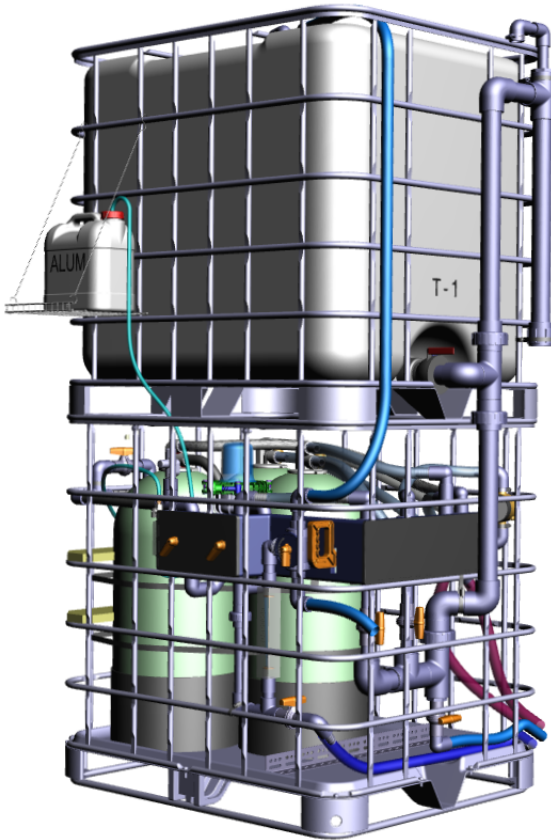


Living Water Treatment System

Assembly and Operation Manual



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water  mission

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Table of Contents

Important Safety Information	ii
1. General Information	1
1.1 Introduction	1
1.2 Intended Use	1
1.3 Safety Information	2
2. Living Water Treatment System Design	3
2.1 Valves and Components	4
2.2 Key Operational Parameters	5
3. Set Up	6
3.1 Enclosure Recommendations	6
3.1.1 Protection from Cold Weather	7
3.2 Unpacking	8
3.3 Assembly	10
3.4 Adding Chlorine Tablets	19
4. Operating Procedures	21
4.1 Start-Up	21
4.2 Alum Addition	22
4.3 Testing and Adjusting the Chlorine Concentration	25
4.4 Backwashing the Filters	26
4.5 Shutdown and Draining the Chlorinator	27
4.6 Draining the Living Water Treatment System	28
4.7 Replacing Chlorine Tablets	29
4.8 Maintaining and Resetting the Pressure Relief Valve	29
5. Troubleshooting	31
5.1 Fixing Leaks	31
5.2 Low Flow Rate	31
5.3 Varying Chlorine Concentrations	31
Appendix A	A-1
OxyChem ACL 90 Chlorine Tablets	
Appendix B	B-1
USALCO Ground Aluminum Sulfate	

Important Safety Information

This manual contains important safety, assembly, installation, and operating instructions for the Living Water Treatment System.

The following symbols are used throughout this manual to indicate potentially dangerous conditions or important instructions.



WARNING: Indicates a potentially dangerous condition. Use extreme caution when performing this task.



NOTE: Indicates a procedure or function that is important to the safe and proper operation of the system.

1. General Information

1.1 Introduction

This manual discusses the assembly and operation of Water Mission's Living Water Treatment System (LWTS).

The number one health risk associated with drinking water is infectious diseases caused by bacteria, viruses, and parasites found in the water. When operated properly, the LWTS will remove both solid particles and microbiological contaminants to provide safe drinking water.

1.2 Intended Use

The LWTS is designed to produce 10,000 gallons (38,000 liters) of safe water per day from fresh water sources such as rivers, lakes, or wells. The LWTS removes suspended solids with filtration, and then kills microbiological contaminants through chlorine disinfection.

The chlorinator on the LWTS uses five, three-inch chlorine tablets. There are several varieties available, all with their own chemical formulation. As long as the tablet is three inches in diameter, it can be used in the chlorinator. One example is calcium hypochlorite, which are quick dissolving tablets that can produce high chlorine concentrations. Slow-dissolving tablets, like trichlor, make the chlorine concentration easier to control. Water Mission uses ACL 90 trichlor tablets from Oxychem (see Appendix A for specifications). All operating parameters outlined in this manual are specific to the ACL 90 tablets. Procedures and results may vary if using a different chlorine tablet.



WARNING: Different chlorine varieties should never be used simultaneously. Combining two products could result in damage to the equipment or the operator. If it is necessary to switch to a new type of chlorine tablet, clean the chlorinator thoroughly beforehand.

1.3 Safety Information

The LWTS uses chlorine to disinfect the water as it exits the system. In low doses, chlorine is highly beneficial and can improve health; however, it can be dangerous in high concentrations.



WARNING: Direct contact with the chlorine tablets can be harmful and should be avoided. Always wear protective gloves when working with chlorine.



WARNING: Chlorine fumes can accumulate in the chlorinator and may be released when draining the chlorinator, removing the cover, or opening the chlorine tablet bucket. Always perform these actions in well-ventilated areas and avoid inhalation of chlorine fumes.



WARNING: Pressure may build up in the chlorinator. Always drain the chlorinator before removing the cover.

2. Living Water Treatment System Design

The LWTS is designed to provide safe drinking water through the steps shown in Figure 1. Raw water enters the system, is treated with alum in high turbidity applications, and passes through two consecutive media-based filters to remove large and small particles. The water is then chlorinated to kill any remaining bacteria, and delivered to the point of distribution.

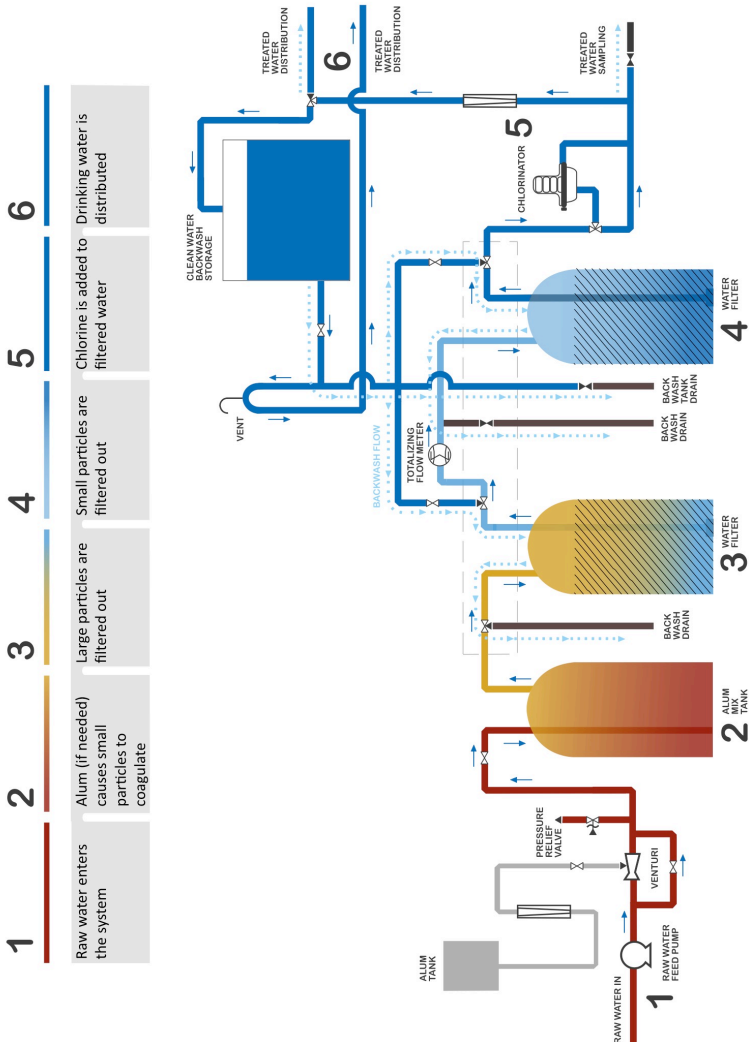


Figure 1 – Diagram of the LWTS

2.1 Valves and Components

To properly operate the LWTS, it is important to be familiar with its valves and components. Figure 2 shows these components, and Table 1 provides a brief description for each.

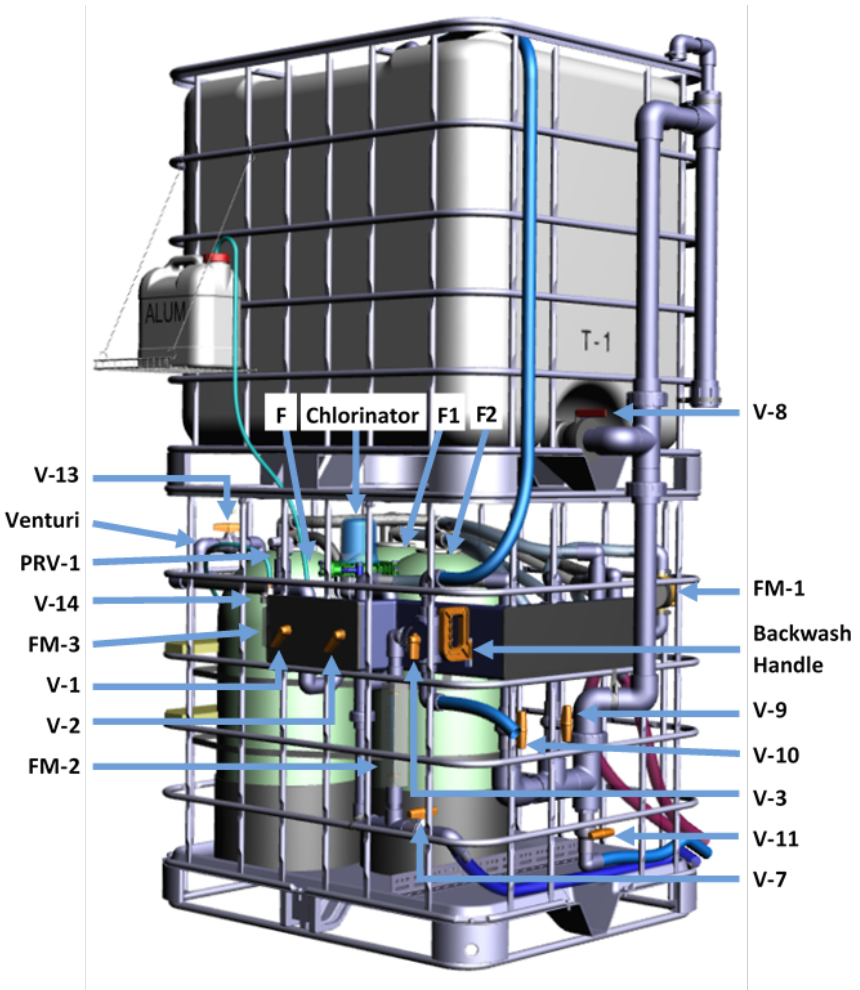


Figure 2 - Diagram of Valves and Components of the LWTS

Table 1 - Valves and Components of the LWTS

Symbol	Description
F	Alum Mix Tank
F1	Primary Filter Tank
F2	Small Contaminant Filter Tank
FM-1	SatWater Meter (totalizing flow meter)
FM-2	Treated Water Flow Meter
FM-3	Alum Flow Meter
V-1	Primary Flow Control Valve
V-2	Chlorine Concentration Control Valve
V-3	Treated Water Distribution Valve
V-7	Water Sampling/Chlorinator Drain Valve
V-8	Backwash Tank Outlet Valve
V-9	Backwash Flow Control Valve (F1 tank)
V-10	Backwash Flow Control Valve (F2 tank)
V-11	Backwash Manifold Drain Valve
V-13	Venturi Bypass Valve
V-14	Alum Flow Control Valve
PRV-1	Pressure Relief Valve

2.2 Key Operational Parameters

The key operational parameters for the LWTS are shown below, and the pressure drop across the LWTS at certain flow rates is shown in Table 2.

Operational Flow

- 3 GPM (0.7 m³/hr) to 10 GPM (2.6 m³/hr)
- Maximum flow should not exceed 15 GPM (3.4 m³/hr)

Operational Pressure

- Gravity flow (minimum head required): 20 ft (6.1 m)
- Pumped flow (maximum inlet): 70 PSI (4.9 bar)

Table 2 - Pressure Drop Across the LWTS

Flow Rate		Pressure Drop	
GPM	m ³ /hr	PSI	bar
6	1.3	10	0.7
10	4.6	25	1.7

3. Set Up

3.1 Enclosure Recommendations

The LWTS should be installed into the piping line between the water source and the storage tank **as close to the storage tank as possible** as shown in Figure 3. Installing the LWTS close to the storage tank will lower the operating pressure and increase the life expectancy of the components.

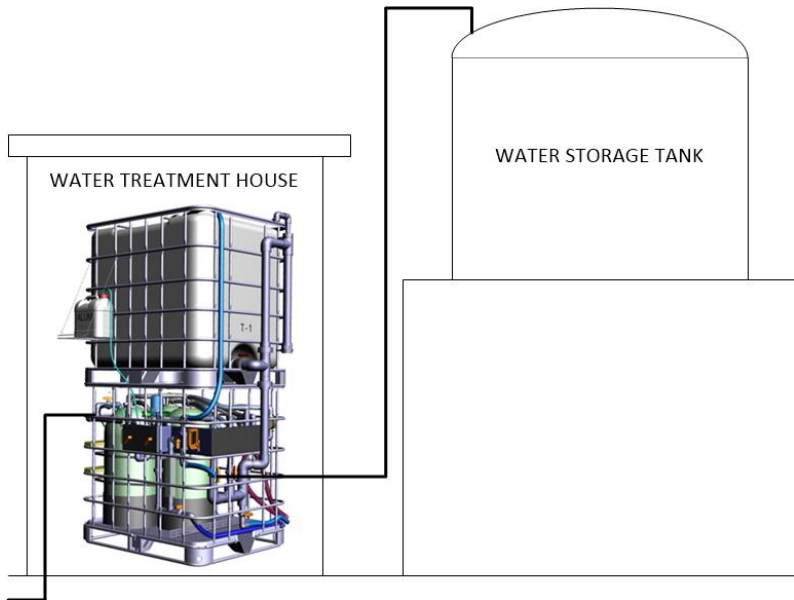


Figure 3 – Installation Diagram

To further increase the life expectancy of the LWTS, it should be installed in a location that is protected against sunlight, weather conditions, and human tampering. Therefore, a structure meeting the following guidelines is recommended to house the LWTS.

Foundation

- A concrete pad constructed with wire and/or rebar that supports the LWTS and provides a solid, dry surface to work.
- Minimum width: 8 ft (2.45 m)
- Minimum length: 10 ft (3.05 m)
- Minimum height: 6 in (0.15 m)

Enclosure

- Should have a door that locks to control access to the LWTS
- Minimum height: 8 ft (2.45 m)
- Minimum door width: 4.5 ft (1.37 m)

Roof

- Metal or thatched roof to shelter the LWTS from direct sunlight
- Minimum height: 11 ft (3.35 m)



NOTE: Ultraviolet rays from the sun will break down hoses and PVC piping; signs of deterioration will begin to appear within a few months. Therefore, it is essential to protect the LWTS and associated hoses/piping from prolonged exposure to direct sunlight.

3.1.1 Protection from Cold Weather

The tanks, filters, hoses, and piping of the LWTS will break if the water inside them freezes. Therefore, steps must be taken to protect the system in cold weather applications. The best protection would be some form of heating or insulation that prevents the water inside the tanks, filters, hoses, and piping from freezing. An alternative would be to drain all of the water from the tanks, filters, hoses, and piping before freezing conditions occur; however, this is very time-consuming and should only be done if the unit cannot be placed in a heated or insulated enclosure.

The distribution piping and hoses should also be protected, as they too will break if the water in them freezes. The best option is to bury pipes and hoses since this protects them from both freezing conditions and other forms of damage. Pipes and hoses must be buried below the frost line to protect against freezing. If burying the piping and hoses is not possible, they must either be insulated well enough to protect against freezing or drained before freezing conditions occur.

3.2 Unpacking

The LWTS will arrive as three metal-framed pallets, or “cages”, as shown in Figure 4.



Figure 4 – Packaged LWTS

Step 1: Unpack cage 2.

Remove the crescent wrench attached to the bottom of the plywood cover on cage 2. Remove the bolts that attach the two bars across the top of cage 2, and then take off the plywood cover as shown in Figure 5.



Figure 5 – Remove Plywood Cover from Cage 2

Remove all of the contents from cage 2. Cage 2 should contain the tool kit, two alum buckets, a suction hose, and a discharge hose. Depending on the project, cage 2 may also contain a generator, pump, bulk wire, engine oil kit, or gas can.

Step 2: Unpack cage 1.

Remove the bolts that attach the two bars on top of cage 1. Remove the plywood and bar assembly, and then cut the zip ties to detach the bars from the plywood as shown in Figure 6.



Figure 6 – Remove Plywood Cover and Detach Bars

Remove all of the loose contents from Cage 1. This includes all of the external parts for the LWTS, such as the backwash arm, backwash tank outlet, overflow extension, backwash tank feed hose, valve handles, alum kit, air relief valves, and required parts bags. All of these items will be used to assemble the LWTS in Section 3.3 *Assembly*.

Reattach the bars across the top of cage 1 and remove the protective sheet as shown in Figure 7.



NOTE: Reattaching the bars across the top of cage 1 is critical to supporting the weight of the backwash tank.



Figure 7 – Reattach Bars and Remove Protective Sheet

3.3 Assembly

Step 1: Install the air relief valves.

Remove the two air relief valves from the small shipping box that was packed in cage 1. Remove the masking tape from the F-1 and F-2 tank tops, and screw in the air relief valves as shown in Figure 8.

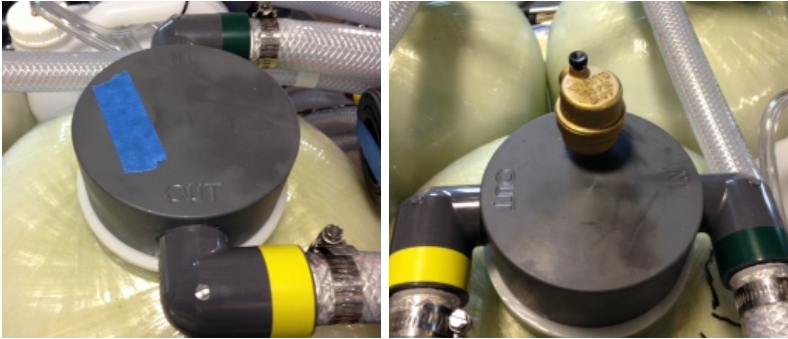


Figure 8 – Install the Air Relief Valves

Step 2: Install the valve handles.

Locate the three valve handles that were shipped inside the chlorinator. Attach the valve handles as shown in Figure 9.



Figure 9 – Attach the valve handles

Step 3: Remove the backwash tank cap.

Unscrew the cap on top of the backwash tank. Remove the plug and tape from the cap as shown in Figure 10.



Figure 10 – Remove the Backwash Tank Cap

Step 4: Attach the backwash tank inlet.

Remove the backwash tank inlet from the “Tank 1 Top Parts Bag”. Wrap the threaded end of the backwash tank inlet with Teflon tape, and then screw it onto the backwash tank cap as shown in Figure 11



Figure 11 – Attach the Backwash Tank Inlet

Step 5: Attach the backwash tank top vent.

Wrap the threaded end of the threaded pipe from the “Tank 1 Top Parts Bag” with Teflon tape. Screw it onto the backwash tank cap, and push the vent down onto the threaded pipe as shown in Figure 12.



Figure 12 – Attach the Backwash Tank Top Vent

Step 6: Reattach the backwash tank cap.

Screw the completed backwash tank cap back onto the top of the backwash tank as shown in Figure 13.



Figure 13 – Reattach the Backwash Tank Cap

Step 7: Attach the backwash tank feed hose.

Push the backwash tank feed hose (marked with gray tape) firmly onto the backwash tank inlet as shown in Figure 14. Place a hose clamp over the connection and tighten.



Figure 14 – Attach the Backwash Tank Feed Hose

Step 8: Position the backwash tank.

Carefully lift and place the backwash tank (cage 3) on top of cage 1 as shown in Figure 15. Secure the backwash tank in place by using two hose clamps to attach the cages together (place them on opposite side of the system).



NOTE: Be sure to rotate the cages so the backwash tank outlet (V-8) is on the same side as the backwash manifold (V-9, V-10, and V-11). This is required to complete Step 12.



Figure 15 – Position the Backwash Tank

Step 9: Connect the backwash tank feed hose.

Push the free end of the backwash tank feed hose firmly onto the venturi outlet of the LWTS as shown in Figure 16. Place a hose clamp over the connection and tighten.

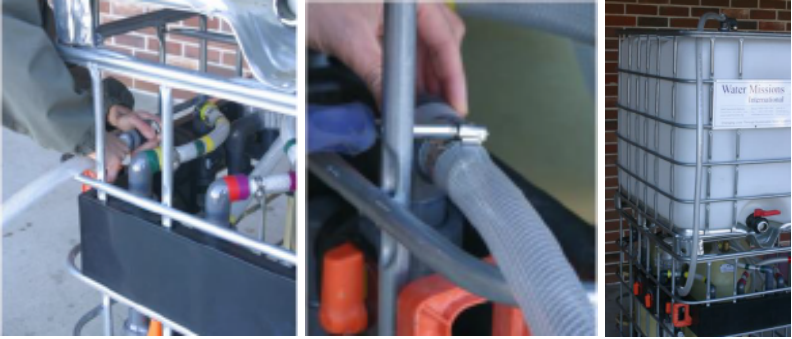


Figure 16 – Connect the Backwash Tank Feed Hose

Step 10: Attach the backwash tank outlet.

Remove the plug and foil seal from the backwash tank outlet, and wrap the threads with Teflon tape. Screw on the backwash tank outlet as shown in Figure 17. Make sure the backwash tank outlet assembly is positioned with the threaded union facing up and the collared union facing down. Also, make sure that the backwash tank outlet valve (V-8) is fully open.



Figure 17 – Attach the Backwash Tank Outlet

Step 11: Remove tape.

Remove the tape on the backwash tank outlet and the backwash arm assembly as shown in Figure 18.



NOTE: The purpose of the tape is to keep the O-rings in place during shipment. Make sure the O-rings remain in place on the ends of the assemblies when removing tape.



Figure 18 – Remove Tape

Step 12: Attach the backwash arm.

Hold the ends of the backwash arm flush with their connections on the LWTS as shown in Figure 19. Secure by sliding the union fittings on both ends over the joints and turning clockwise until tight.



Figure 19 – Attach the Backwash Arm

Step 13: Attach the overflow extension assembly.

Hold the overflow extension flush with its connection on the LWTS as shown in Figure 20. Slide the union fitting over the joint and turn clockwise until tight.



Figure 20 – Attach the Overflow Extension Assembly

Step 14: Connect the LWTS to system piping.

Attach the hose from the source pump to the inlet of the LWTS using a hose clamp as shown in Figure 21.

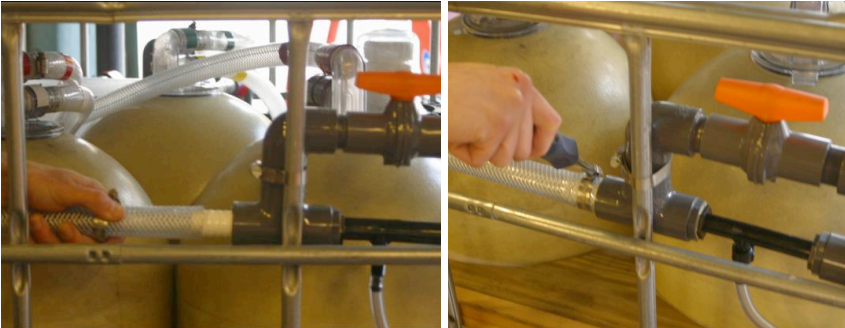


Figure 21 – Connect the Inlet Hose

For the distribution outlet, adapters are provided for 1", 1.5", and 2" hose (adapters shipped in the "Parts for Overflow Extension" bag). Choose the appropriate adapter based on the hose that will lead to the community storage tank or point of distribution. Wrap the threaded end of the adapter with Teflon tape, screw it into the distribution outlet, and use the provided channel-lock pliers to tighten as shown in Figure 22. Attach the distribution hose and use a hose clamp to secure it.

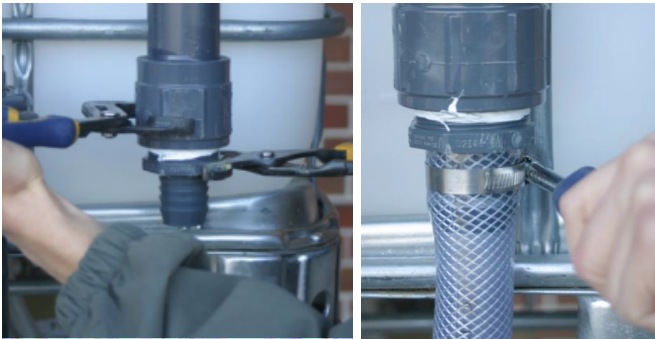


Figure 22 – Connect the Distribution Outlet Hose

Step 15: Add spacers and supports.

Insert one spacer between the 2" portion of the overflow extension and the bar on the backwash tank cage (cage 3). Place a 5" hose clamp around the cage bar, spacer, and overflow extension as shown in Figure 23. Tighten the hose clamp to secure. This acts as a support bracket.



Figure 23 – Insert Spacer on Upper Overflow Extension

Insert a second spacer to support the lower portion of the overflow extension as shown in Figure 24. Tighten a 5" hose clamp around the overflow extension, spacer, and cage bar to secure the support.



Figure 24 – Insert Spacer on Lower Overflow Extension

Attach and tighten one 5" hose clamp to support the backwash arm as shown in Figure 25.



Figure 25 – Insert Hose Clamp to Support Backwash Arm

3.4 Adding Chlorine Tablets

The chlorinator on the LWTS is designed to operate with three-inch diameter chlorine tablets, which must be added to the chlorinator before use.

Step 1: Remove the chlorinator cover.

Remove the ring clamp and cover by unscrewing the knob located on the ring clamp as shown in Figure 26.



WARNING: Removing the cover may release concentrated chlorine fumes and should be done in a well-ventilated area.

Make sure the chlorinator has been drained (Section 4.5) and that the chlorinator drain valve (V-7) is open to eliminate pressure.



Figure 26 – Remove the Chlorinator Cover

Step 2: Add chlorine tablets.

Insert up to five chlorine tablets as illustrated in Figure 27.



WARNING: Concentrated chlorine fumes may be released when opening the chlorine bucket and should not be inhaled.

Wear protective gloves to prevent contact with the tablets.



Figure 27 – Add Chlorine Tablets

Step 3: Replace the cover.

Replace the cover and ring clamp as shown in Figure 28. Make sure that the O-ring is clean and sitting properly in the groove before replacing the cover. Once the ring clamp is in place, hand-tighten the knob until the two ends are touching.



NOTE: Do not use tools to tighten the knob as it may break if over-tightened.



Figure 28 – Replace the Cover

4. Operating Procedures

4.1 Start-Up

After the LWTS has been properly assembled and installed, use the following steps to start producing safe drinking water.

Step 1: Position the valves.

Open V-13, V-8, and V-11 fully. Open V-1 and V-2 halfway. Close V-7. Make sure the backwash handle is pushed in and V-3 is pointing up.

Step 2: Turn on the pump.

Turn on the source pump to begin the flow of water through the LWTS.



NOTE: A hissing noise may be heard as air is removed through the air relief valves (V-16 and V-17 in Figure 29). If no noise is heard, the black vents may need to be loosened.

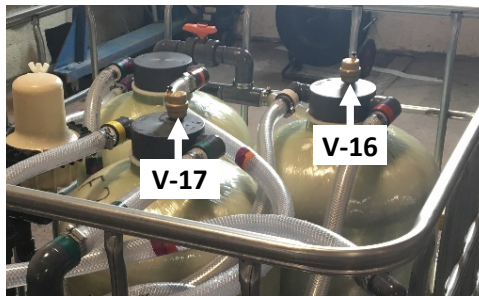


Figure 29 – Air Relief Valves

Step 3: Adjust the flow rate.

Open or close V-1 to reach the desired flow rate.



NOTE: Typical operation is 10 GPM.



Figure 30 – Adjust the Flow Rate

Step 4: Test the outlet turbidity.

Take a sample from the sampling valve (V-7) and determine the turbidity. If the turbidity is greater than 1 NTU, follow the steps in Section 4.2 *Alum Addition* to begin using alum to lower the turbidity.

Step 5: Set the chlorine concentration.

Follow the steps in Section 4.3 *Testing and Adjusting the Chlorine Concentration* to set the chlorine.



NOTE: Do not move on to Step 6 until the free chlorine concentration is within the recommended range; this is critical in the production of safe drinking water.

Step 6: Fill the backwash tank.

Once the chlorine concentration is set, close the backwash manifold drain valve (V-11) to fill the backwash tank with 250 gallons of properly treated water.



NOTE: Do not distribute water from the distribution port (V-3) until the backwash tank is full.

Step 7: Distribute water.

Water will begin to overflow through the backwash tank outlet when the tank's water level reaches 250 gallons. At this time, turn V-3 counter-clockwise until it points down to start flow to the distribution point. Make sure that distributed water has been in contact with chlorine for at least 30 minutes before consumption.

4.2 Alum Addition

Aluminum sulfate, or “alum”, is a flocculating agent that allows the LWTS to better filter turbid water. Water Mission uses a purified grade of aluminum sulfate from USALCO (see Appendix B for specifications). Alum addition is necessary if the outlet turbidity determined in Step 4 of Section 4.1 is greater than 1 NTU. If necessary, use the following steps to begin adding alum to the system.

Step 1: Mix the alum solution.

Fill the provided alum jug with treated water, and fill the alum bottle to the black line with aluminum sulfate powder. Pour the alum powder into the alum jug as shown in Figure 31. Screw the cap onto the alum jug and shake thoroughly until the alum powder is completely dissolved.



Figure 31 – Mix the Alum Solution

Step 2: Attach the alum jug stand.

Attach the alum jug stand to the side of the backwash tank using two 2” hose clamps as shown in Figure 32. Tighten the hose clamps to secure. Then attach the two support chains on the corners of the alum jug stand using the S-hooks.



NOTE: To prevent injury, be mindful to not locate the alum jug stand where it can be accidentally knocked into.

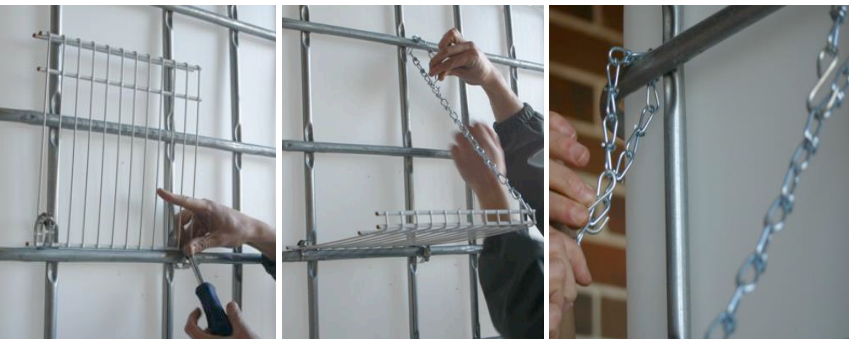


Figure 32 – Attach the Alum Jug Stand

Step 3: Connect the alum jug to the LWTS.

Place the alum jug on the alum jug stand on the side of the LWTS. Connect the tubing from the cap on the alum jug to the bottom of the alum flow meter as shown in Figure 33.

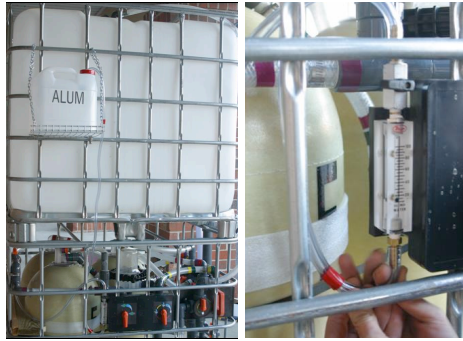


Figure 33 – Connect the Alum Jug to the LWTS

Step 4: Begin alum flow.

Open the alum flow control valve (V-14) completely (so the valve handle points down). Slowly close V-13 until the alum flow rate reaches 100 cc/min as shown in Figure 34.



NOTE: If no flow occurs after V-13 has been fully closed, the nut on the bottom of the venturi should be loosened.

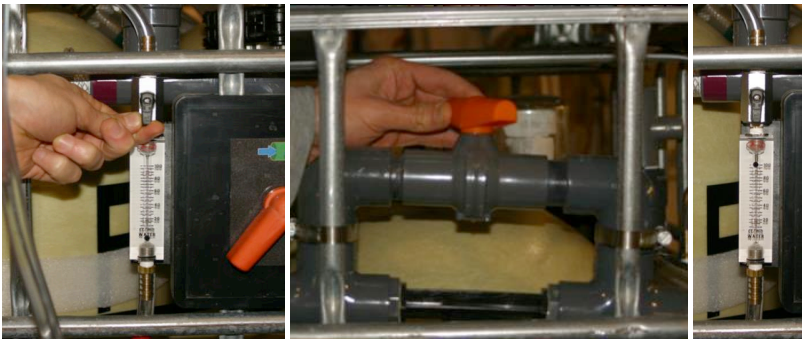


Figure 34 – Begin Alum Flow

Step 5: Adjust the alum flow rate.

Slowly close the alum flow meter valve until it reaches 30 cc/min as shown in Figure 35.



Figure 35 – Adjust the Alum Flow Rate

Step 6: Retest the outlet turbidity

Wait 15 minutes and then retest the turbidity at the sampling valve (V-7). If the turbidity is still greater than 1 NTU, increase the alum flow rate by 5 cc/min. Wait another fifteen minutes and retest again. Repeat until the turbidity out of V-7 is less than 1 NTU.

4.3 Testing and Adjusting the Chlorine Concentration

The chlorine concentration should be tested two minutes after start-up and multiple times throughout the day to ensure the water is safe for drinking. Water Mission recommends a free chlorine concentration of 0.2 to 0.5 mg/L **at the point of distribution**. Therefore, it is necessary to test the free chlorine at both the sampling valve (V-7) and the point of distribution. Depending on the distribution system, the free chlorine concentration may need to be higher than 0.5 mg/L at V-7 to achieve the recommended range at the point of distribution.



NOTE: If the containers used to collect water are not clean and cannot be washed, a higher free chlorine concentration of 1 mg/L at the point of distribution is recommended.

For detailed instructions on testing free chlorine concentrations, refer to the instructions included with the provided Hach Chlorine Test Kit.



NOTE: Make sure to use the “DPD Free Chlorine Reagent” when testing the free chlorine concentration.

If the free chlorine concentration is outside the recommended range, use valve V-2 to adjust the amount of chlorine. Be sure to make small adjustments at a time, and wait one minute to retest the free chlorine concentration after each adjustment.

To *increase* the chlorine concentration: Rotate V-2 counter-clockwise.

To *decrease* the chlorine concentration: Rotate V-2 clockwise.

4.4 Backwashing the Filters

After extended operation, contaminants will collect in the filters and cause the flow rate through the LWTS to decrease. Eventually, the filters will need to be cleaned by backwashing them with treated water from the backwash tank. At a minimum, Water Mission recommends backwashing the filters at the end of every operating day.

Step 1: Turn off the pump.

Turn off the source pump to stop the flow of water through the system.

Step 2: Position the valves and drain hoses.

Open valves V-9 and V-10, and close valve V-11. Direct both drain hoses (marked with brown tape) outside and away from the LWTS.



Figure 36 – Position the Valves and Drain Hoses

Step 3: Begin backwashing.

Pull the backwash handle out to begin the flow of water from the backwash tank, through the filters, and out of the drain hoses.



NOTE: If there is little or no flow from the drain hoses after one minute, the provided hand pump may be needed to start the backwashing process. To do this, attach the discharge end of the drain hose to the inlet of the hand pump. Pump the hand pump until water flow increases, and then remove the hand pump.



Figure 37 – Begin Backwashing

Step 4: Stop backwashing.

Not all of the water in the backwash tank will be needed to properly backwash the filters (50 to 200 gallons is typical). Once the water exiting the drain hoses appears clear, the backwash can be stopped by firmly pressing the backwash handle in to its starting position.



NOTE: If the backwash rates are too high, filter media may be washed out of the filters. If sandy material begins to discharge from the drain hoses, immediately slow the backwash rates by closing valve V-9 and/or valve V-10.

4.5 Shutdown and Draining the Chlorinator

When the LWTS is not in use, the chlorinator should be drained to prevent the accumulation of highly concentrated chlorine water and fumes within the chlorine tablet housing.

Step 1: Turn off the pump.

Turn off the source pump. Water will gradually stop flowing through the system.

Step 2: Backwash the filters.

Follow the steps in Section 4.4 *Backwashing the Filters*.

Step 3: Drain the chlorinator.

Direct the chlorinator drain hose outside and away from the LWTS or into a bucket. After water has stopped flowing through the system, turn V-2 counter-clockwise to the “Drain” position. Then open the chlorinator drain valve (V-7).



WARNING: This should be done in a well-ventilated area as this water contains high chlorine concentrations. Chlorine fumes may also be released, and should not be inhaled.



NOTE: Make sure that air is displacing all of the water in the chlorinator.



Figure 38 – Drain the Chlorinator

4.6 Draining the System

If the LWTS has not been operated for several days, the chlorine concentration of the water stored in the backwash tank will not be at an acceptable level. Therefore, the backwash tank should be drained completely before starting up the LWTS again for water treatment.

Step 1: Turn off the pump.

Turn off the source pump. Water will gradually stop flowing through the system.

Step 2: Position the valves and drain hoses.

Position the LWTS valves for a backwash (V-9 and V-10 open, V-11 closed). Direct both drain hoses (marked with brown tape) outside and away from the LWTS.

Step 3: Drain the backwash tank.

Pull the backwash handle out to begin draining water from the backwash tank.

Step 4: Drain the chlorinator.

Follow Step 3 in Section 4.5 *Shutdown and Draining the Chlorinator*.

Once both the chlorinator and the backwash tank have been completely drained, all valves can be returned to their start-up positions.

4.7 Replacing Chlorine Tablets

Chlorine tablets should be checked weekly or if the chlorine concentration drops unexpectedly. There should be at least half of a chlorine tablet in the chlorinator at all times to provide consistent chlorine concentrations. If less than half of a tablet remains, first shut down and drain the chlorinator according to Section 4.5. Then follow the steps in Section 3.3 *Adding Chlorine Tablets* to add more tablets.

4.8 Resetting the Pressure Relief Valve

PRV-1 will open to relieve excess pressure if the operating pressure exceeds 65 PSI. Each time this happens, PRV-1 will have to be reset according to the following steps.

Step 1: Immediately turn off the source pump if PRV-1 opens (water will spray from the side of PRV-1 as shown in Figure 39 until the pump is turned off).



Figure 39 – Open PRV-1

Step 2: Reset PRV-1 by pushing the rod back into normal operating position as shown in Figure 40 (a loud click will be heard).

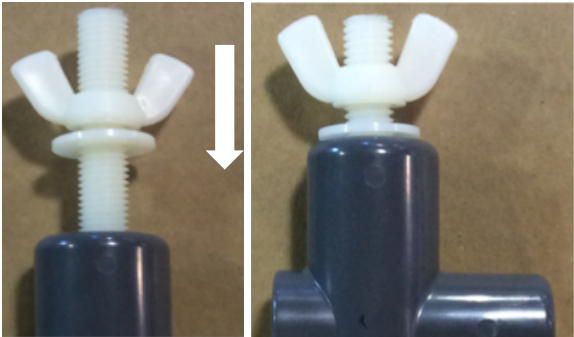


Figure 40 – Resetting PRV-1

5. Troubleshooting

5.1 Fixing Leaks

If there is a leak, shutdown and drain the system according to Section 4.6, and then fix the leak by taking the following measures.

Leak at a glued joint: If the leak is at a joint that has been glued, replace the leaking PVC fitting at the joint.

Leak at a union fitting: Tighten the union fitting by turning it clockwise. If the leak persists, unscrew the slip fitting and check that the O-ring is still in place.

Leak at the chlorinator: Tighten the ring clamp by turning the knob clockwise. If the leak persists, remove the ring clamp and make sure the O-ring is clean and seated properly. Coating the O-ring with petroleum jelly will also help protect against leaks.

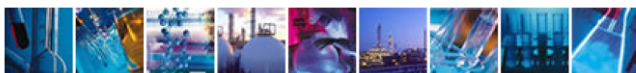
5.2 Low Flow Rate

If the flow rate leaving the LWTS is low, follow the steps in Section 4.4 *Backwashing the Filters*. If the flow rate does not improve, check for and remove any debris on the screen at the end of the suction hose.

5.3 Varying Chlorine Concentrations

If the flow rate through the system varies, it may lead to fluctuations in the chlorine concentration at the sample valve (V7). If this occurs, it is recommended to test the free chlorine concentration at the water storage tank or point of distribution instead. The water storage tank will equalize these variations and result in a more consistent chlorine concentration.

Appendix A. OxyChem ACL 90 Chlorine Tablets



OxyChem[®] A Division of Occidental Petroleum Corporation

Responsible Care
Good Chemistry at Work

ACL[®] 90 Disinfecting Tablets

Sales Specification

ACL 90 is an OxyChem trade name for trichloro-s-triazinetriene. This product is registered by the United States' Environmental Protection Agency as a disinfectant in drinking water and wastewater systems (EPA Registration No. 935-40).

<u>COMPONENT</u>	<u>SPECIFICATION</u>
<u>Three-Inch Tablets</u>	
Appearance	White 3 inch (7.62 cm.) diameter tablets with smooth surfaces and well defined beveled edges.
Available Chlorine, %	90 Minimum
Tablet Weight, grams	200 [±] 1
Packaging	110 lb. / 50 kg. plastic drums 55 lb. / 25 kg. plastic pails (Contact OxyChem for additional packaging options)

For further information, including the safety data sheet, visit:
<http://www.oxy.com/OurBusinesses/Chemicals/Products/Pages/ACL-and-Sodium-Chlorite.aspx>

Appendix B. USALCO Ground Aluminum Sulfate

USALCO® Ground Aluminum Sulfate Purified Grade

USALCO's dry aluminum sulfate (alum) is manufactured using a state of the art process and high quality raw materials ensuring that it meets the highest quality standards. USALCO produces dry alum in various grades (Low-Iron, Iron-Free, FCC Grade) as well as specialty granular sizes to satisfy even the most difficult applications. USALCO's dry alum is used in water treatment, colors and dyes, leather tanning, paper making as well as many other industrial applications. USALCO dry alum meets the specifications of the American Water Works Association Standard B403-18 and complies with the requirements of NSF/ANSI 60: Drinking Water Treatment Chemicals -Health Effects at a maximum dosage of 150 mg/L.

SPECIFICATIONS

% Al ₂ O ₃ :	17.0 -17.5
% Fe:	0.001 - 0.03
% Insoluble	< 0.5

Particle Size:

Through 4 Mesh	0%
Through 10 Mesh	≥ 90%

PRINCIPAL USES

Drinking water / wastewater treatment –
removal of suspended matter and phosphorus

SAFETY / HANDLING

Observe caution when handling corrosive materials. Please consult the safety data sheet (SDS) for safety and handling precautions.

DELIVERY

50 lb bags, FIBC (supersacks), and bulk (pneumatic trailer)

PRODUCTION

USALCO has production facilities in:

- Baltimore, Maryland

CUSTOMER SERVICE

If you have any questions concerning this material, please contact our Inside Sales Department at:

410-918-2230 or info@usalco.com

For further information, including the safety data sheet, visit:
<http://www.usalco.com/products/aluminum-sulfate-granular-solid>

