

QED Environmental Systems

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QED EZ-Tray™ Air Stripper System Operations and Maintenance Manual

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***EZ-TRAY™ AIR STRIPPER
OPERATION AND MAINTENANCE MANUAL***

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Thank you for relying on QED Treatment Systems to handle your treatment needs. After reading your Operation and Maintenance Manual, if you have any questions regarding the startup or operation of your system, please contact the **QED Service and Repair Department at 1-800-624-2026.**

PLEASE NOTE!

Read your QED Operation and Maintenance Manual First!

The manual will assist you in the proper procedure for equipment hookups, installation, startup, maintenance, and troubleshooting.

It is Important That a Qualified, Licensed Electrician Perform All Electrical/Wiring Installation Work.

Please see Equipment Set-Up in the Operating Instructions section of this manual.

Follow the Manufacturers Instructions

All the mechanical equipment that was supplied with your air stripper system should include the respective manufacturer's instruction manual for each piece of equipment. The documentation will either be found with the actual piece of equipment (if shipped loose) or found within a QED Operation and Maintenance manual that includes all relevant manufacturers' instruction sheets.

Follow Safe Work Practices

Be sure to follow all associated safety practices.

BASIC SYSTEM DESCRIPTION

EZ-Tray™ systems are fabricated from rugged stainless steel, or treated carbon steel. Each system is pre-assembled and factory tested before shipment to your site. EZ-Tray™ low profile air strippers are built to meet site and project specifications, which can include a number of standard or optional pieces of equipment. Depending upon the specifics of your order, the equipment described in this manual may or may not be included with your system configuration. Please refer to your sales order for the equipment that should be included with your system. Equipment information will be found either within this O&M manual or in separate documentation provided in addition to this manual.

Air Pressure Gauge (Standard)

The standard pressure gauge reads the differential pressure between the sump pressure and atmospheric pressure, in inches of water column. The gauge is connected to the system via tubing that is attached to a pressure port on the air stripper sump. The air hose connected to the sump leads to the "high" pressure port on the gauge. The "low" pressure port is left open to the atmosphere.

Demister (Standard)

A demister pad is installed beneath the air discharge stack located on the top cover of the unit. The purpose of the demisting pad is to remove entrained water droplets that would have blown through the discharge stack. It is possible, though unlikely, that the demisting pad may become plugged or fouled. If this occurs the demisting pad is easily removed. Disconnect the vent line, take off the demister cap, and remove the demister. The demisting pad can be cleaned with a pressure washer or replaced with a new one.

Gaskets (Standard)

Three gaskets are used in the EZ-Tray™ air stripper units. One gasket is installed in the air discharge stack flange, one gasket is used to form an airtight seal between the front hatch and aeration trays, and a felt gasket is located on the underside of each aeration tray. Through the course of regular maintenance, these gaskets will eventually wear and will not seal effectively. When the gaskets are ripped, worn, or do not seal properly, these gaskets should be replaced. Contact QED for replacement gaskets and adhesive. Please contact QED prior to making any gasket repairs or adjustments.

Sight Tube (Standard)

The sight tube provides a means of easily viewing the water level in the sump tank.

Blower

The blowers on the EZ-Tray™ low profile air stripper units are typically cast aluminum type B spark resistant, direct drive @ 3450 rpm, with motor options of TEFC or EXP. Each blower is selected to meet the proper air flow requirements (cfm) at the anticipated working pressures (inches of water column) of each system.

It is critical that the blower damper be opened wide enough to provide the unit with the designated minimum flow. If the damper is opened too wide, however, high airflow can cause water entrainment, with water droplets caught up in the airstream and sent out of the air stripper discharge stack.

It is also critical that water does not enter the blower housing while the blower is in operation; this will damage your blower and void the warranty. The high water level alarm switch prevents this from happening. Make sure it is installed correctly. If not installed by QED, it is recommended that the blower piping be of an inverted-U design, capable of collecting water within the blower piping and minimizing the potential for blower flooding. Please refer to Figure 3 for a typical blower piping configuration.

If water does accumulate in the blower, it must be removed from the blower housing before continuing operation. A small drain hole may be drilled and plugged on the bottom side of the blower housing to provide a means of discharging any water that may accumulate. Remove the plug temporarily to drain any water. Else, take off the front panel of the fan housing and remove the water.

When starting the unit for the first time, *check that the blower wheel is rotating in the direction of the arrow on the blower housing*. If you hear the blower wheel rubbing or any odd sounds shut down the system immediately and call QED.

Damper

The standard QED blowers normally have a damper on the discharge side of the blower. The damper is used to make adjustments to the air flow rate (cubic feet per minute) of your system. The air flow rate is increased (higher cfm's) by opening the damper, and decreased by closing the damper.

Use the damper to adjust the sump pressure to its proper operating value. By adjusting the sump pressure, the proper operating airflow through the air stripper will be achieved. Follow the instructions given in the earlier "Air Pressure Gauge" section to obtain the correct sump operating pressure. Using an air flow meter and an air pressure gauge together is desirable for confirming airflow and sump pressure, especially when attempting to troubleshoot any problems encountered with the air stripper operation. It is also recommended that you keep a log book of pressure readings so you can determine when and the frequency of system fouling.

Air Blower Silencer

The air blower silencer reduces the dynamic noise level of the blower. The size of the silencer and the type of connection used to mount it is dictated by the size of the blower and the choice of options. If a silencer is purchased through QED, they are typically shipped loose, for customer installation. The silencer can be mounted either horizontally or vertically (through the use of an elbow) but should be properly supported to avoid over-stressing the blower housing. Silencers exposed to high wind velocities should also be properly secured.

Air Flow Meter

The air flow meter measures the amount of air flowing through the system. If it is a pitot tube-type, two air tubes lead from the air piping to a meter/gauge. To operate effectively, the pitot tube must be located a minimum required distance upstream and downstream from elbows, valves, etc. Refer to manufacturer's installation instructions for proper installation procedures.

The air flow meter typically gives readings in feet per minute, which is then multiplied by the cross sectional area, square feet, of the vent line to give cubic feet per minute (CFM). As stated in the damper section, the air flow meter is needed to make damper adjustments, especially after initial start-up.

Control Panel

The control panel serves two basic functions required for the safe operation of the system. The first is to provide the required electrical safety components for each motor (blowers and pumps) per NEC standards. These components consist of fuses, motor starters, and overload relays.

The second function is to provide the required process safety alarm components. The alarm circuit monitors the low air pressure switch and the high water level alarm switch. If either of these alarms occur then the alarm contacts will shut off the incoming water source (feed or well pumps) if the appropriate connections have been made. A qualified, licensed electrician should perform any and all electrical connections.

Control Panel Intrinsically Safe Components

EZ-Tray™ low profile air stripper systems that process potentially explosive concentrations of vapors require intrinsically safe (IS) signals to all electrical components housed in non-explosion proof enclosures. The IS signal does not have enough energy to ignite the concentration of any NEC classified explosive vapor. Typical components that need IS signals are the float switches and well probes. Determination of when IS signals are required is generally the responsibility of the groundwater remediation engineer who has placed the order for a system. A qualified, licensed electrician should perform any and all electrical connections.

Water Flow Indicators and Totalizers

The digital water flow indicator, typically installed in the incoming process water line or shipped loose, reads the rate of flow (GPM) and the totalized flow (gallons). The flow meters are selected to exceed the maximum flow of your system while providing a wide working range. The digital face plate is battery operated and intrinsically safe. The mechanical components of the meter is the turbine styled rotor which spins around a shaft that is axial to the flow of water.

The standard nutating disc meters have a totalizing function only. They operate upon the positive-displacement principle, where the flow of water through the meter moves a disc which in turn rotates a magnet. Every magnet rotation corresponds to a fixed volume of fluid which is then added to the summed total of flow.

Feed and Discharge Pumps

Any transfer pumps included in the air stripper order have been selected by our engineering staff to meet all known flow and pressure requirements. The standard pumps are typically stainless steel centrifugal-type with motor options of EXP or TEFC. The standard pumps are not self-priming; they must be primed *before starting* by filling either the discharge port or the priming port with clean water until the entire pump chamber is full. The pipe/hose leading into the pump should also be full of water, too. Install throttle valves on the discharge lines for adjusting water flowrate. The valve should be throttled back until the motor draws the nameplate current rating. Warning: If the pump is running wide open and it is not pumping against the required head, the pump will cavitate and adversely affect pump performance and pump life.

Centrifugal transfer pumps used by QED typically must be throttled back if they are not pumping against the required head. Before initial system startup, double check the pump rotation. A pump shaft rotating in the wrong direction could spin off the pump impeller and cause serious damage to the pump. Pumps operating in the wrong

rotation will show poor performance. Systems using pumps should have the flow rates tuned so that the discharge is keeping up with the feed pump.

High Water Level Alarm Switch

The high water level alarm switch is one of the two alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start-up. Please see the Special Cautions at the beginning of the Operating Instructions section for more information. The purpose of the high water level alarm switch is to prevent water from flooding the blower by shutting off the incoming contaminated water once it has reached a designated level. The high water level switch will send an alarm signal when it is approximately 3½ inches above the coupling its cord emerges from.

Line Sampling Ports

The line sampling ports provide a quick and easy means to take a water sample of both incoming contaminated water and outgoing clean water. The sampling ports are the ball valves located on both of the inlet and outlet piping. When starting the unit for the first time double check that the valves on the sample ports are closed.

When taking a water sample, open the valve and let the water flow for at least 1 minute prior to taking the sample. This purges the sample port of any stagnant water. When purging the sample port on the contaminated water line, make the contaminated water is collected in some sort of storage container and then properly dispose of the water after sampling.

Low Air Pressure Alarm Switch

The low air pressure alarm switch is one of the two alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start up. Please see the Special Cautions at the beginning of Operating Instructions section for more information. The low air pressure alarm switch monitors the blower for continuous water treatment.

Should the blower fail, the low air pressure switch should be wired to shut off all incoming water. It, like the air pressure gauge, is connected to the system via an air hose which is attached to a pressure port on the sump tank. The air hose is connected to the "high" pressure port on the switch. The "low" pressure port is open to the atmosphere. Periodically inspect and remove any water which may have accumulated in the tubing. The presence of water can affect proper switch operation.

Test the switch, at initial start up, by removing the air hose from the pressure port on the sump tank once the system is in full operation. This should set the system into an alarm condition and shut off the incoming contaminated water.

Main Disconnect Switch

The main disconnect switch removes power from the EZ-Tray™ low profile air stripper. A disconnect is required by the National Electric Code (NEC) and must be installed. Some control panels, not supplied by QED, contain an internal disconnect or circuit breaker to remove power. Disconnects supplied by QED are external to the control panel, providing flexibility in situations where a site already contains a disconnect for the air stripped system. A qualified, licensed electrician should perform any and all electrical connections.

Intermittent Operation

Some systems are ordered with the intermittent operation option. EZ-Tray™ low profile air stripper systems can be designed to run intermittently when continuous blower

operation is a concern. When the feed water is flowing into the system, the blower will be in operation and the outlet pump (if provided) will maintain proper sump tank levels. When the feed water is shut down, the blower will run for an additional period of time to treat the water that had previously entered the air stripper before shutting down. When the feed water is restored, the blower will start up to treat the new incoming water. The benefits of intermittent operation are lower operating costs, better control of noise, and longer motor life.

Water Temperature Gauge

The temperature gauges can be installed on both the inlet and outlet piping. The water temperature represents an important factor when estimating the system's performance since it directly effects removal efficiency. Temperature gauges provided by QED typically have read outs of 0-140 degrees F.

Water Pressure Gauge

Water pressure gauges can be installed on both the inlet and outlet water lines. The gauges can be used to determine the water pressures entering and exiting the system. Excessively high readings could signal that something in your system is plugged. Large fluctuations in the pressure readings could be a sign that the water flow rate is varying.

EQUIPMENT SET UP

Special Cautions!

Use a Licensed, Qualified Electrician for Any and All Electrical/Wiring Work, and Always Use Proper Work Safety Practices!

Follow All Applicable Codes

The plumbing and electrical installations must be performed by qualified personnel. All installations must be done in accordance with local, state and national codes.

Install Adequate Supports on Piping and Ductwork

The external process piping that will connect into and from the QED equipment should be properly supported to minimize stresses and vibration from non-QED equipment. The QED equipment is not designed to support the process water and air lines without proper structural support.

Do Not Run Free Product, Oil or Grease Through the Air Stripper

Free product will contaminate the unit by coating the sidewalls with a film of free-product. Air strippers are not designed to treat free product, oil, grease, or any other type of immiscible phase.

Equipment Setup Steps Depending upon how the system was ordered, some of the following instructions may not apply.

Setup Step 1. Secure/Mount the Equipment

For shipping purposes, the EZ-Tray™ unit may come either already skid-mounted or the equipment shipped loose. If shipped loose, locate the equipment as required and firmly secure to the floor, base, etc.

Setup Step 2. Install the Blower Piping

If the blower is not already pre-piped on a QED skid, install the blower piping to connect the blower outlet to the air inlet nozzle on the air stripper sump. Refer to Figure 3 for an example of a blower piping configuration.

Setup Step 3. Level the EZ-Tray™ Unit

Level the EZ-Tray™ unit. This is a critical step in the proper assembly of the equipment. The aeration trays must be as close to level as possible.

Setup Step 4. Install Discharge Piping, either gravity-discharge or pump-discharge.

Install the Gravity Discharge Pipe (For Gravity Discharge Units Only)

Refer to the outlet piping drawing in Figure 4 to assemble the piping kit and vacuum breaker. Customers providing their own gravity discharge piping must ensure that proper water sump levels are maintained during operation.

It is essential that the piping be mounted vertically and that it be properly supported. Install outlet piping from the pump's discharge port. Use proper pipe sealant, PVC cement, and proper plumbing techniques as necessary.

Caution: The vertical height of the piping should not be changed from that provided in the kit unless air stripper conditions have changed dramatically from the originally-specified flows. The piping kit includes flexible couplings to allow easy vertical height adjustment, should it be necessary.

Install the Pump Discharge Pipe (For Pump Discharge Units Only)

For a unit with a discharge pump that has not come mounted to a QED skid, install the water line from the air stripper sump to the pump inlet. If customer has purchased a QED pump kit, the components will be found in a separate box. Install outlet piping from the pump's discharge port. Use proper pipe sealant, PVC cement, and proper plumbing techniques as necessary.

Prime the pump. Allow the inlet line and pump chamber to fill completely.

Setup Step 5. Install the Sump Drain Valve and the Sight Tube (if not already installed at the factory)

Setup Step 6. Connect the Water Lines

Connect the process water lines to the inlet and discharge piping. **Firmly support the process water lines to prevent excessive stress on the piping. The piping is not designed to support the weight of the customer's process water lines.**

Use proper pipe sealant, PVC cement, and proper plumbing techniques as necessary.

Setup Step 7. Connect the Tubing Between Pressure Gauges, Pressure Switch(es), and Air Stripper Sump

Connect the air line tubing from the hose barb located on the top of the sight tube to the high pressure ports on both the air pressure gauge and the air pressure switch(es). Keep the low pressure ports open to the atmosphere (remove plugs or caps).

Setup Step 8. Install Air Discharge Stack

Install any necessary extension to the air stripper air discharge stack as necessary. **Caution: Any added extension should have an inner diameter at least as large as the air stripper stack.** Connect the stack extension to the exhaust stack using a flexible rubber coupling or other suitable means. Support the extension independently of the air stripper so that it can be easily disconnected if the demister element must be removed for maintenance purposes.

Setup Step 9. Wire the Electrical Components

Have a qualified, licensed electrician wire up the electrical components in compliance with local, state, and national codes.

IMPORTANT! Make sure the safety interlocks are connected properly! To avoid damage to the blower and flooding of the equipment with contaminated feed water, install the high water level and low air pressure interlock switches. If the water level in the sump tank rises beyond the maximum level water could

flood the blower. This will destroy the blower and void the warranty. The high water level interlock switch will shut off the feed water pump in an emergency situation. The low air pressure interlock switch will shut off the feed water pump in the event of a blower failure. This reduces the risk of having untreated water passing through the air stripper.

If QED is supplying the control panel, refer to the appropriate wiring diagrams.

Setup Step 10. Install Optional Items

Refer to manufacturers' installation instructions for all equipment and properly support all equipment in an appropriate manner. This also applies to the optional air stripper blower silencer which requires support to avoid overstressing the air stripper blower housing.

START UP

Please refer to Figures 1 and 2 at the end of this manual for a general drawing of an E-Z Tray air stripper and its aeration tray. Upon completion of the equipment set-up procedure (above), mechanical and electrical installation (including float switches, air pressure switches, etc.), proceed as follows:

Startup Step 1. Turn Off Electrical Components Using the Site's Appropriate "Lock-Out" Procedure. Close Drain and Sample Valves.

Check that all electrical components associated with the unit are turned off, and all drain and sample valves are closed.

Startup Step 2. IMPORTANT! Fill the Inlet Chambers with Clean Water.

Each downcomer (see Figures 1 and 2) must be sealed by having its end immersed in the seal pot water of the tray below it. Remove the air stripper front hatch and fill the seal pots to their proper levels (to the height of the weir). Failure to do so may create a situation where not enough back pressure is provided upon blower startup, causing the blower motor overload to trip.

Startup Step 3. IMPORTANT! Fill the Sump Tank with One Foot of Clean Water.

On initial start-up, the sump tank must be filled with clean water to a height of about one foot. The sump tank can be filled by taking off the front hatch and filling the sump directly or by disconnecting the water inlet piping and using a hose applied through the water inlet connection. The water level should be seen in the sight tube.

Startup Step 4. Power May Now Be Supplied to the System.

Startup Step 5. IMPORTANT! Check the Blower Rotation (IMPORTANT for proper air stripper operation)

Check the blower rotation by momentarily turning the Hand-Off-Auto (HOA) Switch to the "Hand" position ("bumping" the motor). Verify that the fan turns in the direction of the arrow on the blower casing. If rotation is incorrect 1) have a licensed electrician correct the wiring per manufacturer's instructions, and 2) check and correct the rotation of the other motor(s) in the system.

(This is a common oversight and very often is the reason for inadequate blower operation. If the blower is not providing the expected airflow or backpressure, please double-check this step).

Startup Step 6. Connect a Clean Water Line to the Air Stripper Inlet. Trial-run Air Stripper System Using Clean Feed Water at the Expected Flowrate.

Start the QED Air Stripper System by closing the Blower Damper and Placing the Appropriate HOA Switches in the "Auto" Position. Carefully open the damper to achieve the desired tray pressure or air flowrate at the anticipated water flowrate for the system.

Startup Step 7. Monitor the Trial Run and Adjust the System Accordingly.

The following items should be monitored as water builds up on each tray:

1. Proper sump pressure. This may require 15-30 minutes for the water to reach the proper depth on each tray. Once the blower has reached its operational speed and water flow is steady, the blower can be throttled to adjust airflow to optimal conditions. QED wet-tests every EZ-Tray unit for proper sump pressures at the customer’s expected water flow rates for “clean tray” and “fouled tray” conditions. The wet-test values are normally printed on a label and affixed to the side of the air stripper. Adjustments should be made first by referring to these wet-test pressure values. If no values are given, refer to the table below. The values are estimates, and vary depending upon the influent water flowrates. The table assumes there is no additional pressure from equipment downstream of the air stack. If downstream equipment adds backpressure, these values may not be accurate.

<u># of Trays</u>	<u>Typical Sump Operating Pressures, (approximate*)</u>
1 tray system	4-6" wc
2 tray system	8-12" wc
3 tray system	12-18" wc
4 tray system	16-24" wc
etc.	etc.

IT IS RECOMMENDED THAT A BOOSTER BLOWER BE USED IF IT IS EXPECTED THAT THE COMBINED PRESSURE LOSS OF THE QED AIR STRIPPER AND ANY DOWNSTREAM EQUIPMENT EXCEEDS 40" WC.

Be careful when making damper adjustments—fouling of the system over time will affect the air flow rate. A “fouled” system will have lower air flow at the same sump pressure reading than a clean system. A severely fouled air stripper will not produce the minimum air flow the system requires for proper performance. The blower damper should therefore be adjusted to the proper sump pressure after the trays have been properly cleaned. Refer to the “Equipment Maintenance Instructions” for proper cleaning procedures.

2. Check for any leaks and correct.

Note: If the blower overload trips, the system will shut down. This overload may indicate that the damper needs to be partially closed. Reset the overload and try to start the system again.

Once Step 7 is successfully completed, turn HOA switches to “Off” and proceed to Step 8.

Startup Step 8. Replace the Clean Water Feed Line with the Contaminated Feed Line.

Install the inlet piping according to proper plumbing practices. Use proper pipe sealant and PVC cement where necessary.

Startup Step 9. Initiate Full Operation.

Switch all air stripper system HOA switches to “Auto”.

PLEASE NOTE: The blower damper should now already be in its proper position to provide the desired airflow for the system's anticipated influent water flowrate; however, the airflow through the air stripper upon initiating "full operation" will be greater until water builds up on the trays. If this increased airflow is a concern, it is advised to close the damper slightly to throttle the airflow until the water has built up to its final height on each tray.

Startup Step 10. Inspect and Record Unit's Operation Data

Inspect the unit's operation at regular intervals and take pertinent instrument readings. Record readings and performance data in an operations log book.

Startup Step 11. Set the Throttle Valve on Discharge Pump

Units with a discharge pump are supplied with a throttle valve. The valve should be set so that the pump matches the influent flow rate without cavitation and draws no more than the rated full load amps stamped on the pump motor.

SYSTEM SHUT DOWN PROCEDURE

Shut Down Step 1. Shut Water Off

Shut off the water feed to the system.

Shut Down Step 2. Wait 5 Minutes Before Blower Shutoff

Wait 5 minutes to allow the water in the aeration trays to be completely treated, then shut off the blower.

Shut Down Step 3. Shut Power Off

Shut off power at the main disconnected switch if more than a temporary shut down is anticipated.

Caution:

If proper shut down procedures are not followed contaminated water will drain into the sump and contaminate the water that has collected in the sump. Allow the blower to run the additional 5 minutes after the feed water is shut off.

EQUIPMENT MAINTENANCE INSTRUCTIONS

This information describes how to clean the QED EZ-Tray™ Air Stripper unit. Please refer to the manufacturer's instructions for maintenance on the non-air stripper equipment.

Tray Fouling

With normal operation of the air stripper, the sump pressure will typically increase over time. This typically indicates that the air stripper trays are becoming fouled. If this occurs, shut down the system. Remove the door and visually inspect for signs of fouling and clean the air stripper as outlined in the "Maintenance" section of this manual. Occasionally inspect the pressure gauge tubing for water build up. Water trapped in the air tubing could produce an erroneous reading. A pinch clamp is provided on the tubing and should be closed when no one is at the site in order to prevent potential condensate accumulation. Condensation buildup will ruin the pressure gauge.

Dealing with High Mineral Concentrations

Minerals, dissolved in high concentrations, tend to precipitate out of groundwater during aeration processes. These minerals form insoluble deposits commonly referred to as "fouling". Deposits from iron-rich or mineral-rich feed water can be reduced by pre-treating it with sequestering agents or possibly other types of technologies. There are a number of sequestering suppliers that should be able to offer recommendations or suggestions. The recommended cleaning procedure is pressure washing. Follow the instructions detailed below.

Cleaning the Air Stripper

Recommended cleaning equipment:

Pressure Washer with Washer Wand

2 GPM minimum flow at 900 PSI maximum. Equipment rental companies can usually supply such a unit on a daily rental basis.

Clean Water Supply

Clean water supply with a capacity of at least 2 GPM at 20 PSI, connected to the pressure washer by means of an ordinary garden hose.

Cleaning the Unit. The QED air stripper is designed for easy cleaning. Trays can either be removed for cleaning or left in the unit and cleaned. Another option would be for the customer to purchase a spare set of trays which would allow maintenance personnel to replace the fouled trays with clean trays and reduce air stripper downtime and allow the maintenance personnel to clean the trays at a more convenient time.

Cleaning Step 1. Turn Off Equipment, Perform Electrical "Lockout" Procedure

Turn off the feed water supply and all associated electrical equipment.

Cleaning Step 2. Provide for Waste Disposal

Make provisions for disposing of the sludge and waste generated during cleaning.

Cleaning Step 3. Remove Front Cover(s). Either remove the trays from the air stripper unit or leave them in for cleaning.

Cleaning Step 4. Turn On Water and Pressure Washer

Turn on the water supply to the pressure washer. Then, turn on the pressure washer itself. Wear protective goggles while spraying.

Cleaning Step 5. Insert Wand into Air Stripper (This step is for cleaning trays while they remain in the air stripper unit. If trays have been removed for cleaning, skip step 5 and proceed to step 6.)

Insert the wand all the way into the door opening. Point the spray nozzle up towards the bottom of the lowest tray.

Cleaning Step 6. Clean Bottom Side of Tray

Holding the wand tightly, pull the trigger to start the pressurized water flow. Expect the wand to kick back as flow starts. Move the wand side to side at a rate of about 1" per second. Be sure to cover the entire tray bottom area. The tray holes must be cleaned of all deposits. Periodically stop the cleaning operation and inspect the cleaned area. The area is clean when there are no deposits around the aeration holes.

Cleaning Step 7. Clean Top Side of Tray

Move the wand to the top side of the tray. Continue spraying with the nozzle pointed down onto the top surface of the tray. Also clean the downcomer and sealpot areas. Remove all visible deposits from the tray baffles and the walls of the unit. Inspect the cleaned area for deposits.

Cleaning Step 8. Repeat for all Trays

Repeat the procedure for all trays, working up to the top-most tray.

Cleaning Step 9. Spray the Ceiling and Walls of the Air Stripper. If the air stripper is a mild-steel unit with coal tar epoxy coating, extra care must be taken not to remove the epoxy with the high pressure water. Cleaning the walls and ceiling are not necessarily required for proper air stripper operation.

Cleaning Step 10. Rinse

After the cleaning operation is finished, rinse the ceiling, trays, baffles, and walls with the pressure sprayer. Work down from the top down to the sump tank. Make sure the surfaces are clean and the holes are not blocked by loosened debris.

Cleaning Step 11. Check the Demister Pad and Replace as Necessary

Inspect the demister pad and clean as needed.

Use the pressure sprayer to remove debris, deposits and gummy residues sometimes found on the demister pad.

Demister pads that are excessively plugged should be replaced.

Cleaning Step 12. Inspect the Air Stripper

Visually inspect the air stripper box for the following:

1. Gasket integrity
2. a. If this is a mild steel unit, the internal and external epoxy-coatings must be inspected for exposed areas. Scratches, chips, burns, etc. will expose the mild steel to water, contaminants, and the elements, creating potential for corrosion. These exposed areas must be cleaned, dried, and re-epoxyed before commencing air stripper operation. Contact QED for touchup epoxy.
b. If this is a steel unit, inspect the air stripper for any damage and repair as necessary.
3. Aeration tray integrity. Inspect trays for structural damage, felt gasket integrity, and acceptable silicone sealant in the sealpot area. Check the downcomer of each tray for holes, rips, etc. Replace as necessary. Contact QED for replacement items.
4. Inspect the internal piping (typically PVC piping) and replace as necessary.

Cleaning Step 13. Follow Manufacturer's Instructions for Maintenance on Non-Air Stripper Equipment

TROUBLESHOOTING

Problem 1. Blower Won't Start or Run

No Power to Blower

Check that all switches are in "ON" or "AUTO" position.

Position main disconnect switch to "ON" position. Turn control switches to "ON" or "AUTO".

Blown Fuse

Check to see if fuses are okay. Check fuses in main disconnect switch and in control panel.

If blown, replace with fuse of same size and rating.

Overload Relay Trips

Locate reset button on blower overload relay.

Rush reset button in. Reasons for tripping: incorrect line voltage, motor wired incorrectly, inadequate ventilation, bearings are bad.

tubing to Pressure Switch Plugged with Water or Debris

Remove tubing from pressure switch and blow into it towards tank.

Clean or replace tubing if plugged or kinked.

Blower Wheel Jammed Against Side of Housing

TURN OFF ALL power to the system. Try to spin wheel by hand. Wheel should rotate freely. Call QED.

Problem 2. Outlet Pump Won't Shut Off

Suction or Discharge Piping for Pump is Clogged

Check water flow from discharge pipe. Piping should be clean inside. Look for narrowing caused by scale or iron accumulation.

Remove piping, inspect and clean or replace as necessary.

Float Switch in Tank is Stuck in Down Position

Look into sump and check that all floats are floating on the water.

Clean all deposits from float. Replace float is necessary.

Normal Operation - Water Level in Sump is Okay

Pump will stop when water level reaches pre-determined height in tank.

Allow water level to decrease until pump turns off.

Let water level reach pre-determined lower level, which will cause outlet pump to turn off.

Problem 3. Outlet Pump Won't Start or Run

No Power to Pump

Check that all switches are in "ON" or "AUTO" position.

Position main disconnect switch to "ON" position. Turn control switches to "ON" or "AUTO".

Blown fuse

Check to see if fuses are okay. Check fuses in main disconnect switch and in control panel.

If blown, replace with fuse of same size and rating.

Overload Relay Trips

Locate reset button on pump overload relay.

Push reset button in. Reasons for tripping: incorrect line voltage, motor wires incorrectly, inadequate ventilation, bearings are bad.

Normal Operation - Water Level in Sump is Okay

Pump will start when water level reaches pre-determined height in tank.

Allow water level to increase until pump turns on. be sure pump switch is in "Auto" position.

Let water level reach pre-determined upper level, which will cause outlet pump to turn on.

Level Switch in Tank is Wired Incorrectly in Control Panel

Check wiring circuit against diagram. See that all connections are tight and no short circuits exist because of worn insulation, crossed wires, etc.

Rewire any incorrect circuits. Tighten connections, replace defective wires.

Impeller, Seal or Bearing Damaged

TURN OFF POWER. Try to turn impeller by hand.

If impeller won't turn, remove housing and locate source of binding.

Problem 4. Low Air Pressure in Stripper Tank

Blower Damper Closed

Visually check position of damper on inlet of blower.

Open damper to get proper reading on pressure gauge. Firmly tighten screws.

Motor Rotation Backwards

Watch rotation of blower wheel at slow speed.

Reconnect for proper rotation as per motor diagram.

Gravity Discharge Trap Installed Incorrectly

Tray should be positioned vertically.

Install discharge trap per outlet plumbing drawings provided in Figure 4.

Inlet Chamber (Sealpot) in each Tray is Not Full of Water

Slide tray aside and look at water level in chamber.

Remove front cover. Fill up inlet chambers with a hose. Or, follow inlet chambers fill up procedures above in Initial Start Up.

Front Cover not in Place

Front cover must be secured during operation.

Tubing to Pressure Gauge Plugged with Water or Debris

Remove tubing from pressure gauge and blow into it towards tank.

Clean or replace tubing if plugged or kinked.

Debris Blocking Blower Intake

Look at blower intake. Remove any accumulated debris.

Normal Operation for Automatic Unit

When inlet pump starts, blowers will start, air pressure will rise to operational level.

No action necessary.

Problem 5. High Pressure in Stripper

Air Exhaust Piping is Restricted

Check vent piping for obstructions. Check that vent pipe diameter does not decrease.

Vent piping diameter must be the same as the outlet vent diameter on the cover.

Air Holes in Bottom of Trays are Plugged

Remove inspection and cleanout caps and visually inspect holes.

For iron fouling, clean out unit with a 1000 PSI pressure washer. For scaling, scrape or bang scale from all surfaces, then use a pressure washer to open holes. Consider using sequestering agent or other technology to reduce scaling.

Demister Pad is Plugged

Inspect the bottom of the demister pad in the cover. Clean and/or replace as necessary.

Problem 6. Water Won't Flow into Unit

Inlet/Well Pump Functioning Properly

Allow water level to rise in well pump, which will turn on inlet pump to system.

No action necessary.

Tank Air Pressure is Low. System is in Alarm Condition

Read tank air pressure from pressure gauge. System should be in alarm condition if pressure is below about 2 inches w.c.

Check that blower is operating properly. Check that all rubber caps are in place on end of trays.

Inlet Piping is Plugged

Remove inlet piping and inspect for debris and buildup.

Clean or replace clogged parts.

Problem 7. Iron Fouling is a Problem

Iron Precipitates Out of Water When Treated with an Air Stripper Causing Iron Build Up in Unit

Remove the front door(s) and inspect inside of tray for buildup/fouling.

Clean out unit with 1000 PSI pressure washer on routine basis.

Pretreat incoming water using sequestering agents or other appropriate technology.

QED TREATMENT EQUIPMENT WARRANTY

QED Environmental Systems Inc. (QED) warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

QED warrants the equipment components of its manufacture for a period of one (1) year from date of delivery. Our sole obligation during this warranty will be to repair or replace (at our option) the defective components. We are not responsible for consequential damages. Labor costs are not included.

Purchaser's exclusive remedy for breach of said warranty shall be as follows: if, and only if, QED is notified in writing within the applicable warranty period of the existence of any such defects in the said products, and QED upon examination of any such defects, shall find the same to be within the term of and covered by the warranty running from QED to Purchaser, QED will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Purchaser. If QED for any reason, cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's notification of a warranty claim, then QED's sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Purchaser, or to refund the full purchase price. In no event shall such allegedly defective products be returned to QED without its consent, and QED's obligations of repair, replacement or refund are conditioned upon the Purchaser's return of the defective product to QED.

IN NO EVENT SHALL QED ENVIRONMENTAL SYSTEMS INC. BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.

The foregoing warranty does not apply to major subassemblies and other equipment, accessories, and other parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties supplied by their respective manufacturers. In the event of failure of any such product or accessory, QED will give assistance to Purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of QED, and QED neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products, materials and/or workmanship.

It is understood and agreed that QED shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty.

The equipment is warranted to perform as specified under the conditions specified here and within the air stripper model or QED will make the necessary changes at no cost to the owner. Some restrictions apply. Requirements for warranty consideration include, (but are not limited to):

1. Current operating conditions do not differ from the previously-modeled conditions.
2. The system should be cleaned regularly to maintain system performance.
3. The equipment is installed, operated and maintained according to QED's instruction or non-QED manufactured subassembly manufacturer's instructions.
4. Air stripper influent air is not "dirty" (does not contain VOC's, etc.).
5. No surfactants, oils, greases, or other immiscible phases are present in the water.
6. Each influent contaminant does not exceed 25% of its maximum solubility under modeled conditions.

QED shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the consent of QED. If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact QED for determination of warranty coverage. If the return of a component is determined to be necessary, QED will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the Purchaser.

In the event of air stripper performance issues, QED may require customer to conduct a variety of troubleshooting steps. These include, but are not limited to, modifying operational parameters, cleaning air stripper system, modifying (temporarily or permanently) process piping, and obtaining reasonable and necessary influent/effluent samples. These steps are the responsibility of the customer and will be conducted by customer prior to consideration by QED for a site visit. These steps and the associated costs incurred are the responsibility of the customer, regardless of future action. Should customer request a site visit by QED or accept a site visit offer by a QED-trained technician, the visit and associated costs: a) will be the responsibility of the customer at \$500/day, plus travel, lodging, and meals, if the visit finds improper sampling, process piping installation, or equipment operation inconsistent with QED's Operation and Maintenance Manual; or b) will be the responsibility of QED if the visit finds QED responsible for the performance issue(s) raised.

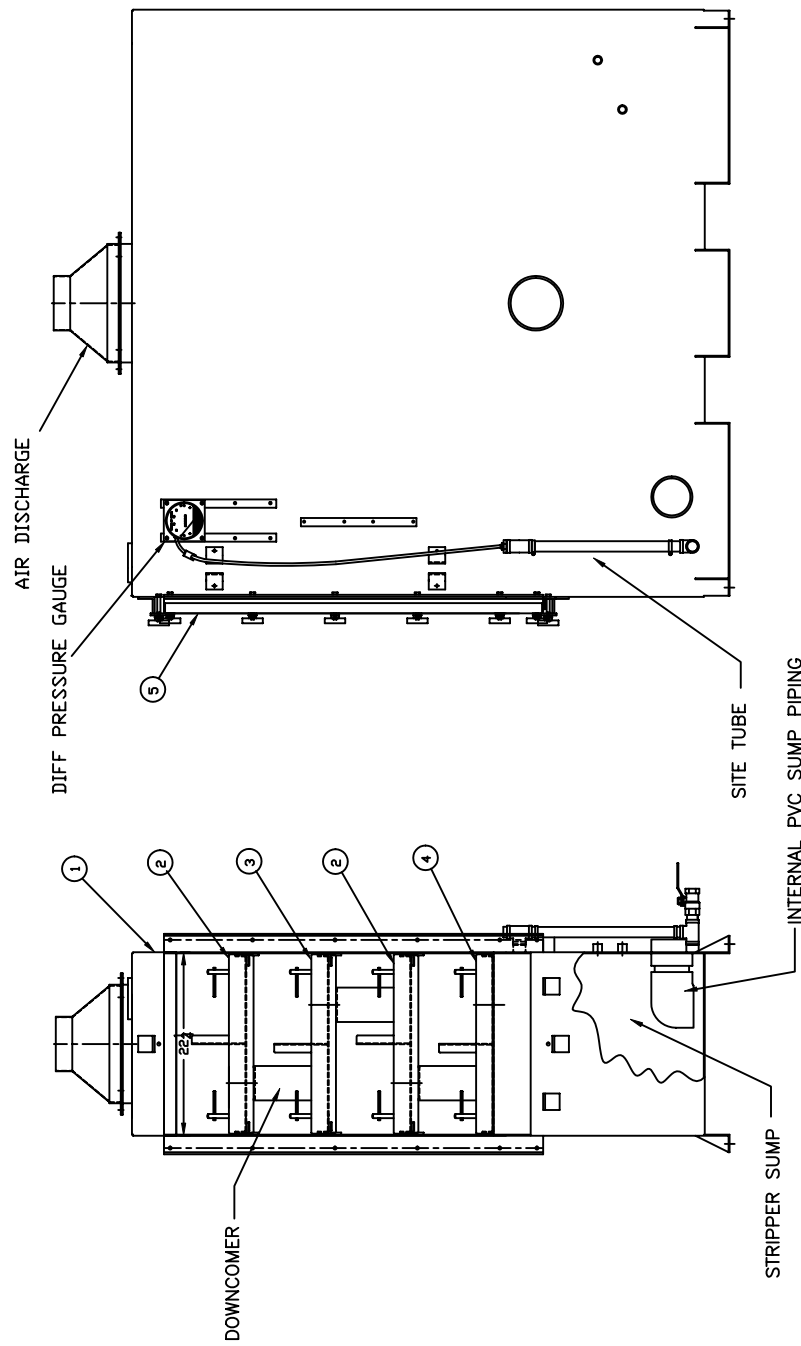
The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of QED and:

1. Identify the product or system involved by job number or QED order number.
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. If applicable, send the malfunctioning component, *after receiving a Return Authorization Code (RAC) Number by the QED Service Department, to:*

**QED Environmental Systems Inc.
6241 Jackson Road
Ann Arbor, MI 48103**

Attn: R.A.C. No. (Return Authorization Code Number provided by QED Service Dept.)

FIGURE 1. GENERAL DWG OF E-Z TRAY AIR STRIPPER

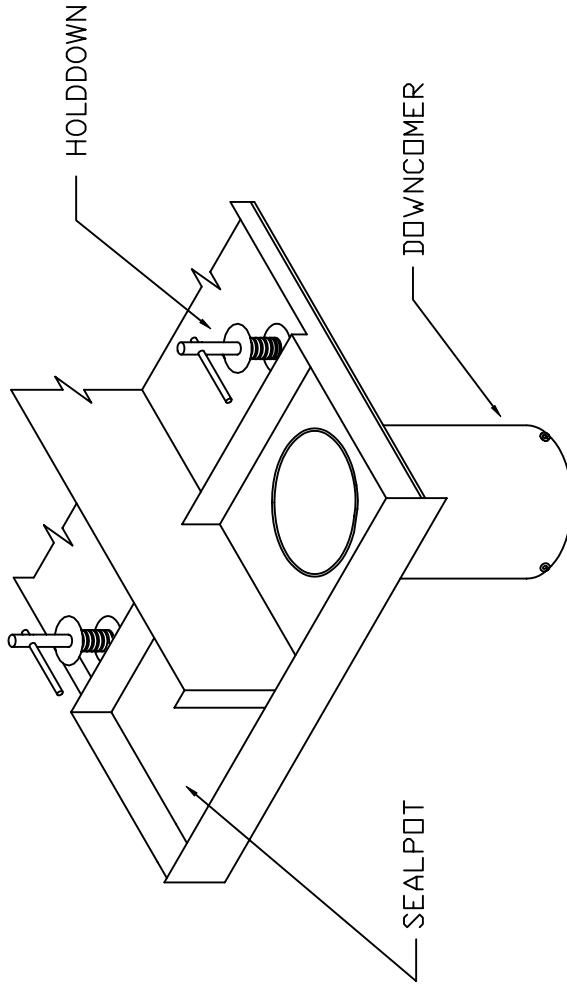


ITEM	QTY	DESCRIPTION	REMARKS
6	1	WELDMENT, DEMISTER	QED #807048
5	1	STANDARD HATCH	QED #807019
4	1	SIEVE TRAY ASSEMBLY, BOTTOM RH	QED #807062
3	1	SIEVE TRAY ASSEMBLY, INTERMEDIATE RH	QED #807056
2	2	SIEVE TRAY ASSEMBLY, INTERMEDIATE LH	QED #807059
1	1	BOX ASSEMBLY 12.4 R.H. AIR STRIPPER	QED #807044

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES AND INCLUDE PLATING REMOVE ALL BURRS TOLERANCES .00X+/- .01 FRACT +/-.1/64 .00X+/- .005 ANGLES +/-1/2 OTHER TOLERANCES AS SPECIFIED	DRAWN BY	DATE
	MEB	01/20/97
	CHECKED BY	DATE
	APPROVED BY	DATE
	MFG. APPROVAL	
	MATERIAL	

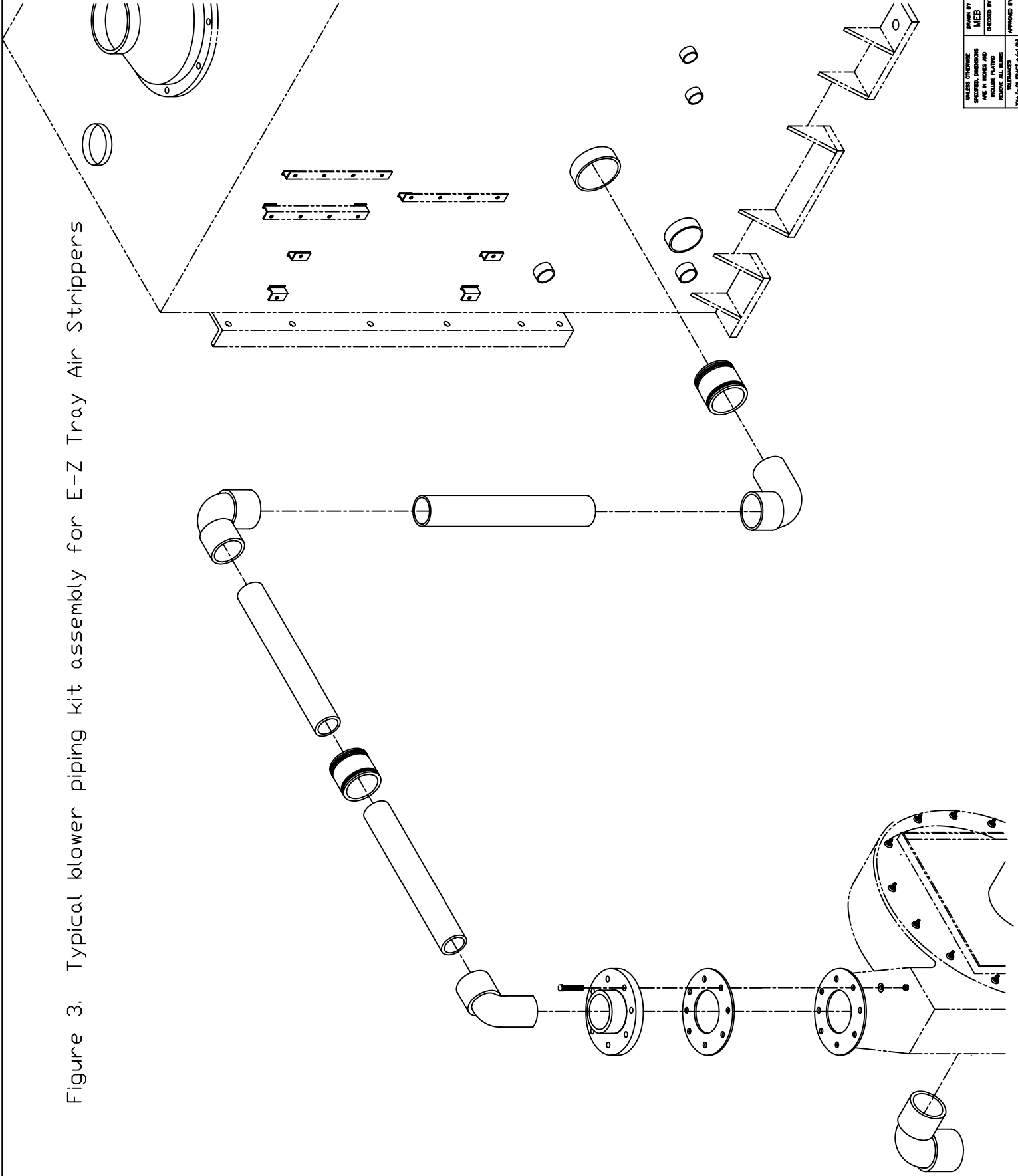
Q.E.D.	
ENVIRONMENTAL SYSTEMS INC.	
6155 JACKSON ROAD, ANN ARBOR, MI.	
TITLE	EZ-TRAY AIR STRIPPER DWG
DRAWING NUMBER	eztdwg.dwg
SCALE	1 OF 1
SHEET	1
REV	

FIGURE 2. TYPICAL TRAY ASSEMBLY



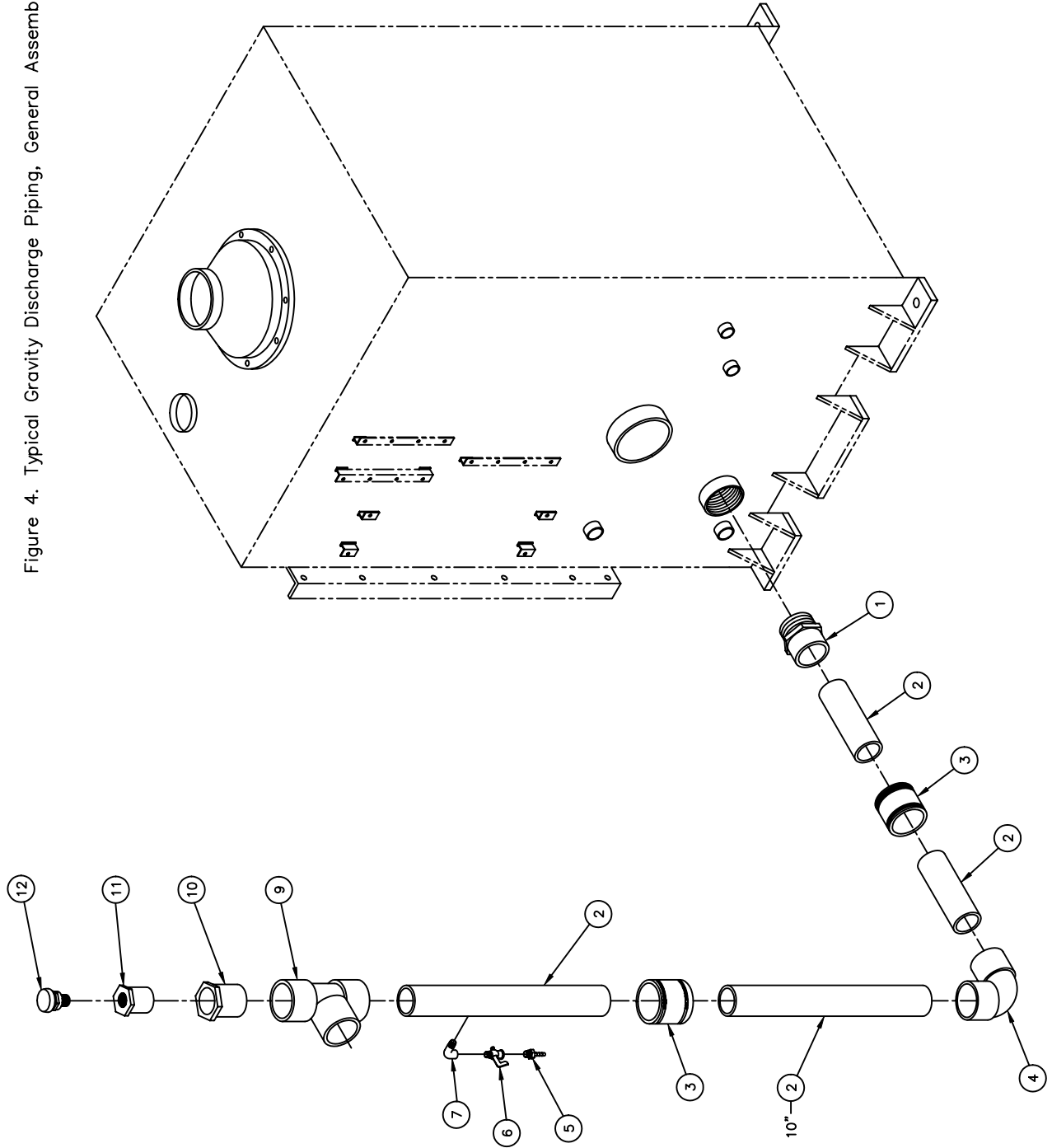
ITEM QTY	DESCRIPTION	REMARKS
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES AND INCLUDE PLATING REMOVE ALL BURRS	DRAWN BY MEB	DATE 01/20/97
TOLERANCES .004+/-01 FRACT +/-1/64 .0004+/-005 ANGLES+/-1/2	CHECKED BY	DATE
OTHER TOLERANCES AS SPECIFIED	APPROVED BY	DATE
12.X, 24.X AIR STRIPPER	MFG. APPROVAL	
NEXT ASSY	MATERIAL	
USED ON	FINISH	
	DRAWING NUMBER	TRAY
	SCALE	1 OF 1
	TITLE	TYP. TRAY ASSEMBLY
	Q.E.D. ENVIRONMENTAL SYSTEMS INC. 6155 JACKSON ROAD, ANN ARBOR, MI.	REV A

Figure 3. Typical blower piping kit assembly for E-Z Tray Air Strippers



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES AND INCLUDE FLATNESS, PERPENDICULARITY, SURFACE FINISH, TOLERANCES, AND OTHER TOLERANCES AS SPECIFIED.	DESIGNED BY MEB	DATE 9/16/97	Q.E.D. ENVIRONMENTAL SYSTEMS INC. 6165 JACKSON ROAD, JAY, ARIZONA, AZ
200 +/- .01 INCHES +/- .01 INCHES OTHER TOLERANCES AS SPECIFIED	CHECKED BY [Blank]	APPROVED BY DATE [Blank]	TITLE BLOWER KIT W/O BLOWER ASSEMBLY/BOM/KIT
NEXT SIZE	USED ON	FIGURE	DRAWING NUMBER 02101KIT.CHG REV A
			SCALE N.T.S. SHEET 1 OF 1

Figure 4. Typical Gravity Discharge Piping, General Assembly



NOTE:

1. CENTER LINE OF WATER OUT (ITEM 1) TO CENTER LINE OF DRAIN CONNECTOR (ITEM 9) TO BE 27" - 6 TRAY 18" - 4 TRAY

(DIMENSIONS ARE APPROXIMATE--REQUIRES SOME ADJUSTMENT AS NECESSARY BASED UPON PUMP PRESSURES AND WATER FLOWS. ASSUMES STANDARD OPERATING CONDITIONS.)

12	1	BREAKER, VACUUM RELIEF 1/2"
11	1	BUSHING, SPI X THD PVC SCH 80
10	1	BUSHING, REDUCER SPI. X SOC.
9	1	TEE, SOCKET PVC SCH 80
8		
7	1	ELBOW, STREET 1/8" FPT BRASS
6	1	COCK, SHUTOFF 1/8"MPT X 1/8"FPT BRASS
5	1	BARB, 1/8"MPT X 3/16" BARB
4	1	ELBOW, 90 DEGREE PVC SCH 80 SOCKET
3	2	FERNCO, FLEXIBLE PVC
2	TBD	PIPE, PVC SCH 80
1	1	ADAPTER, PVC SCH 80
ITEM QTY		DESCRIPTION
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES AND INCLUDE PLAYING REMOVE ALL BURRS		
TOLERANCES .XX+/-01 FRACT +/-1/64 .XXX+/-005 ANGLES+/-1/2 OTHER TOLERANCES AS SPECIFIED		
DRWN BY	DATE	
MEB	10/29/99	
CHECKED BY	DATE	
APPROVED BY	DATE	
MFG. APPROVAL		
MATERIAL		
FINISH		
USED ON		
NEXT ASSY		
		ENVIRONMENTAL SYSTEMS INC. 6155 JACKSON ROAD, ANN ARBOR, MI.
TITLE		GRAVITY DRAIN ASSEMBLY/BOM/KIT
DRAWING NUMBER	eztgravidis	REV
SCALE	N.T.S.	SHEET 1 OF 1