

Ultraviolet Disinfection

SALCOR 3G UNIT

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SALCOR INC
Fallbrook, California

Typical wastewater influent concentration ranges for pathogenic and indicator organisms (Casson *et al.*, 1990; Rose, 1988; and U.S. EPA, 1979b)

Organism	Minimum, no./100 mL	Maximum, no./100 mL
Total coliforms	1 000 000	-----
Fecal coliforms	340 000	49 000 000
Fecal streptococci	64 000	4 500 000
Virus	0.5	10 000
Cryptosporidium oocysts	85	1 370
Giardia cysts	80	320

Secondary effluent ranges for pathogenic and indicator organisms before disinfection (U.S. EPA, 1986)

Organism	Minimum, No./100 mL	Maximum, No./100 mL
Total coliforms	45 000	2 020 000
Fecal coliforms	11 000	1 580 000
Fecal streptococci ^a	2 000	146 000
Viruses	0.05	1 000
Salmonella sp.	12	570

^a Assuming removal efficiencies for fecal streptococci similar to the fecal coliform removal efficiencies.

Survival times of pathogens in soil and on plant surfaces (U.S. EPA, 1992)

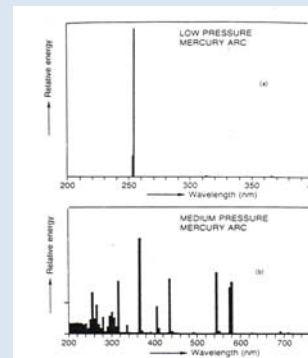
Pathogen	Soil		Plants	
	Absolute maximum ^a	Common maximum	Absolute maximum	Common maximum
Bacteria	1 year	2 months	6 months	1 month
Viruses	1 year	3 months	2 months	1 month
Protozoan cysts ^b	10 days	2 days	5 days	2 days
Helminth ova	7 years	2 years	5 months	1 month

^a Greater survival time is possible under unusual conditions such as consistently low temperatures or highly sheltered conditions (for example, helminth ova below the soil in fallow fields).

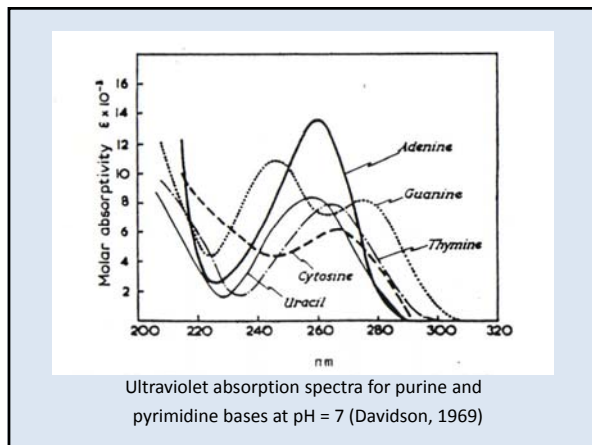
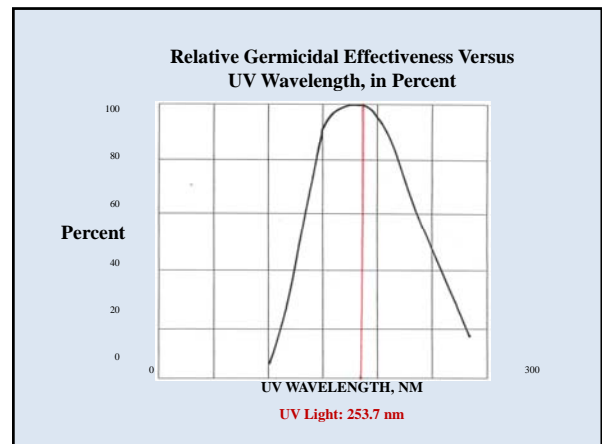
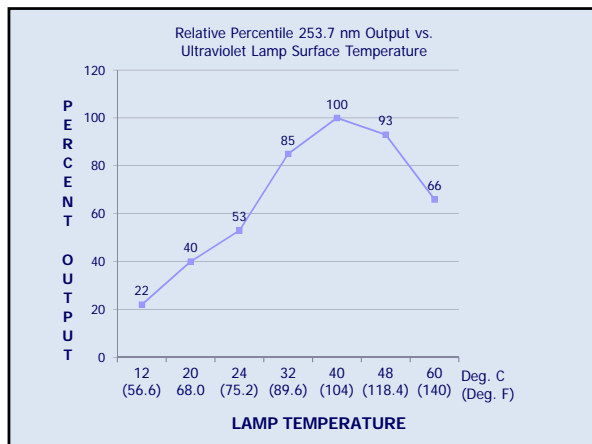
^b Few, if any, data are available on the survival times of Giardia cysts and Cryptosporidium oocysts.

UV Disinfection – Basic Facts

- 240-260 nm UV light destroys microorganisms
- Dosage is product of UV intensity and exposure time
- UV light transmission and suspended matter important variables
- Low-pressure mercury UV lamps are readily available at low cost
- Reliable delivery of UV dose to the fluid is the engineering design challenge



- Radiant power output spectra from (a) low-pressure and
- (b) medium-pressure mercury arc lamps (Meulemans, 1987)

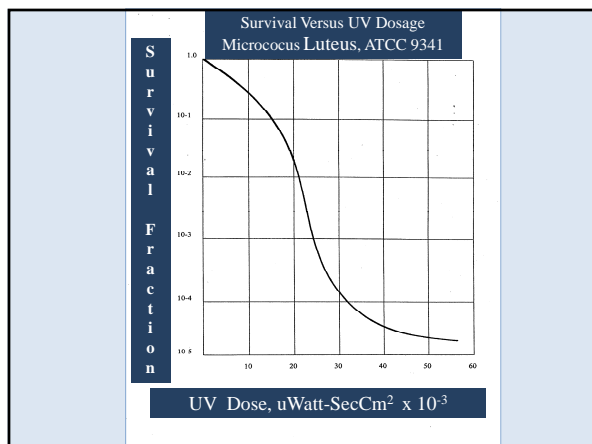


Dose and Survival

Survival Ratio or S.R. = $N_t/N_0 = e^{-Kit}$

Where:

- N_0 = the number of organisms initially present
- N_t = the number of surviving organisms at time t
- t = the exposure time
- I = the ultraviolet light intensity
- K = a constant, which depends on the microorganism type and the ultraviolet light wavelength



UV Destruction Dosages (>99.9% Inhibition)
For Important Microorganisms (mj/cm²)

•BACTERIA

Clostridium tetani (Tetanus)	22
Dysentery bacilli	4.2
Escherichia coli (indicator organism)	6.6
Legionella pneumophila (Legionnaires' disease)	2.76
Mycobacterium tuberculosis	10
Pseudomonas aeruginosa (slime former)	10.5
Salmonella typhosa (Typhoid fever)	4.1
Salmonella enteritidis (Enteric fever)	7.6
Staphylococcus aureus	6.6
Streptococcus lactis	8.8

UV Destruction Dosages (>90% Inhibition) For Important Microorganisms (mj/cm²)

• VIRUS

Influenza	6.6
Polio Type I	6
Coxsackie A2	4.8
Adeno virus Type III	4.5
Ebola (Zaire)	2.3
Hepatitis C	23.3
Herpes Virus Type 4	5.3
Mumps	4.7
Norwalk	5.6
Papilloma Virus	9.8
Influenza A	2.3
Bacteriophage MS 2	23.7

Dose requirements needed for inactivation of viruses by UV light exposure (mj/cm²)

Virus	90.0%	99.0%	99.9%	99.99%
Echovirus 1	8	16.5	25	33
Echovirus 2	7	14	20.5	28
Coxsackievirus B5	9.5	18	27	36
Coxsackievirus B3	8	16	24.5	32.5
Poliovirus 1	8	15.5	23	31
Adenovirus type 32	40	78	119	160

From: Appl Environ Microbiol. 2002 October; 68(10): 5167-5169.
Doi: 10.1128/AEM.68.10.5167-5169.2002

UV Destruction Dosages (>99.9% Inhibition) For Important Microorganisms (mj/cm²)

• YEAST AND MOLD

Bakers Yeast	8.8
Saccharomyces sp.	17.6
Penicillium roqueforti	26.4
Aspergillus niger	330
Mucor racemosus A & B	35.2
Oospora lactis	11

UV Destruction Dosages (>99.9% Inhibition) For Important Microorganisms (mj/cm²)

• OTHER

Chlorella vulgaris (algae)	22
Fungi (typical)	45
Cryptosporidium (Oocysts)	20 – 30
Giardia lamblia (cysts)	20 – 30

Light Transmission Through Fluids

Light Intensity Ratio or L.I.R. = $I_x / I_0 = e^{-\alpha x}$

Where:

I_0 = the initial light intensity, in $\mu\text{W}/\text{cm}^2$

I_x = the light intensity at a distance x , in $\mu\text{W}/\text{cm}^2$

α = the absorption coefficient of the medium in cm^{-1}

x = the distance through which the light has traveled in the medium

Typical Ultraviolet Transmission Data On Water and Wastewater

Water Type	Percent Transmission of 253.7 nm UV per cm	Absorption Coefficient (253.7 nm UV) (cm^{-1})
Distilled or High Purity Water	99	0.01
High Purity Drinking Water (no ferric iron or absorbing organics)	95	0.05
Poor Quality Drinking Water (<0.3 ppm iron, slight amount of absorbing organics)	82	0.2
Filtered Secondary Effluent (<10 SS, <10 BOD)	71	0.35
Unfiltered Secondary Effluent (<30 SS, <30 BOD)	65	0.43
Lagoon Effluent (<100 SS, < 30 BOD)	61	0.5
Water containing 10 ppm Humic Acid	56	0.58
Water containing 10 ppm Ferric Iron	25	1.4

Installation Steps

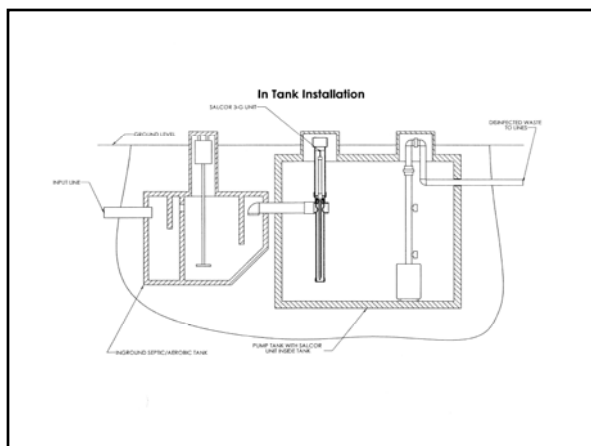
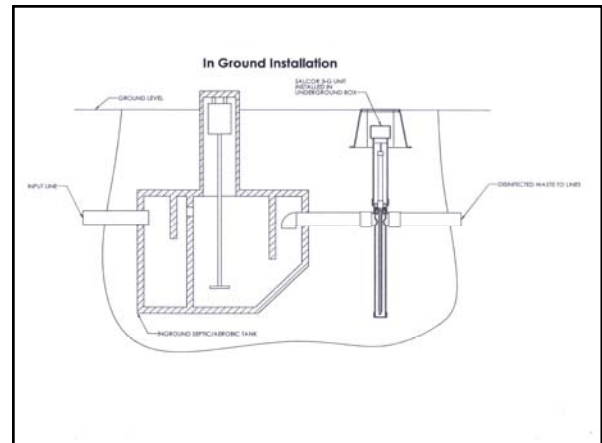
- Cut riser pipe and lamp handle to meet job needs.
- Bond the riser pipes and couplings and mount the disinfection chamber.
- Route the lamp power cable through the lamp handle and connect it to the lamp.
- Insert the lamp into the quartz tube in the center of the disinfection sub-assembly.
- Slide the sub-assembly into the chamber.

Installation-Continued

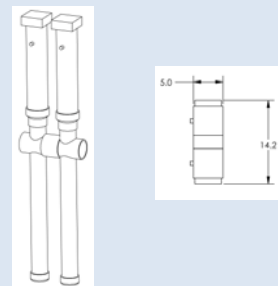
- Feed electrical power, alarm, and ground wires through the side of the junction box.
- Connect the power and alarm wires to the labeled terminal blocks on the PC Board in the junction box.

Operation and Maintenance

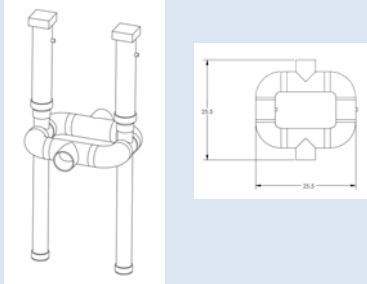
- Operates continuously
- Annual maintenance - remove disinfection sub-assembly, clean with a sponge and detergent
- Replace UV lamp every two years



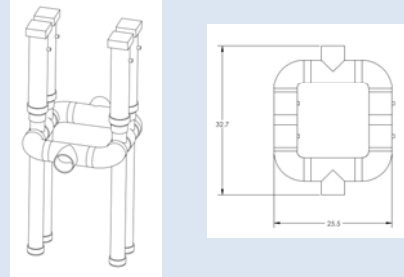
2 Units in Series



2 Units in Parallel



4 Unit Series & Parallel



4 Unit Installation Cascade School, Turner, Oregon



ULTRAVIOLET DISINFECTION TEST RESULTS

JET PLANT EFFLUENT		FECAL COLIFORM PER 100 ml		
	Suspended Solids	DOD-5	Before	After
<u>Date</u>	<u>(mg/liter)</u>	<u>(mg/liter)</u>	<u>UV</u>	<u>UV</u>
6/24/97	312	--	--	0
7/29/97	26	41	--	0
8/5/97	14	72	--	0
8/13/97	26	33	--	0
8/19/97	30	40	TNTC	0
8/26/97	24	32	2000	0
9/2/97	54	50	4000	0
9/10/97	16	31	TNTC	0

Orenco Data

A SALCOR INC. UV Unit Was Installed in N9 Pump Basin

Installation Date: 11/17/04

Pump Rate 4.5 GPM

Date	Filtrate e. coli	Filtrate Turb.	UV Filtrate e. coli	UV Filtrate Turb.	Q GPD	Date	Filtrate e. coli	Filtrate Turb.	UV Filtrate e. coli	UV Filtrate Turb.	Q GPD
11/19/2004	12,390		5.2			1/27/2005	17,250	13.20	2.0	12.40	462
12/7/2004	21,300	3.00	1.0	2.70	496	1/31/2005	1,600	5.03	1.0	5.86	493
12/21/2004	114,500	6.93	<1	4.45	543	2/1/2005	19,560	12.40	1.0	13.10	443
12/23/2004	9,880	8.40	3.0	5.58		2/2/2005	23,590	13.90	<1	13.30	406
1/3/2005	1,710	7.40	<1	7.40		2/7/2005	4,480	8.83	<1	5.87	699
1/13/2005	13,540	8.23	<1	9.33	636	2/8/2005	2,030	12.50	<1	12.10	661
1/17/2005	8,800	8.13	<1	5.14	861	2/9/2005	2,010	13.00	<1	11.10	817
1/19/2005	19,680	8.25	<1	5.70	836	2/14/2005	12,590	12.20	7.5	13.30	693
1/20/2005	24,890	8.16	<1	7.74		2/15/2005	630	3.77	<1	7.20	755
1/25/2005	9,600	9.50	<1	12.70	555	2/17/2005	6,020	7.78	<1	8.48	817
1/26/2005	26,130	22.70	4.1	8.10	643	2/21/2005	6,380	5.10	<1	4.06	

Orenco Data

A SALCOR INC. UV Unit Was Installed in N9 Pump Basin

Installation Date: 11/17/04

Pump Rate 4.5 GPM

Date	Filtrate e. coli	Filtrate Turb.	UV Filtrate e. coli	UV Filtrate Turb.	Q GPD	Date	Filtrate e. coli	Filtrate Turb.	UV Filtrate e. coli	UV Filtrate Turb.	Q GPD
2/23/2005	64,880	11.70	6.3	12.50	512	3/21/2005	12,740	5.76	<1	6.43	518
2/24/2005	28,510	6.43	<1	7.04	512	3/22/2005	24,810	4.71	1.0	10.00	493
3/1/2005	4,500	5.16	<1	6.52	655	3/23/2005	5,560	3.94	<1	5.70	599
3/2/2005	28,090	10.50	<1	5.56	693	3/30/2005	19,180	6.33	<1	3.67	560
3/3/2005	18,500	9.30	<1	4.90	593	3/31/2005	10,760	4.75	1.0	5.85	568
3/7/2005	4,650	7.54	<1	4.98	412	4/4/2005	3,640	2.61	<1	2.70	633
3/8/2005	51,720	11.60	<1	10.50	580	4/11/2005	12,540	22.70	<1	3.33	808
3/9/2005	8,390	4.49	<1	4.95	6	4/13/2005	2,419	7.80	<1	7.55	743
3/14/2005	2,108	6.69	<1	8.29	518	4/20/2005	20,980	5.19	<1	5.11	749
3/15/2005	3,640	6.64	<1	6.12	711	5/2/2005	2,950	3.42	<1	3.00	708
3/16/2005	1,790	5.21	<1	5.14	612	5/11/2005	22,470	10.50		9.74	689

Third Party Testing

University of Rhode Island
George Loomis 1999 - 2005

- FAST Unit effluent
- Annual Service
- Lamp replacement every two years
- Geometric mean fecal coliform count 9.4/100 ml

Micro Septec Unit Effluent
Poway, CA, 2002 – 2003 (10 months)

- No servicing or lamp change
- Samples taken from pump tank
- Geometric mean fecal coliform count 2.6/ 100ml

Orenco Systems
Sutherlin, OR, Nov 2004 - May 2005

- Dosing rate 4.5 GPM
- No servicing or lamp change
- Geometric mean fecal coliform count less than 2/100 ml

University of California, Davis
George Tchobanoglous, 2005

- Advantex AX – 20 Effluent
- Seven log MS2 Virus reduction
- Five log coliform reduction
- No micro organisms could be detected in the UV effluent

WASHINGTON STATE TESTING

- Advanced Treatment Unit & SALCOR UV
- NSF Standard 40 & WA State Fecal Coliform Reduction Protocol
- Duration 26 weeks
- Twenty Tests have been initiated. Eighteen are complete, and two are in progress.
- 3G UV Effluent Fecal Coliform counts ranged from 2 – 35 per 100 ml (Geometric Mean)
- Demonstrates that the 3G UV unit operates reliably without maintenance for over 6 months

Manufacturers Who Have Tested With the SALCOR 3G Unit Using the Washington State Protocol

1. Consolidated Treatment, Enviro-Guard .75	10. Jet Inc.
2. Consolidated Treatment, Multiflo	11. Enviro Flo
3. Consolidated Treatment, Nyadic	12. ANUA (Bord na Mona)
4. Delta Whitewater DF-60	13. Norweco - Singulair
5. Delta Whitewater, Ecopod	14. AK Industries, Hydro Action
6. Orenco, AX 20N	15. Aero Tech
7. Bio Microbics, Microfast 0.5	16. Ecological Tanks, Aqua Safe,
8. Quanics, ATS-CSAT-8-AC-C500	17. Clearstream
9. Hoot Aerobics	18. Aqua Klear

WASHINGTON STATE TEST RESULTS SUMMARY

Treatment Type	Geometric Mean Fecal Coliform/100 ml
Suspended Growth	18 – 33
Fixed/Suspended Growth	26 – 56
Fixed Growth – Textile	1.7
Fixed Growth – Peat	2.1
Fixed Growth – Foam	16

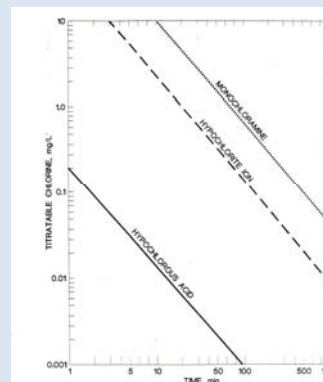
CHLORINE REACTIONS

- $\text{Cl}_2 \text{ \& } \text{H}_2\text{O} = \text{HCl} + \text{HOCl}$
- $\text{HOCl} = \text{H}^+ + \text{OCl}^-$

Effect of pH on Dissociation of Hypochlorous Acid at 30° C (86° F)

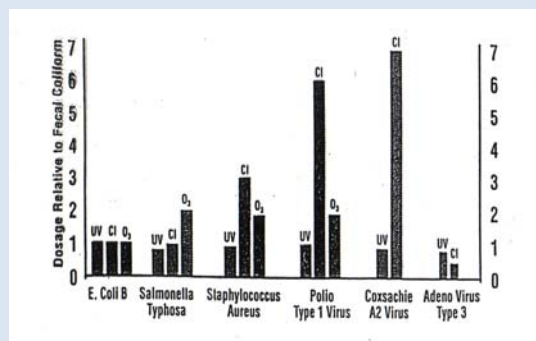
pH Value	%HOCl	%OCl
5.0	99.7	0.3
6.0	96.9	3.1
7.0	75.9	24.1
7.2	66.5	33.5
7.4	55.6	44.4
7.6	44.2	55.8
8.0	23.7	76.3
9.0	3.0	97.0

Figure 5.5 *Escherichia coli* kill times versus residual concentration (from Clarke, N.A., et al. [1964] *Human Viruses in Water: Source, Survival and Removability, Advances in Water Pollution Research*. Vol. 2, Pergamon Press, London, U.K., 523



Lethality Coefficient for Ozone and Chlorine

Disinfectant	Enteric Bacteria	Viruses	Spores	Amoebic Cysts
Ozone	500	5.0	2	0.5
Chlorine as HOCl	20	1.0	0.05	0.05
Chlorine as OCl	0.2	<0.02	<0.0005	0.0005
Chlorine as NH_2Cl	0.1	0.005	0.001	0.02



Summary Comparison of UV, Chlorine & Ozone Disinfection for Small Wastewater Flows

EFFECT	UV	CHLORINE (tablets)	OZONE
pH	No	Yes	Yes
Temperature	No	Yes	Yes
Residual	No	Yes	Dependent on pH & temp.
Contract time required	Very short	Very long	Medium
Operator skill required	Little	Little	Moderate
Equipment maintenance	Little	Moderate	High
Ammonia interference	No	Yes	Yes
Water chemistry change	No	Yes	Yes
Dissolved iron interference	Yes	Yes	Yes
Dissolved organic interference (e.g. phenol, humic acid, lignin sulfonates)	Yes	Yes	Yes
Capital cost	Low	Medium	High
Operating cost	Low	High	Medium

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INSTALLATION MANUAL

UV DISINFECTION UNIT MODEL 3G

April, 2011

I. INSTALLATION INSTRUCTIONS

WARNING! Improper connection of the appliance grounding conductor can result in the risk of electric shock.

Check with a qualified electrician or service representative if you are in doubt about whether the appliance is properly grounded.

Open and carefully unpack the shipping carton.

Check for any damage that may have occurred in shipping. If there are any problems, call **SALCOR INC.** at 760-731-0745 or fax to **SALCOR INC.** at 760-731-2405 and explain the problem(s).

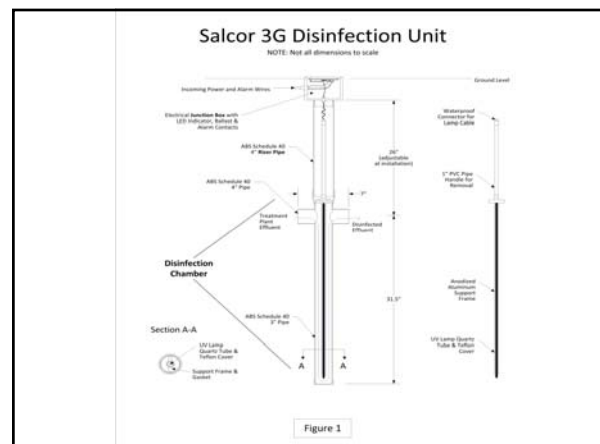
The following list describes the components that are contained in the shipping carton.

- Riser pipe: Four-inch diameter ABS pipe. The one-inch PVC bubble-wrapped insertion and removal handle containing the UV lamp is packed inside the four-inch riser pipe.
- Disinfection chamber: three-inch diameter ABS pipe with 4-inch inlet and outlet hubs.
- Disinfection subassembly consisting of an anodized aluminum frame supporting a Teflon ® sleeve containing a pure fused quartz tube. This complete item is packed inside of the three-inch disinfection chamber.
- One-inch White PVC handle which is used for inserting and removing the disinfection subassembly.
- The Long Life UV lamp is packed inside of the PVC handle.
- Electrical subassembly junction box (rated 6P) with pre wired alarm board, electronic ballast, and the lamp cord supplying power to the UV lamp.
- Two 4-inch Schedule 40 ABS pipe couplings.
- Watertight connection(s) for bringing the power and alarm wires into the junction box. Flexible conduit should be used to connect to these fittings.

There will be some additional items needed for installation, which are:

- ABS cement (also multipurpose cement if bonding to PVC pipe)
- Teflon tape for sealing PVC and Watertight connectors.
- Isopropyl (rubbing) alcohol
- Glycerin (available from drug stores)
- Power and Alarm Wires
- Power and Alarm Wire Watertight Flexible Conduit for connecting to the Junction Box watertight connectors
- Valve Box cover if unit is to be installed at or above ground
- RTV Sealant

A schematic drawing of the unit is shown in figure 1.



II. TWO INSTALLATION OPTIONS

1. In the ground: couple the 4-inch inlet to the exit pipe of the pretreatment unit, and couple the 4-inch outlet to the drain field pipe. See **Figure 2**.
2. In a Pump Tank: couple the UV unit inlet pipe to the pretreatment unit exit pipe at the entrance of the pump tank. See **Figure 3**.
Note: **Figure 1** indicates that the electrical junction box should be placed at ground level. If this should pose a problem with lawn mowers, etc., then the box could be placed below grade in an irrigation or water meter box. Another possibility is to use a hollow artificial rock to cover the junction box.
The Junction box is rated NEMA 6P. To be safe, however, the junction box should be protected from flooding.
For in-pump tank installations, care should be taken to prevent flooding of the junction box.

III. DETAILED INSTALLATION STEPS

1. Install the three-inch disinfection chamber in place at the site.
 - a. Position the disinfection chamber in the ground.
 - b. Connect the hubs to the inlet and outlet pipes.

Disinfection Chamber



2. Cut the 4-inch riser pipe and 1-inch lamp handle to meet the job needs.
 - a. Use the 4-inch connection to the pretreatment unit as a reference point.
 - b. The lamp handle upper end should be approximately six inches from the top of the riser pipe.
 - c. Bond the riser pipe to the chamber assembly and the second female PVC adapter to the handle.

Handle and Riser Pipes



3. Carefully slide the lamp cord through the top of the one-inch PVC handle pipe. The lamp cord wire with the 4 pin lamp socket connector should extend out about 6 inches past the threaded bottom end of the 1-inch white PVC handle female pipe connector.



Top End

PVC Handle Pipe



Bottom End

4. Carefully connect the 4-pin socket connector of the lamp cord to the UV lamp pins. Note: the pins are not arranged in a square formation. Make certain to put the socket on the pins the correct way. Make sure that the 4-pin socket connector is fully connected onto the pins, as it is important to have a complete connection.

5. Then carefully slide the UV lamp into the quartz tube in the frame assembly. CAUTION! The Teflon ® sleeve is very fragile, so handle it with care.

Lamp connector Pins are not square



Lamp Cord connected and Lamp inserted into frame

6. Wrap both of the one-inch threaded pipe pieces with Teflon ® tape.
 - a. First screw the bottom threaded end of the 1-inch lamp handle onto the upper end of the aluminum frame assembly.

Use Teflon Tape to seal the threads



Tighten the Gland.



- a. Second, screw the threaded reducer into the top end of the handle pipe. It is important that Teflon ® tape is used to seal the threads to maintain waterproof operation of the lamp.
7. Make sure that the UV lamp is bottomed out in the quartz tube.
 - a. Tighten this gland nut to approximately 22 in/lb to make the UV lamp chamber watertight. **CAUTION!** Do not over tighten!

8. Inspect the Teflon ® sleeve.
 - a. If necessary, use a clean soft cloth and isopropyl (rubbing) alcohol to clean and remove any fingerprints.
 - b. Lubricate the rubber gaskets with either water or glycerin.

Note: Do not use silicone or petroleum based lubricants on the gaskets.

PVC handle on the anodized aluminum frame assembly



9. Gently insert the entire frame/handle assembly into the riser/chamber assembly using the white PVC handle. Make sure that the wide part of the subassembly is at right angles to the inlet and outlet pipes, and that the holes on the upper hub of the subassembly are set onto the two pins in the disinfection chamber. The orientation of the frame is very important for successful UV unit operation.



10. After tucking the extra lamp cord wire into the top of the riser pipe, place the junction box onto the 4 inch riser pipe and secure it with 2 set screws.

11. Install the Watertight Conduit connector to the side of the Junction Box and secure with the nut on the inside. Use a little RTV on the O-ring of the watertight conduit connector to assist in waterproofing.

Nut on back side of conduit connector



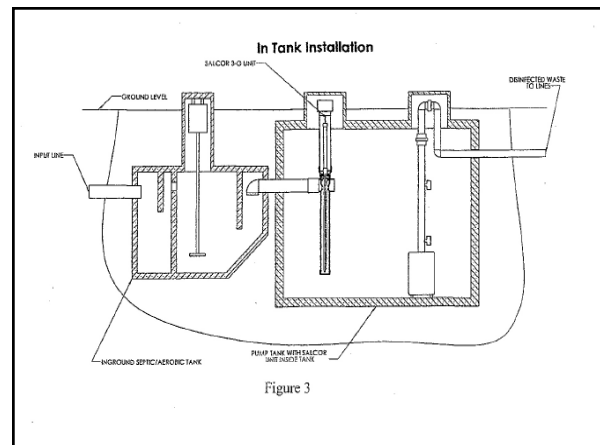
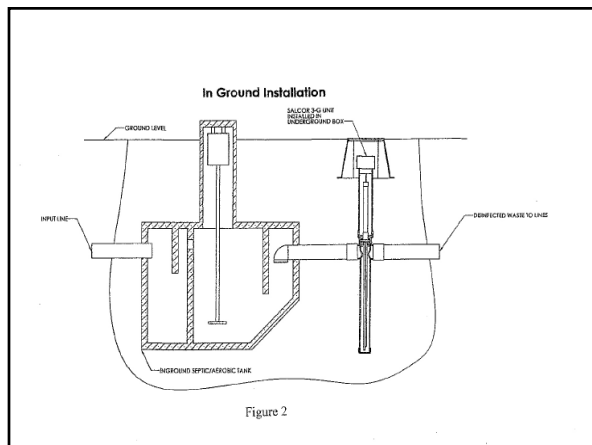
12. Bring the power wires and alarm wires into the junction box via the waterproof conduit connection. Seal the outside of the flexible conduit pipe to the waterproof connector with RTV. The **installer** is responsible for ensuring that the external flexible wire conduit connection(s) containing the power and/or alarm wires to the junction box are



WATERTIGHT.

Install watertight Conduit connector

13. Attach the cable wires to the appropriate terminals on the alarm board. See figure 4. The alarm contacts are compatible with both normally open (N/O) and normally closed (N/C) external alarm circuit units (furnished by others). Note: N/O means the contacts are **OPEN** when there is **NO POWER** to the alarm board relay. The contacts are rated for up to 240 volts and up to 2 Amps. Select the common contact terminal and then the N/C or N/O contact that complies with the receiving alarm panel circuit.
14. Attach the lid to the junction box with 4 screws.
15. The UV unit operates on 120 VAC single-phase (50 or 60 HZ) power and consumes 30 watts. A specific separate from pumps, etc. 10-15-amp circuit breaker on the main electrical panel should be used for service to the SALCOR Model 3G unit.
16. Allow the effluent to start flowing through the unit.
17. Turn on the breaker at the main electrical panel. The LED indicating light on the junction box lid should now be shining, indicating that the unit is operating properly.
18. The installation is now complete.



IV. MAINTENANCE AND SERVICE

The Salcor Model 3G UV disinfection unit is designed to provide a long service life. It is recommended that the UV lamp be replaced every two years to insure proper disinfection.

UV LAMP REPLACEMENT PROCEDURE

1. Turn off the dedicated breaker located in the main electrical panel that supplies power to the UV system.
2. Remove the electrical junction box from the UV disinfection chamber and carefully set it aside.
3. Using the power line connected to the UV Lamp Assembly, lift the Assembly out of the disinfection subassembly.
4. Loosen the Lamp Cord Grip at the top of the Lamp Assembly.
5. Disconnect the four pin connector attaching the power line to the UV lamp.
6. Connect the new lamp to the four-pin connector and completely lower the new lamp into the quartz tube of the UV subassembly.
7. Tuck the remaining power line into the riser pipe.
8. Insert the plastic section on the back side of the control center enclosure into the top of the riser pipe.
9. Turn on the dedicated breaker located in the main electrical panel that supplies power to the UV system.

It is recommended that the disinfection subassembly be removed and serviced (cleaned) a minimum of once per year to insure proper effluent disinfection.

TO CLEAN THE TEFLON® SHEATH AND DISINFECTION SUBASSEMBLY

1. Use a soft sponge and detergent to clean the surfaces, especially the Teflon® sleeve.
2. Use a soft cloth with isopropyl alcohol to remove difficult stains like finger prints and other films.

V. ELECTRICAL JUNCTION BOX LID

The Printed Circuit Alarm Board is permanently mounted on the Junction Box Lid. The power and alarm terminal strips are mounted on the Printed Circuit Alarm Board. The Ballast is also mounted on the Printed Circuit Board but is removable by maintenance personnel when it needs replacing.



Figure 4
Grounding Post Power Inlet Terminal Alarm Wire terminal block.

Connect alarm wires as needed for your specific circuit.
N/O or N/C describes the contact configuration when there is **NO POWER APPLIED** to the relay.
Another way of designating the N/O or N/C condition is that the relay contacts are in that state when the relay is **NOT ENERGIZED!**

SALCOR INC
P.O. Box 1090 Fallbrook, CA 92088-1090
Telephone: 760-731-0745
Fax: 760-731-2405

LIMITED WARRANTY SALCOR MODEL 3G UV DISINFECTION UNIT

This warranty is given by SALCOR Inc. for the benefit of the first purchaser of the product to which the warranty applies, the warranty applies only to those parts which are manufactured and delivered by SALCOR Inc. The warranty is that the parts manufactured and delivered by SALCOR Inc. will be free from defects in the material or workmanship under normal use and service according to the Installation and Operating Instructions for the time specified below.

In the event of a failure of a part due to such a covered defect, SALCOR Inc. will repair or replace, at its option, the defective part at its factory located at 447-D Ammunition Road, Fallbrook, CA 92028. At the option of SALCOR Inc, repairs or replacement may be made at the site of equipment installation.

The part must be returned to the factory at the expense of the person claiming the benefit of the warranty unless SALCOR Inc. elects to repair or replace the defective part at the installed site.

The warranty shall be for a period of twenty four (24) months after the date of delivery of the product, or the specified service life of the product, whichever period is the shortest. All products for which warranty claims are filed must be returned as provided above to the factory within thirty (30) days from the date of the claimed malfunction in order for this warranty to be effective. The only entity authorized to do any warranty repairs is SALCOR Inc.

The repairs or replacement by SALCOR Inc. will be accomplished within twenty (20) days from receipt of the defective parts at the factory.

This warranty is expressed in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose, and of all other obligations or liabilities on the part of SALCOR Inc., and it neither assumes nor authorizes any other persons to assume for SALCOR Inc. any other liabilities in connection with the sale of the products. This warranty does not cover parts of products made by others, or products or any part thereof which have been repaired or altered, except by SALCOR Inc., which shall have been subjected to misuses, negligence, or accident. SALCOR Inc. shall not be liable for damage or delay suffered by the purchaser regardless of whether such damages are general, special, or consequential in nature whether caused by defective material or workmanship, or otherwise, or whether caused by SALCOR Inc. negligence, regardless of degree.

A few older UV installations
and how they look today





Recent Installations

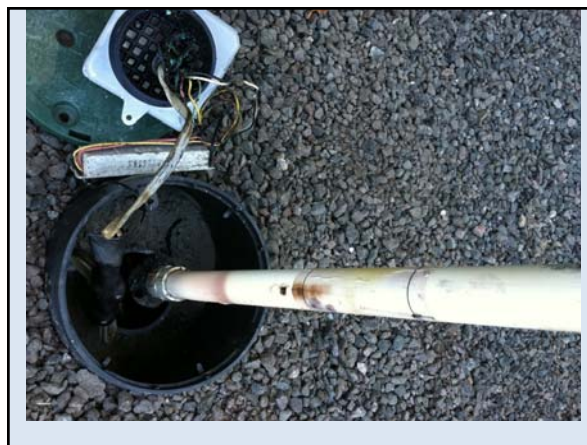
- Fast to pressure
- UV unit in pump tank, ABS piping
- UV unit in pump tank using Fernco

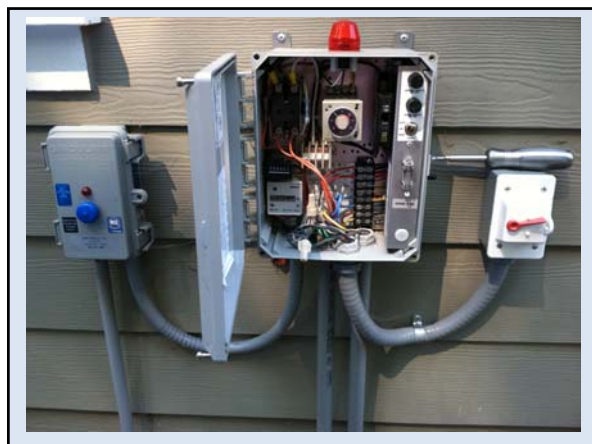
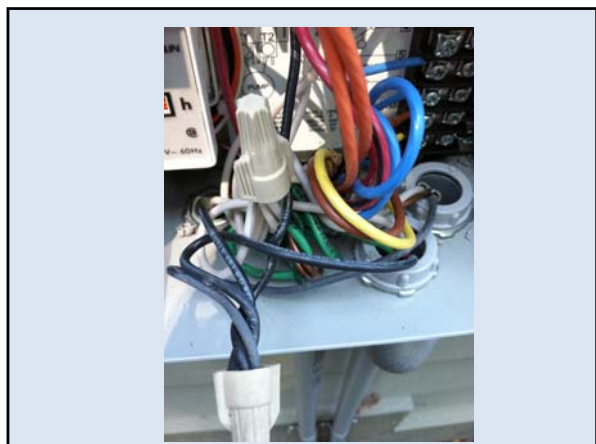




Norweco to Pressure

- 1 year old
- Burned and still live, no breakers tripped and fuses still intact
- One circuit for everything
- Bulb melted down in crystal





Norweco to Pressure – new

- Installation issues
- Electrician issues
- Control panel placement
- Landscape issues
- Signed off..... and will fail







Uv 'Disinfector'

- Power still on and smoking



Creative Wiring





Recent Installations

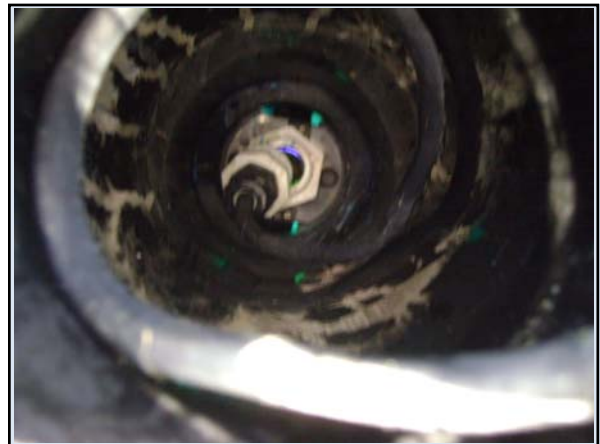
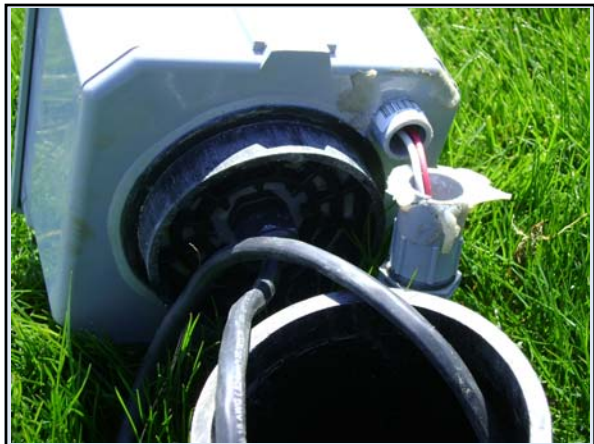
- Accesibility
- Deposits on bulb
- Cleaning the Teflon Sheath





More creative wiring

- Improper glue used
- Not enough slack
- Box 'repaired'
- Accessibility
- Crystal and connection burned
- Wire connectors

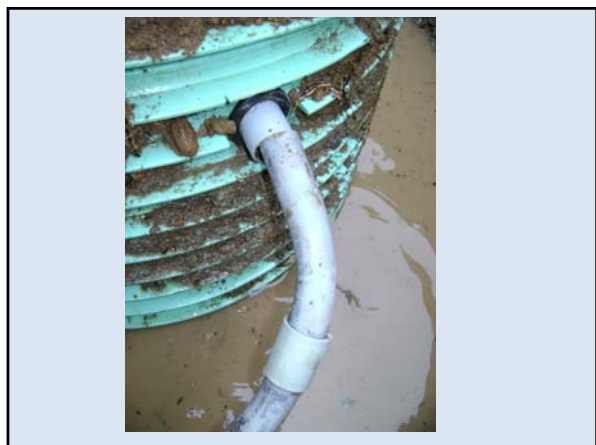
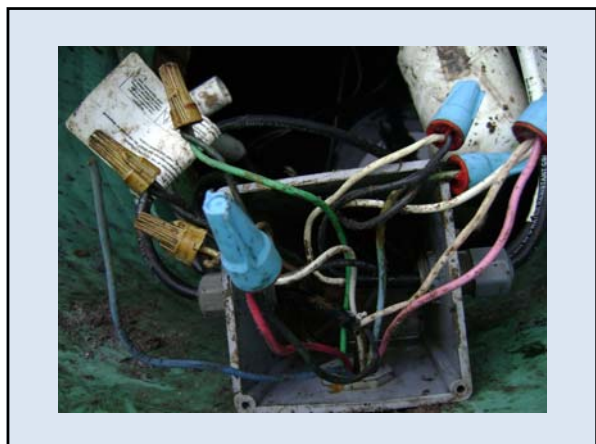




Bad Installation Practices are Common

- Junction boxes
- Conduit
- Service providers





Settling Issues

- Quick to backfill....
- Often big consequences



Salcor install

- Settling problem
- Bends or breaks the abs piping



Improper backfill

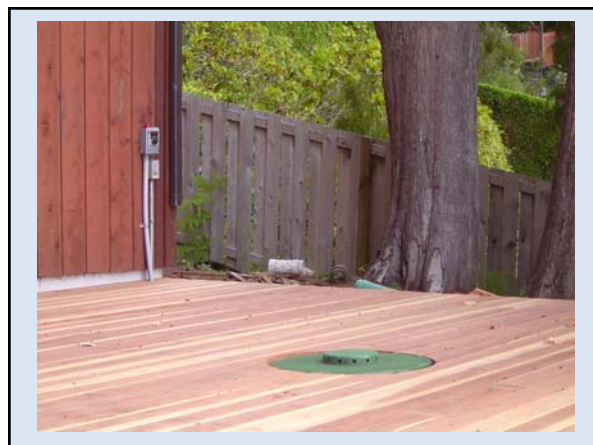
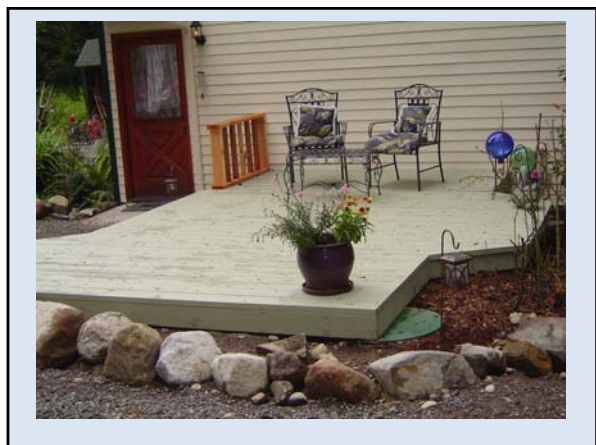
- Warped, bent piping or broken connections
- Tilted baffles
- Other consequences
- How to correct?



Homeowners.....

- Accessibility – they don't believe in it
- Educate them from the start





Control Panel Placement

- Too low
- Practicality of monitoring
- Liability





Waste strength

- Needs to be clean enough for UV to work
- Filters
- Turbidity

