ABB	1SAX121001R1104	Overload Relay; Electronic, Setting range; 1.9-6.3A	 	2	EF19-6.3
13-16-41-1324	AIXP1	ASSMANN	H3CCH-1006G-ND	Cable; Ribbon, 10 Position, 6", double endedm gray	 	1	H3CCH-1006G-ND
13-16-86-1033	PE1	Cutler-Hammer	GBK10	Ground Bar; 10 circuit ground bar kit	 	6	GBK10
13-16-11-1014	CCB16;FCB10;HTCB15;UCB11;UCB12	Cutler-Hammer	QCR1010x150	Circuit Breaker; 10A, 1P, 120/240V	 	5	QCR1010x150
13-16-11-1009	LCB14	Cutler-Hammer	QCR1015	Circuit Breaker; 15A, 1P, 120/240V	 	1	QCR1015
13-16-99-1012		Custom Connector Corp	C-107-PM	DIN Rail; 1 meter, pre-punched, aluminum	 	6	C-107-PM
13-16-71-1467	X1	Citel	DTB-48	Terminal Block; Surge voltage protection, 30A, 48V, Black	 	17	DTB-48
13-16-71-1448	X1	Citel	DTB	Terminal Block; Blank, 60V, Black	 	10	DTB
13-16-41-1328	DIOXP1	DigiKey	H3CCH-2018G	Cable; Ribbon, 20 Pin, 18", F/F	 	1	H3CCH-2018G
13-16-43-1060	AIXP1	Dorigo	ATRTU- AIXP Rev A1	Telemetry; Expansion Board, 8AI, TCOM	 	1	ATRTU- AIXP Rev A1
13-16-43-1012	DIOXP1	Dorigo	ATRTU DIOXP- Rev B1	Telemetry; Expansion Board, 8DI & 8DO, TCOM	 	1	ATRTU DIOXP- Rev B1
13-16-43-1042	TCOM1	Dorigo	ATRTU TCOM IO; Rev. E 1.1	Telemetry; ATRTU TCOM IO; Tev E1.1, 12DI, 10DO, 10AI, 2AO	 	1	ATRTU TCOM IO; R ev. E1.1
13-16-43-1030	TCOM1	Dorigo	ATRTU TCOM Processor Rev D1.2	Telemetry; ATRTU TCOM Processor Board, Rev D1.2, ROHS, TKY	 	1	ATRTU TCOM Processor Rev D1.2
13-16-99-1016		Entrelec	1SNA150057R0000	High Din Rail; 30 deg., Slotted, Aluminum, 1 Meter	 	1	1SNA150057R0000
13-16-66-1034	HOA1...HOA16	Eaton	XTD2B1ABP	Switch; Toggle, 1PDT, On-Off-On, .250 Spade Terminals, 20A @ 125VAC	 	16	XTD2B1ABP
13-16-43-1130	TCOM1	Fascomp	FC4542-632-A	Telemetry; 1/4" OD Hex Standoffs (Male-Female)/6-32x1"/Aluminum, for TCOM/VCOM IO Boards	 	5	FC4542-632-A
13-16-56-1021	AA1	Floyd Bell Inc.	MW-09-301-Q	Alarm; 240V, 95db, Extra Fast Warble, Panel Mount	 	1	MW-09-301-Q
13-16-26-1071	F1	F.Shaw	GGM3	Fuse; 3A, 250V, 20mm	 	2	GGM3
13-16-71-1530	L1...L3;N	F.Shaw	FS PDB 3A	Distribution block; 310A, 600V, 2in/8out	 	4	FS PDB 3A

# Summarized Parts List

ERP	Device Tag(s)	Manufacturer	Order number	Description		Quantity	Type
13-16-36-1524	AL1	IDEC	HW1L-M2F10QD-A-240V	Pushbutton; Amber, Illuminated, 220V, Complete	 	1	HW1L-M2F10QD-A-240V
13-16-46-1283	CR1...CR19	IDEC	SJ2S-07LW	Socket; 8 Pin DIN/Pnl Mt, for RJ Relays	 	19	SJ2S-07LW
13-16-46-1063	CR1...CR18	IDEC	RJ2S-CL-D24	Relay; 24VDC, DPDT, 8A, Indicator	 	18	RJ2S-CL-D24
13-16-46-1067	CR19	IDEC	RJ2S-CL-A24	Relay; 24V, DPDT, 8A, Indicator	 	1	RJ2S-CL-A24
13-16-66-1047	ETH_SW1	IDEC	SX5E-HU055B	Switch; Industrial Ethernet, 5 Port, 10/100 Mbps, Din-Rail mount	 	1	SX5E-HU055B
13-16-41-1058	PS1...PS3	IDEC	PS5R-VC24	Power Supply; 24VDC, 1.3A, 30W	 	3	PS5R-VC24
13-16-39-1378	HMI1	Maple Systems	HMI5070LB	Touchscreen; 7", TFT, 24VDC	 	1	HMI5070LB
65-LBL-EGRV-BLAC K-2X1-2	AL1	Orenco System Inc.	65-LBL-EGRV-BLACK-2X 1-2	LABEL - 2" X 1/2" custom engraved	 	1	2x.5 engraved black
XX-XX-XX-7298	TCOM1	Orenco System Inc.	65-BRKT-PCB	Shroud; Touch Safe Cover for TCOM Boards	 	1	65-BRKT-PCB
65-BRKT-TGL-10		Orenco System Inc.	65-BRKT-TGL-10	Toggle Switch Bracket; 10-Hole, Aluminum	 	1	65-BRKT-TGL-10
65-BRKT-TGL-06		Orenco System Inc.	65-BRKT-TGL-06	Toggle bracket for 6 switches	 	1	65-BRKT-TGL-06
13-16-86-1022	GL2...GL4	Penn Union	PENLA20	Ground Lug; 14-2/0AWG, 5/8" Stud Size, 600V	 	3	PENLA20
11-16-86-1547		Panduit	F2X2LG6	Duct; 2" x 2" x 6'; light Gray	 	10	F2X2LG6
13-16-71-1055	F1	Phoenix Contact	3004100	Fuse Block; 1P, 240V, 20mm, 6A, UK5, 26-10AWG	 	1	UK 5-HESI
13-16-71-1473	GB1;GL1;X1	Phoenix Contact	3044128	Terminal Block; Ground for terminal width 6.2mm	 	4	UT 4-PE
13-16-71-1366	RES1	Phoenix Contact	3046142	Terminal block; 28/12 AWG, 20A, 1P, 500V, 6.2mm	 	1	UT 4-TG
13-16-71-1369	RES1	Phoenix Contact	3036796	Terminal Block; 6A, Gray, 5.2mm, Component Connector for 13-16-71-1366	 	1	P-CO
13-16-61-1039	SA1	Phoenix Contact	2910362	Surge Protection; Protective plug and base element, 240V, Type 1, Remote Contact, Two Channel	 	1	VAL-US-240/40/1+1-FM
13-16-71-1169	X1	Phoenix Contact	3072820	Partition Plate; D=62.5mm, W=1.0mm, h=66.5mm; Gray Color	 	7	TS-UK 6-T
13-16-71-1445	X1	Phoenix Contact	3044102	Terminal Block; 26/10AWG, 32A, 1P, 1000V, 6.22mm	 	32	UT 4
13-16-71-1450	X1	Phoenix Contact	3044131	Terminal Block; 24/8AWG, 41A, 1P, 1000V, 8.2mm	 	37	UT 6
13-16-71-1480	1...7	Phoenix Contact	0800886	Terminal Block; End Block, ENS 35N	 	7	E/NS 35 N
13-16-86-1607	ETH_SW1;HMI1	Quiktron	570-110-003	Cable; Patch Cord, Category 5, Blue, 3'	 	2	570-110-003

# Summarized Parts List

ERP	Device Tag(s)	Manufacturer	Order number	Description	Quantity	Type
13-16-86-1680	GL1;PE1	Raco	TA2-Bulk	Ground Lug; 2AWG, Burndy  	12	TA2-Bulk
XX-XX-XX-5613		Rittal	8017591	(WM603612NC) Enclosure; 60x36x12 Legacy Wall Mount, Carbon Steel, NEMA4, 12  	1	WM.8017591
13-16-81-1095	VTR1	Signal Transformer	CL2-40-24	Transformer; 40 VA, P/115/230V, S/24V 	1	CL2-40-24
HF4002B	HT1	Saginaw	HF4002B	Cabinet Heater 400W, 230V Heater W/ Thermostat  	1	HF4002B
13-16-39-1246	LOGO1	Siemens	6ED1052-1MD08-0BA1	Logic Device; LOGO8! 12/24V, 8DI(4AI)/4DO, Soft Comfort V8.3  	1	6ED1052-1MD08-0BA1
13-16-51-1076	CS10...CS14	Veris Industries	H800-HV	Current Sensor; Solid state, 0.75-200A, output type N.O, 0.5A @ 250VAC/DC  	5	H800-HV
13-16-51-1078	CT1...CT9	Veris Industries	H722LC	Current Sensor; 120V, 0-40A, 0-5VDC Output  	9	H722LC
13-16-99-1022	RES1	Yageo	5.6KQBK-ND	Resistor; 5.6k Ohm, 1/4W, 5%, Axial 	1	5.6KQBK-ND

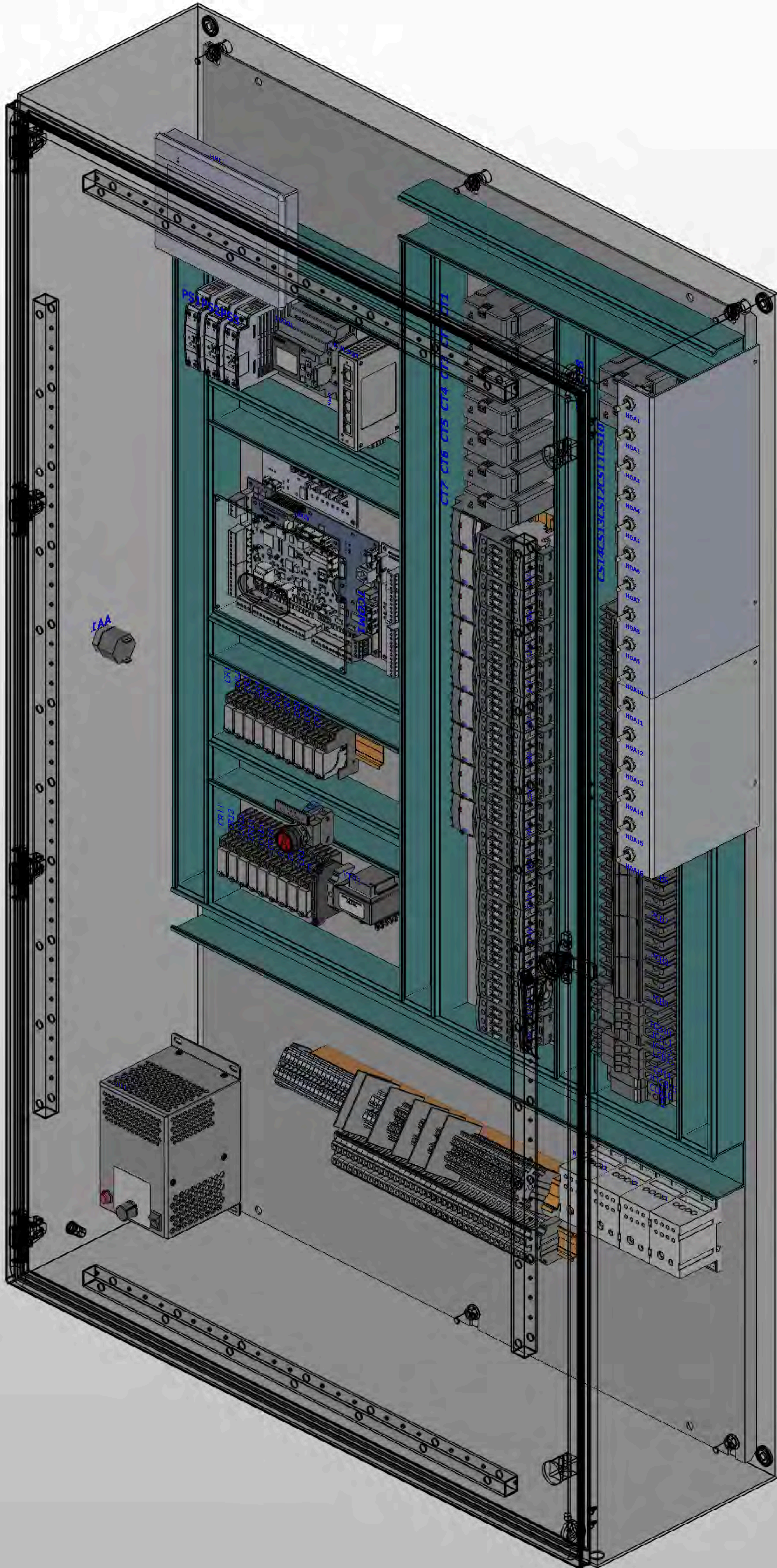
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# Field Terminations

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Internal Connection	ERP Number	Terminal Designation	Torque (lb-in)	Field Connection	Sheet Row	
	13-16-71-1467	Ø 1 · Ø	5-7	PA Redundant Off/ Low Level Alarm	11.19	
	13-16-71-1467	Ø 2 · Ø	5-7	PA Pump(s) Off	11.18	
	13-16-71-1467	Ø 3 · Ø	5-7	PA Lead Pump On	11.16	
	13-16-71-1467	Ø 4 · Ø	5-7	PA High Level Alarm/ Lag Pump On	11.15	
	13-16-71-1448	Ø 5 · Ø	5-7	Pre-Anoxic Common	11.15	
	13-16-71-1467	Ø 6 · Ø	5-7	RT Redundant Off/ Low Level Alarm	11.27	
	13-16-71-1467	Ø 7 · Ø	5-7	RT Override Timer On&Off	11.25	
	13-16-71-1467	Ø 8 · Ø	5-7	RT High Level Alarm/ Lag Pump Enable	11.24	
	13-16-71-1448	Ø 9 · Ø	5-7	Recirc Common	11.24	
	13-16-71-1467	Ø 10 · Ø	5-7	DT Redundant Off/ Low Level Alarm	11.36	
	13-16-71-1467	Ø 11 · Ø	5-7	DT Timer On&Off	11.34	
	13-16-71-1467	Ø 12 · Ø	5-7	DT Override Timer On&Off	11.33	
	13-16-71-1467	Ø 13 · Ø	5-7	DT High Level Alarm/ Lag Pump Enable	11.31	
	13-16-71-1448	Ø 14 · Ø	5-7	Discharge Tank Common	11.31	
	13-16-71-1467	Ø 15 · Ø	5-7	LCFA Redundant Off/ Low Level Alarm	13.32	
	13-16-71-1448	Ø 16 · Ø	5-7	LCFA Float Common	13.32	
	13-16-71-1467	Ø 17 · Ø	5-7	Spare DI1	13.36	
	13-16-71-1448	Ø 18 · Ø	5-7	Spare DI1 Common	13.36	
	13-16-71-1467	Ø 19 · Ø	5-7	Spare DI2	13.38	
	13-16-71-1448	Ø 20 · Ø	5-7	Spare DI2 Common	13.38	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1467	Ø 21 · Ø	5-7	Discharge Flow Meter Pulse +	10.17	
	13-16-71-1448	Ø 22 · Ø	5-7	Discharge Flow Meter Pulse -	10.17	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1448	Ø 23 · Ø	5-7	+24VDC	14.28	
	13-16-71-1467	Ø 24 · Ø	5-7	Spare AI1	14.29	
	13-16-71-1467	Ø 25 · Ø	5-7	Spare AI2	14.30	
	13-16-71-1448	Ø 26 · Ø	5-7	Common	14.31	
	13-16-71-1473	Ø PE · Ø	5-7	Shield	14.32	
	13-16-71-1448	Ø 27 · Ø	5-7	+5VDC	14.33	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1445	Ø 28 · Ø	4.4-5.3	Irrigation Field 1 Valve NC	9.12	
	13-16-71-1445	Ø 29 · Ø	4.4-5.3	Irrigation Field 1 Valve Common	9.13	
	13-16-71-1445	Ø 30 · Ø	4.4-5.3	Irrigation Field 1 Valve NO	9.13	
	13-16-71-1445	Ø 31 · Ø	4.4-5.3	Irrigation Field 2 Valve NC	9.17	
	13-16-71-1445	Ø 32 · Ø	4.4-5.3	Irrigation Field 2 Valve Common	9.17	
	13-16-71-1445	Ø 33 · Ø	4.4-5.3	Irrigation Field 2 Valve NO	9.18	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1445	Ø 34 · Ø	4.4-5.3	Remote Alarm Dry Contact 6A MAX	8.34	
	13-16-71-1445	Ø 35 · Ø	4.4-5.3	Remote Alarm Dry Contact 6A MAX	8.34	
	13-16-71-1445	Ø 36 · Ø	4.4-5.3	Remote Audible Alarm Dry Contact 6A MAX	8.43	
	13-16-71-1445	Ø 37 · Ø	4.4-5.3	Remote Audible Alarm Dry Contact 6A MAX	8.43	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1445	Ø 38 · Ø	4.4-5.3	Remote Alarm 120VAC Line	8.33	
	13-16-71-1445	Ø 39 · Ø	4.4-5.3	Remote Alarm Neutral	8.33	
	13-16-71-1445	Ø 40 · Ø	4.4-5.3	Remote Audible Alarm 120VAC Line	8.41	
	13-16-71-1445	Ø 41 · Ø	4.4-5.3	Remote Audible Alarm Neutral	8.41	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1445	Ø 42 · Ø	4.4-5.3	PA P1 Heat Sensor	7.06	
	13-16-71-1445	Ø 43 · Ø	4.4-5.3	PA P1 Heat Sensor	7.06	
	13-16-71-1445	Ø 44 · Ø	4.4-5.3	PA P2 Heat Sensor	7.10	
	13-16-71-1445	Ø 45 · Ø	4.4-5.3	PA P2 Heat Sensor	7.10	
	13-16-71-1445	Ø 46 · Ø	4.4-5.3	RT P1 Heat Sensor	7.14	
	13-16-71-1445	Ø 47 · Ø	4.4-5.3	RT P1 Heat Sensor	7.14	
	13-16-71-1445	Ø 48 · Ø	4.4-5.3	RT P2 Heat Sensor	7.18	
	13-16-71-1445	Ø 49 · Ø	4.4-5.3	RT P2 Heat Sensor	7.18	
	13-16-71-1445	Ø 50 · Ø	4.4-5.3	RT P3 Heat Sensor	7.22	
	13-16-71-1445	Ø 51 · Ø	4.4-5.3	RT P3 Heat Sensor	7.22	
	13-16-71-1445	Ø 52 · Ø	4.4-5.3	RT P4 Heat Sensor	7.26	
	13-16-71-1445	Ø 53 · Ø	4.4-5.3	RT P4 Heat Sensor	7.26	
	13-16-71-1445	Ø 54 · Ø	4.4-5.3	PAR P1 Heat Sensor	7.30	
	13-16-71-1445	Ø 55 · Ø	4.4-5.3	PAR P1 Heat Sensor	7.30	
	13-16-71-1445	Ø 56 · Ø	4.4-5.3	DT P1 Heat Sensor	7.34	
	13-16-71-1445	Ø 57 · Ø	4.4-5.3	DT P1 Heat Sensor	7.34	
	13-16-71-1445	Ø 58 · Ø	4.4-5.3	DT P2 Heat Sensor	7.38	
	13-16-71-1445	Ø 59 · Ø	4.4-5.3	DT P2 Heat Sensor	7.38	
	13-16-71-1169			<b>Partition Plate</b>		
	13-16-71-1450	Ø 60 · Ø	11-20	PA P1 Pump L1	4.14	
	13-16-71-1450	Ø 61 · Ø	11-20	PA P1 Pump L2	4.15	
	13-16-71-1450	Ø 62 · Ø	11-20	PA P1 Pump L3	4.16	
	13-16-71-1450	Ø 63 · Ø	11-20	PA P2 Pump L1	4.20	

# Field Terminations

<b>-X1</b>						<b>X1</b>
Internal Connection	ERP Number	Terminal Designation	Torque (lb-in)	Field Connection	Sheet. Row	
	13-16-71-1450	Ø 64 · Ø	11-20	PA P2 Pump L2	4.21	
	13-16-71-1450	Ø 65 · Ø	11-20	PA P2 Pump L3	4.22	
	13-16-71-1450	Ø 66 · Ø	11-20	RT P1 Pump L1	4.26	
	13-16-71-1450	Ø 67 · Ø	11-20	RT P1 Pump L2	4.27	
	13-16-71-1450	Ø 68 · Ø	11-20	RT P1 Pump L3	4.28	
	13-16-71-1450	Ø 69 · Ø	11-20	RT P2 Pump L1	4.32	
	13-16-71-1450	Ø 70 · Ø	11-20	RT P2 Pump L2	4.33	
	13-16-71-1450	Ø 71 · Ø	11-20	RT P2 Pump L3	4.34	
	13-16-71-1450	Ø 72 · Ø	11-20	RT P3 Pump L1	4.38	
	13-16-71-1450	Ø 73 · Ø	11-20	RT P3 Pump L2	4.39	
	13-16-71-1450	Ø 74 · Ø	11-20	RT P3 Pump L3	4.40	
	13-16-71-1450	Ø 75 · Ø	11-20	RT P4 Pump L1	4.44	
	13-16-71-1450	Ø 76 · Ø	11-20	RT P4 Pump L2	4.45	
	13-16-71-1450	Ø 77 · Ø	11-20	RT P4 Pump L3	4.46	
	13-16-71-1450	Ø 78 · Ø	11-20	PAR P1 Pump L1	5.05	
	13-16-71-1450	Ø 79 · Ø	11-20	PAR P1 Pump L2	5.06	
	13-16-71-1450	Ø 80 · Ø	11-20	PAR P1 Pump L3	5.07	
	13-16-71-1450	Ø 81 · Ø	11-20	DT P1 Pump L1	5.11	
	13-16-71-1450	Ø 82 · Ø	11-20	DT P1 Pump L2	5.12	
	13-16-71-1450	Ø 83 · Ø	11-20	DT P1 Pump L3	5.13	
	13-16-71-1450	Ø 84 · Ø	11-20	DT P2 Pump L1	5.17	
	13-16-71-1450	Ø 85 · Ø	11-20	DT P2 Pump L2	5.18	
	13-16-71-1450	Ø 86 · Ø	11-20	DT P2 Pump L3	5.19	
	13-16-71-1450	Ø 87 · Ø	11-20	Fan 1 L1	5.22	
	13-16-71-1450	Ø 88 · Ø	11-20	Fan 1 N	5.24	
	13-16-71-1450	Ø 89 · Ø	11-20	S2400C UV1 L1	5.28	
	13-16-71-1450	Ø 90 · Ø	11-20	S2400C UV1 N	5.30	
	13-16-71-1450	Ø 91 · Ø	11-20	S2400C UV2 L1	5.34	
	13-16-71-1450	Ø 92 · Ø	11-20	S2400C UV2 N	5.36	
	13-16-71-1450	Ø 93 · Ø	11-20	LCFA Peri Pump L1	5.40	
	13-16-71-1450	Ø 94 · Ø	11-20	LCFA Peri Pump N	5.42	
	13-16-71-1450	Ø 95 · Ø	11-20	LCFA Mixer L1	5.45	
	13-16-71-1450	Ø 96 · Ø	11-20	LCFA Mixer N	5.47	



## 22. Appendix 14 – T-Com Settings

DRAFT

## TCOM-DAX/DDAX/S/DAX380 3Ø TSD XF LCFA (2)UV (2)CV fm (AUS/NZ)

DCN: EIN-CP-SET-5898

Rev: 1.0

Date: 06/24/25

Orenco Custom TCOM Control Panels include a number of user adjustable parameters. Your custom TCOM Control Panel uses the ATRTU-TCOM Board; see document EIN-TCOM-SW-2 on how to access and change your user adjustable parameters.

This TCOM unit uses point numbers (Pt#) to identify the various program functions. The following point numbers are adjustable by the system operator:

### Page e: PreAnoxic Tank (PA1) Settings

Pt#65: PA1 High Level Delay	5.00 Seconds
Pt#66: PA1 Lag Enable	O/F
Pt#67: PA1 Minimum Run Time	30.00 Seconds
Pt#68: PA1 Pump High Amp Alarm	4.10 Amps
Pt#69: PA1 Pump Low Amp Alarm	0.50 Amps
Pt#70: PA1 Pump 1 Liters per Minute	113.56 LPM
Pt#71: PA1 Pump 2 Liters per Minute	113.56 LPM

### Page i: Recirc Tank 1 (RT1) Auto Timer Settings

Pt#129: RT1 UseTrend Data	O/F
Pt#130: RT1 Ret Recirc Ratio	4:1
Pt#131: RT1 Maximum Off Time	20.00 Minutes
Pt#132: RT1 Minimum Off Time	0.50 Minutes
Pt#133: RT1 Number of Days for Average	28.00 Days
Pt#134: RT1 Estimated Average Daily Flow	12,000.00 LPD
Pt#135: RT1 Estimated Peak Daily Flow	37,800.00 LPD

### Page j: RT1 Manual Timer/Pump Settings

Pt#145: RT1 High Level Delay	5.00 Seconds
Pt#146: RT1 Lag Enable	O/F
Pt#147: RT1 Manual Time Set	O/F
Pt#148: RT1 Off Time	13.80 Minutes
Pt#149: RT1 On Time	1.50 Minutes
Pt#150: RT1 Ovr Off Time	4.60 Minutes
Pt#151: RT1 Ovr On Time	1.50 Minutes
Pt#152: RT1 Pump High Amp Alarm	4.60 Amps
Pt#153: RT1 Pump Low Amp Alarm	0.60 Amps
Pt#154: RT1 Pump 1 Liters per Minute	189.27 LPM
Pt#155: RT1 Pump 2 Liters per Minute	189.27 LPM
Pt#156: RT1 Pump 3 Liters per Minute	189.27 LPM
Pt#157: RT1 Pump 4 Liters per Minute	189.27 LPM

**Page o: Pre-Anoxic Return (PRA) Settings**

Pt#225: PRA Manual Off Time	55.60 Minutes
Pt#226: PRA Manual On Time	4.40 Minute
Pt#227: PRA Use Flow % Timer	O/E
Pt#228: PRA Flow Multiplier	1.25
Pt#229: PRA Minimum Dose Flow	10.00 L
Pt#230: PRA Pump 1 Enable	O/F
Pt#231: PRA Pump High Amp Alarm	4.10 Amps
Pt#232: PRA Pump Low Amp Alarm	0.50 Amps
Pt#233: PRA Pump 1 Liters per Minute	113.56 LPM

**Page r: Dose Tank 1 (DT1) Settings**

Pt#273: DT1 High Level Delay	5.00 Seconds
Pt#274: RT1 Lag Enable	O/E
Pt#275: DT1 Off Time	30.00 Minutes
Pt#276: DT1 On Time	15.00 Minutes
Pt#277: DT1 Ovr Off Time	10.00 Minutes
Pt#278: DT1 Ovr On Time	15.00 Minutes
Pt#279: DT1 Pump High Amp Alarm	7.00 Amps
Pt#280: DT1 Pump Low Amp Alarm	1.00 Amps
Pt#281: DT1 Pump 1 Liters per Minute	283.90 LPM
Pt#282: DT1 Pump 2 Liters per Minute	283.90 LPM

**Page v: Liquid Chem Feed (LCA) Settings**

Pt#337: LCA Peri Pump Enable	O/F
Pt#338: LCA Mixer Enable	O/F
Pt#339: LCA Use Timer Mode ?	O/F
Pt#340: LCA Mixer Pre Run Time	3.00 Minutes
Pt#341: LCA Off Time	59.00 Minutes
Pt#342: LCA On Time	1.00 Minutes
Pt#343: LCA RO Delay	3.00 Days
Pt#344: LCA LLA Delay	10.00 Seconds

**Page A: Flowmeter (FM1) Setting**

Pt#356: FM1 Influent Liters per Pulse	10.00 LPP
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**Page B: High Flow Alarm Setting**

Pt#371: Maximum Flow Alarm	37800.00 L
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**Page F: UV (UV1&2) Status/Settings**

Pt#404: UV1 Unit 1 Disable	O/E
Pt#405: UV2 Unit 2 Disable	O/E

**Page F: Fan (XF1) Status/Settings**

Pt#434: XF1 Fan 1 Disable	O/E
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**Page H: Alarm Settings**

<b>Pt#465: Audible Alarm Activate Delay</b>	120.00 Minutes
<b>Pt#466: Audible Alarm ReActivate Delay</b>	720.00 Minutes
<b>Pt#467: Page Interval</b>	30.00 Minutes
<b>Pt#468: Current Alarm Delay</b>	20.00 Seconds

**USER LOG Summary**

- Log #17: PA1 Pump 1 Flow Daily**
- Log #18: PA1 Pump 2 Flow Daily**
- Log #19: PA1 Total Daily**
- Log #20: RT1 Pump 1 Flow Daily**
- Log #21: RT1 Pump 2 Flow Daily**
- Log #22: RT1 Pump 3 Flow Daily**
- Log #23: RT1 Pump 4 Flow Daily**
- Log #24: RT1 Total Daily**
- Log #25: PRA Pump 1 Flow Daily**
- Log #26: DT1 Pump 1 Flow Daily**
- Log #27: DT1 Pump 2 Flow Daily**
- Log #28: DT1 Total Daily**
- Log #29: FM1 Flow Daily**

**To access the User Logs: Go to 4) Expanded Reports Menu, then to 3) User Log Report**

For instructions on how to download various logs see pages 69-71 of document EIN-TCOM-SW-2.

## 23. Appendix 15 – Warranties

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# AdvanTex® Treatment Systems

Manufactured by Orenco® Water, a division of Orenco Systems®

## Limited Warranty For Commercial and Municipal Applications

### Commitment to Quality

Since 1981, Orenco Systems®, Incorporated (hereinafter referred to as "Orenco"), has been known as a company that researches, designs, manufactures, and sells high-quality products. We see ourselves as more than a "business." We see ourselves as a company that makes the planet a cleaner, healthier place, a company that is Protecting the World's Water™.

Any wastewater treatment system can be affected by improper design, installation, lack of maintenance, or system abuse. Although our products are carefully designed and constructed, it's still important to pay strict attention to system design and installation instructions and to follow through with intelligent usage and regular maintenance.

### Limited Warranty Coverage

Subject to the exclusions, limitations, and conditions contained herein, Orenco warrants to Purchaser and subsequent owners that all of its component products comprising an AdvanTex® Treatment System (consisting of all Orenco products between the inlet of the processing or recirculating tank and the outlet of the treatment unit, including the control panel, risers, and lids) will be free from defects in materials or workmanship that cause the product to lose structural integrity or to electrically or mechanically operate improperly for a period of three (3) years from the date of installation (the "Warranty Period").

If Orenco determines that a component it supplied as part of the AdvanTex Treatment System has failed within the Warranty Period because of a defect in materials or workmanship, Orenco will repair or replace, at its discretion, the failed component.

### Obtaining Warranty Service

To make a claim under this Limited Warranty, directly contact your Orenco Commercial and Municipal Wastewater Systems Dealer or Supplier ("Orenco's Representative"), who will process your claim. If for some reason Orenco's Representative is unavailable, or if you purchased your AdvanTex Treatment System directly from Orenco, contact Orenco by phone (800-348-9843 or +1-541-459-4449) to make your claim.

Any warranty claim must be received no later than the expiration of the Warranty Period listed above.

If requested by Orenco, potentially defective components must be returned to Orenco's Sutherlin, Oregon facility, if reasonably practicable, through Orenco's Representative (if applicable), transportation prepaid.



### Exclusive Remedy

The exclusive remedy for any claim under this Limited Warranty shall be the obligation of Orenco to repair or replace, at its discretion, any defective components. Labor is not covered under this Limited Warranty. Defects in materials or workmanship will be determined in good faith by Orenco upon receipt and inspection of a returned component. Components shall not be deemed to be defective if the failure, malfunction, or damage was caused by, or resulted from:

- (a) the AdvanTex Treatment System not being designed properly for the application in accordance with the most current version of the applicable AdvanTex Design Criteria in effect at the time of purchase; or not being constructed in accordance with said design;
- (b) abuse, misuse, accident, or negligence;
- (c) a lightning strike or other catastrophic event beyond the control of Orenco; or
- (d) improper or incorrectly performed installation, operation, maintenance, or repair of the AdvanTex Treatment System.

In the event Orenco determines that a returned component is defective in materials or workmanship and covered by this Limited Warranty, Orenco will credit or reimburse you for all reasonable transportation charges incurred in returning the component, and will be responsible for all transportation charges to return the repaired or replacement component to you. Such repaired or replacement component shall continue to be warranted under the Limited Warranty of the original purchase. In the event Orenco determines that a returned component is not defective in materials or workmanship, or is not covered by this Limited Warranty, Orenco may charge you a testing fee and all reasonable transportation charges required to return the component to you.

ORENCO SHALL NOT BE LIABLE FOR ANY LOSS, INJURY, OR DAMAGES TO PERSONS OR PROPERTY RESULTING FROM FAILURE OF, OR ANY DEFECT IN, THE ADVANTEX TREATMENT SYSTEM, OR FOR ANY TECHNICAL ASSISTANCE OR INFORMATION THAT ORENCO MAY HAVE PROVIDED TO THE OWNER. NOR SHALL ORENCO BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, PLANT DOWNTIME, FINES OR PENALTIES, OR LAWSUITS BY THIRD PARTIES AGAINST THE OWNER OR OPERATOR OF THE ADVANTEX TREATMENT SYSTEM. IN NO EVENT SHALL THE LIABILITY OF ORENCO UNDER THIS LIMITED WARRANTY EXCEED THE TOTAL INVOICED PRICE, EXCLUDING INSTALLATION AND/OR STARTUP COSTS, OF THE ADVANTEX TREATMENT SYSTEM.

### Disclaimer

EXCEPT AS SPECIFIED IN THIS LIMITED WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, ACCURACY OF INFORMATIONAL CONTENT, OR THOSE ARISING FROM A COURSE OF DEALINGS, LAW, USAGE, OR TRADE PRACTICE, ARE EXCLUDED TO THE EXTENT ALLOWED BY APPLICABLE LAW, AND ARE EXPRESSLY DISCLAIMED BY ORENCO. ANY IMPLIED WARRANTIES WHICH MAY EXIST UNDER LAW NOTWITHSTANDING THIS DISCLAIMER ARE LIMITED TO THE DURATION OF THE WARRANTY PERIOD.

### Exclusions and Limitations

This Limited Warranty shall be void if any of the following occur:

- (a) construction or installation of the AdvanTex Treatment System is not performed by an Authorized Commercial Installer in accordance with Orenco's installation instructions;
- (b) components not provided or approved by Orenco are used in the installation, maintenance, or repair of the AdvanTex Treatment System;
- (c) settings or functional parameters of the AdvanTex Treatment System are modified without authorization from Orenco, Orenco's Representative, or an Authorized Commercial Operator;
- (d) the AdvanTex Treatment System's startup is not overseen by Orenco or its designee; or
- (e) the AdvanTex Treatment System is not maintained continuously under contract with an Authorized Commercial Operator, or is not operated or maintained according to the Operation and Maintenance Manual provided by Orenco.

## Orenco® Controls

Manufactured by Orenco Controls, a division of Orenco Systems®

### Limited Warranty For Electrical Control Panels

#### Commitment to Quality

For over 30 years, Orenco Controls (a division of Orenco Systems, Incorporated – “Orenco”) has been known as a company that designs, manufactures, and sells high-quality standard and custom electrical control panels. We provide custom solutions for every application – from simple alarm panels with a single custom component to highly sophisticated panels that are totally customized with programmable logic, variable frequency drives, reduce voltage starters, or remote telemetry. Our assembly facility is equipped to build virtually any electrical control panel to your specifications, whether you need one unit or thousands.

#### Limited Warranty Coverage

Subject to the exclusions, limitations, and conditions contained herein, Orenco warrants to Purchaser and subsequent owners that all of its standard and custom electrical control panels, which are not covered by a separate written warranty, will be free from defects in materials or workmanship that cause the product to lose structural integrity or to electrically or mechanically operate improperly for a period of three (3) years after the panel has been delivered to the end-user (the “Warranty Period”), except that the Warranty Period shall be one (1) year from the date of the component’s manufacture for the following components:

- Variable frequency drive (VFD) components
- Reduced voltage soft start (RVSS) components
- Air conditioners
- Pressure transducers
- Ultrasonic transducers
- Controllers and logic devices not manufactured by Orenco

If Orenco determines that an electrical control panel has failed within the Warranty Period because of a defect in materials or workmanship, Orenco will repair or replace, at its discretion, the failed panel.

#### Exclusions

The following components in an electrical control panel are not covered by this Limited Warranty, though any warranties offered by the components’ manufacturer may still apply:

- (a) Customer-supplied components, or
- (b) Customer-specified components that have not been evaluated or approved by Orenco, or
- (c) Field-installed sensors, transducers, meters, or other devices



#### Obtaining Warranty Service

To make a claim under this Limited Warranty directly contact your Orenco Dealer, Supplier, or Distributor (“Orenco’s Representative”), who will process your claim. Please provide them with the control panel’s unique UL® Number, typically located on the inside of the enclosure door, to aid in processing the claim.

If for some reason Orenco’s Representative is unavailable, or if you purchased the product directly from Orenco, contact Orenco by phone (800-348-9843 or +1-541-459-4449) or by e-mail (electricalreturns@orenco.com) to make your claim.

Warranty claims must be made no later than the expiration of the Warranty Period listed above.

If requested by Orenco, potentially defective products must be returned to Orenco’s Sutherlin, Oregon facility, if reasonably practicable, through Orenco’s Representative (if applicable), transportation prepaid.

#### Exclusive Remedy

The exclusive remedy for any claim under this Limited Warranty shall be the obligation of Orenco to repair or replace, at its discretion, any defective products. Labor is not covered under this Limited Warranty. Defects in materials or workmanship will be determined in good faith by Orenco upon receipt and inspection of a returned product. Products shall not be deemed to be defective if the failure, malfunction, or damage was caused by, or resulted from:

- (a) the product not being installed, operated, maintained, or repaired in accordance with any applicable instructions provided;
- (b) abuse, misuse, accident, or negligence;
- (c) a lightning strike or other catastrophic event beyond the control of Orenco; or
- (d) modification of the product.

In the event Orenco determines that a returned product is defective in materials or workmanship and is covered by this Limited Warranty, Orenco will credit or reimburse you for all reasonable transportation charges incurred in returning the product, and will be responsible for all transportation charges to return the repaired or replacement product to you. Such repaired or replacement product shall continue to be warranted under the Limited Warranty of the original purchase. In the event Orenco determines that a returned product is not defective in materials or workmanship, or is not covered by this Limited Warranty, Orenco may charge you a testing fee and all reasonable transportation charges required to return the product to you.

**ORENCO SHALL NOT BE LIABLE FOR ANY LOSS, INJURY, OR DAMAGES TO PERSONS OR PROPERTY RESULTING FROM FAILURE OF, OR ANY DEFECT IN, THE PRODUCT, OR FOR ANY TECHNICAL ASSISTANCE OR INFORMATION THAT ORENCO MAY HAVE PROVIDED TO YOU. NOR SHALL ORENCO BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, PLANT DOWNTIME, FINES OR PENALTIES, OR LAWSUITS BY THIRD PARTIES. IN NO EVENT SHALL THE LIABILITY OF ORENCO UNDER THIS LIMITED WARRANTY EXCEED THE TOTAL INVOICED PRICE, EXCLUDING INSTALLATION AND/OR STARTUP COSTS, OF THE PRODUCT.**

#### Disclaimer

**EXCEPT AS SPECIFIED IN THIS LIMITED WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, ACCURACY OF INFORMATIONAL CONTENT, OR THOSE ARISING FROM A COURSE OF DEALINGS, LAW, USAGE, OR TRADE PRACTICE, ARE EXCLUDED TO THE EXTENT ALLOWED BY APPLICABLE LAW, AND ARE EXPRESSLY DISCLAIMED BY ORENCO. ANY IMPLIED WARRANTIES WHICH MAY EXIST UNDER LAW NOTWITHSTANDING THIS DISCLAIMER ARE LIMITED TO THE DURATION OF THE WARRANTY PERIOD.**

## 24. Appendix 16 – Orenco Disclosure Letter

DRAFT

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SYSTEMS

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## WASTEWATER TREATMENT SYSTEM OWNER DISCLOSURE

Congratulations on your purchase of a wastewater treatment system manufactured by Orenco Systems, Inc.

Since 1981, Orenco has been designing, patenting, and manufacturing award-winning wastewater products, which have been installed on countless properties around the world. We see ourselves as more than just a business, as we work to safeguard the public health and protect the world's water.

To do that effectively, we stay in contact with a significant number of our customers, especially those who have purchased larger commercial and municipal systems. With 30+ years of project tracking, we know what it takes to help ensure our systems perform their best, year in and year out.

Our wastewater treatment systems perform optimally when they are continuously operated and maintained in accordance with our instructions and manuals. Failing to do so can limit the system's effectiveness and may even cause damage to its components.

In order to maintain your Limited Warranty, we require that your treatment system be continuously operated and maintained by an appropriately licensed and trained operator who strictly follows our instructions. This will also give you confidence that your system will perform optimally and reliably, year after year.

Be sure to read the Limited Warranty when you receive your package of manuals and other system materials.

We're honored that you've selected Orenco for your wastewater treatment needs, and we'll work hard to maintain your confidence.

Sincerely,



Mike Saunders  
National Sales Manager, Municipal and Commercial Systems

**Prepared by:**

**Matt McKennariey**

**Director**

**ENVR Solutions Pty Ltd**

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