



OptiVenn™ Series

Operation and Maintenance

User Manual

Original Instructions

Edition 8





If you require technical assistance, please contact Aquafine Corporation Technical Support using the contact information below:

Telephone: 1-661-257-4770
E-mail: techservice@trojantechnologies.com

At the time of publishing, the information within this document is current. Due to continuous improvements, we may have future changes and recommendations which will be sent via product bulletins.

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Section 1 Specifications

Specifications are subject to change without notice.

General			
Fluid Standard Temperature Range	40°F to 104°F (5°C to 40°C)		
Fluid High Temperature Range (Liquid Sugar Applications only)	40°F to 131°F (5°C to 55°C)		
Ambient Air Temperature	34°F to 104°F (1°C to 40°C)		
Ambient Storage Temperature	-4°F to 104°F (-20°C to 40°C)		
Ambient Relative Humidity	10% to 90%, non-condensing		
Control Power Panel			
Supply Voltage	Refer to Component Label		
Environmental Rating			
Material			
Weight			
UV Chamber			
Operating Pressure (maximum)	150 psi (10 bar)		
Material	316L Stainless Steel		
Weight	Model	Diameter (in.)	Weight (lbs / kg)
	01CDS, 02CDS, 03CDS	6	75 / 34
	02CDM, 03CDM, 04CDM, 04CTM, 06CTM	6	190 / 86
	04CDL	6	200 / 91
	02DDM, 04DDM, 08DTM, 12DTM	8	220 / 100
	04DDL, 06DDL, 08DDL, 08DTL, 10DTL, 12DTL	8	235 / 107
	08EDL	10	305 / 138
	08FDL	12	430 / 195
	10GDL	14	285 / 129
12HDL	16	575 / 261	
<i>* Maximum allowable flow velocity at inlet is 8 ft/sec (2.5 m/s).</i>			
UV Lamp			
Type	Low pressure, High output (254 nm or 185 nm, with non-validated or validated options)		
Lamp Sleeve Material	Natural Quartz		
UV Lamp Driver			
Input	110-240 VAC, 50-60Hz		
UVI Sensor			
Output range	4 to 20 mA current loop (2 wire)		
Supply Voltage	24 VDC from the Control Power Panel		
Maximum Operational Temperature	131°F (55°C)		
Maximum Non Operational Temperature	194°F (90°C)		

Specifications

System Regulatory Compliance
cULus, CE, UKCA, NOM and KC optional

User Guide: *This device is a device that has been evaluated for use in a work environment and may be subject to radio interference if used in a home environment.*

Section 2 Safety Information

Please read this entire manual before operating this equipment. Pay attention to all danger, warning and caution statements in this manual. Failure to do so could result in serious personal injury or damage to the equipment.








Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in installation manual.

2.1 Use of Hazard Information
















⚠ DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION
Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE
Indicates a situation that is not related to personal injury.




2.2 Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	<p>Electrical equipment marked with this symbol may not be disposed of in European public disposal systems. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user.</p> <p>Note: For recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal. No equipment is to be returned without authorization. Local recycling programs may be used. For the manufacturer recycling UV Lamp program or producer-supplied electrical accessories and auxiliary items, contact the equipment supplier for proper disposal instructions.</p>
	This symbol indicates there is Mercury present.
	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. When on the equipment, refer to the Operational and Maintenance manual for additional safety information.
	This symbol indicates a risk of electrical shock and/or electrocution exists.
	This symbol indicates the marked item has stored energy. Obey procedures to wait 5 (five) minutes after disconnecting main power, to allow stored energy to dissipate.
	This symbol indicates the marked equipment may contain a component that can eject forcibly. Obey all procedures to safely depressurize.
	This symbol indicates corrosive material. Avoid inhalation, ingestion, or exposure to eyes and skin. Wear appropriate clothing and personal protective equipment.




Safety Information


	This symbol indicates the components of the system have been exposed to biohazardous waste.
	This symbol indicates a trained and competent lift operator should be used to move the equipment.
	This symbol indicates a body crush hazard. People should stay clear from under overhead loads.
	This symbol indicates surfaces may be slippery and there is a potential fall hazard.
	This symbol indicates there is a potential UV hazard. Proper protection must be worn.
	This symbol indicates the marked item could be hot and should not be touched without care.
	This symbol indicates that there is a potential ozone exposure hazard. Adequate ventilation is required.
	This symbol indicates that there is potential for VERY hot fluid to drain from UV Chamber openings. Allow fluid inside UV Chamber to cool before performing maintenance or service procedures.
	This symbol indicates that there is potential for VERY hot fluid spray from UV Chamber openings. Obey all procedures to safely depressurize. Allow fluid inside UV Chamber to cool before performing maintenance or service procedures.
	This symbol indicates the marked item should not be touched.
	This symbol indicates a risk of electrical shock and/or electrocution exists. All appropriate lockout tag out procedures must be obeyed.
	This symbol indicates to secure the device with a safety device / hook.
 <small>UV-C</small>	This symbol indicates a safety glasses with side protection is required for protection against UV exposure.
 <small>UV-C</small>	This symbol indicates a UV rated full face shield is required. Face shields are to be worn with safety glasses or safety goggles.
	This symbol indicates gloves must be worn.



	<p>This symbol indicates safety boots must be worn.</p>
	<p>This symbol indicates a hard hat must be worn.</p>
	<p>This symbol indicates the operator must read all available documentation to perform required procedures.</p>

2.3 Safety Precautions

Read the safety precautions in this section before doing maintenance, service or repair. Obey the instructions in the safety precautions. Failure to follow the instructions in the safety precautions can result in serious injury or death.

⚠ DANGER	
  	<p><i>Arc Flash and Shock Hazard - Live Electrical Circuit Present. Hazardous Voltage.</i></p> <ul style="list-style-type: none"> Failure to follow these instructions will result in electrical shock, injury or death from electrocution. Devices inside this equipment contain stored energy. NEVER work inside this equipment until at least 5 (five) minutes after disconnecting main power to allow stored energy to dissipate. Lockout tag out all sources of power before performing any inspection, repair, or maintenance. <i>There may be more than one source of power!</i>

⚠ DANGER	
	<p><i>Shock Hazard.</i></p> <ul style="list-style-type: none"> Failure to use manufacturer approved parts, including UV Lamps, may result in significant thermal damage to insulation systems which may result in the exposure of live parts.

⚠ DANGER	
 	<p><i>Pressurized Device - Impalement Hazard.</i></p> <ul style="list-style-type: none"> Failure to follow these instructions will result in serious injury or death due to forcible ejection of materials from UV Chamber. ALWAYS follow lockout tag out procedures. NEVER perform any physical inspection, repair, maintenance or service on UV Chamber unless UV Chamber has been isolated, depressurized and open to atmosphere. NEVER pressurize UV Chamber without service end cap properly installed. NEVER stand in front of UV Lamp section while UV Chamber is undergoing a hydrostatic pressure test. Stand to the side of the UV Chamber while looking for leaks. <i>If a leak is observed, depressurize immediately, drain, repair and retest.</i>

⚠ DANGER



Inhalation Hazard.

- Failure to follow these instructions will result in exposure to ozone.
- ALWAYS ensure adequate ventilation.

⚠ WARNING



Personal Injury Hazard.

- Use of parts not approved by the manufacturer may cause personal injury, damage to the UV system or malfunction of the UV System and may void the manufacturer's warranty.
- Use of UV Lamps and Lamp Drivers, not approved by the manufacturer, will void UL and CE product safety certifications.
- The parts listed in [Section 11](#) are approved by the manufacturer.

⚠ WARNING



Body Crush Hazard.

- Failure to follow these instructions could result in serious injury or death due to improper lifting procedures, underrated lifting equipment, and moving parts.
- ALWAYS secure with safety device.
- ALWAYS stay clear of elevated loads.
- ALWAYS comply with local safety regulations.

⚠ WARNING



Scald or Burn Hazard.

- Failure to follow these instructions could result in serious scalds or burns due to exposure to VERY hot fluid.
- Fluid inside UV Chamber may be very hot. Avoid severe burns.
- NEVER touch hot fluid.
- Allow fluid inside UV Chamber to cool before performing maintenance or service procedures.

⚠ CAUTION



UV Light Hazard.

- Failure to follow these instructions may result in serious burns to unprotected eyes and skin.
- ALWAYS use UV protective gear, including gloves and clothing and face shield, when UV light is present.
- NEVER look directly at illuminated UV Lamp, even with protective gear.
- NEVER illuminate UV Lamp if personnel may be directly exposed to UV light.

⚠ CAUTION



Burn Hazard.

- Failure to follow these instructions may result in minor or moderate injury due to burns.
- NEVER touch hot surface.
- Allow UV Lamps to cool for a minimum of 10 (ten) minutes before handling.
- If accidental exposure occurs, immediately cool affected area. Consult physician.



⚠ CAUTION



Slip and Fall Hazard.

- Failure to follow these instructions may result in injuries from a slip and fall.
- ALWAYS ensure safe footing.
- ALWAYS clean up spills promptly.
- ALWAYS comply with site specific safety protocols and procedures.

NOTICE



Mercury Chemical.

- UV Lamps contain a small amount of mercury in either elemental or bound amalgam state, depending on lamp type. These lamps are similar to fluorescent and compact fluorescent lamps (CFL). Always comply with local regulations governing the disposal of lamps containing mercury and the waste associated with breakage.
- NEVER use a vacuum cleaner to clean up broken lamps containing mercury. Vacuuming could spread mercury-containing powder or vapour.
- Thoroughly collect broken glass and trace amounts of mercury and place into a sealable bag or container. For further reference see the U.S. EPA guidelines <http://www.epa.gov/cfl/cleaning-broken-cfl>.
- If you have further questions about the safe clean-up of mercury containing lamps, contact the Aquafine service support group at techservice@trojantechnologies.com

NOTICE



Personal Protective Equipment Required.

- ALWAYS use appropriate eye, hand, and foot protection.
- ALWAYS wear UV-C safety glasses when around equipment or a UV-C faceshield with safety glasses or safety goggles when inspecting open running equipment.
- ALWAYS follow plant safety procedures and protocols.
- ALWAYS take all necessary precautions when working around, operating, or working on this equipment, if contamination of components is expected within this application due to effluent biological or chemical contaminants.

NOTICE



Only competent personnel should undertake operation, repairs, maintenance or servicing of equipment described in the product manual. Maintain the continuity of the lockout tag out between shifts. If you do not understand the information or procedure explanations in the product manual, STOP and contact your Service Provider for assistance.

NOTICE

The **OptiVenn** system model **01CDS, 02CDS, 03CDS, 02CDM, 03CDM, 04CDM, 04CDL, 02DDM, 04DDM, 04DDL, 06DDL, 08DDL, 08EDL, 08FDL, 10GDL** and **12HDL** inactivates *Escherichia coli* (E. coli) and Fecal Coliform.

The **OptiVenn** system model **04CTM, 06CTM, 08DTM, 12DTM, 08DTL, 10DTL** and **12DTL** breaks down trace levels of ozone, chlorine and total organic carbon.

The **OptiVenn LS** system model **02CDS, 03CDS, 02CDM, 03CDM, 04CDM, 04CDL, 02DDM, 04DDM, 04DDL, 06DDL, 08DDL, 08EDL, 08FDL, 10GDL** and **12HDL** inactivates *Alicyclobacillus*, *Salmonella* and *Escherichia coli* (E. coli).

NOTICE

The product has only the approvals listed and the registrations, certificates and declarations officially provided with the product. The usage of this product in an application for which it is not permitted is not approved by the manufacturer.



WARNING: This product can expose you to chemicals including phthalates, which is known to the State of California to cause cancer, and mercury, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Notes: 1) *Dispose of contaminated parts/components as per country requirements.*

2) *Refer to the Safety Data Sheets for accidental exposure to materials.*

2.4 Safety Features

The UV System has safety features that prevent personal injury:

- Service End Cap - The electrical power supplied to all lamp holders is turned off when the service end cap is removed.
- Door disconnect switch - A disconnect switch removes power to the UV System.

Section 3 General Information

The information in this manual has been carefully checked and is believed to be accurate. However, the manufacturer assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, the manufacturer reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation.

3.1 Acceptable Noise Levels

The airborne noise emissions, A-weighted emission sound pressure level, is not more than 70dB(A).

3.2 Patents and Permissions

The products described in this document may be protected by one or more patents in The United States of America, Canada and/or other countries. For a list of patents owned by Trojan Technologies, go to:

www.trojantechnologies.com/patents.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without written permission of Aquafine Corporation.

3.3 Abbreviations and Acronyms

Table 1 describes the abbreviations and acronyms included in this manual.

Table 1 Abbreviations and Acronyms

Abbreviation/Acronym	Description
AC	Alternating Current
AO	Analog Output
CE	Conformité Européenne (European Conformity)
CPP	Control Power Panel
cULus	Underwriters Laboratories Listed to Canadian and USA standards
EOL	End of Life
EPDM	Ethylene Propylene Diene Monomer
FKM	Fluorocarbon based fluoroelastomer material
HMI	Human Machine Interface
KC	Korea Certification
lbf.ft	Pounds force foot
lbf.in	Pounds force inch
LS	Liquid Sugar
N.m	Newton metre
NOM	Norma Oficial Mexicana
psi	pounds per square inch
TOC	Total Organic Compound
UKCA	UK Conformity Assessed
UV	Ultraviolet
UVI	Ultraviolet Intensity

General Information

3.4 System Overview

The system is a pressurized UV Chamber that uses high-output low pressure UV Lamps.

Figure 1 and Figure 2 show the UV Chamber components.

One Control Power Panel (CPP) provides the power distribution for one UV Chamber and controls the UV Chamber through a microprocessor user interface. Refer to Section 8.

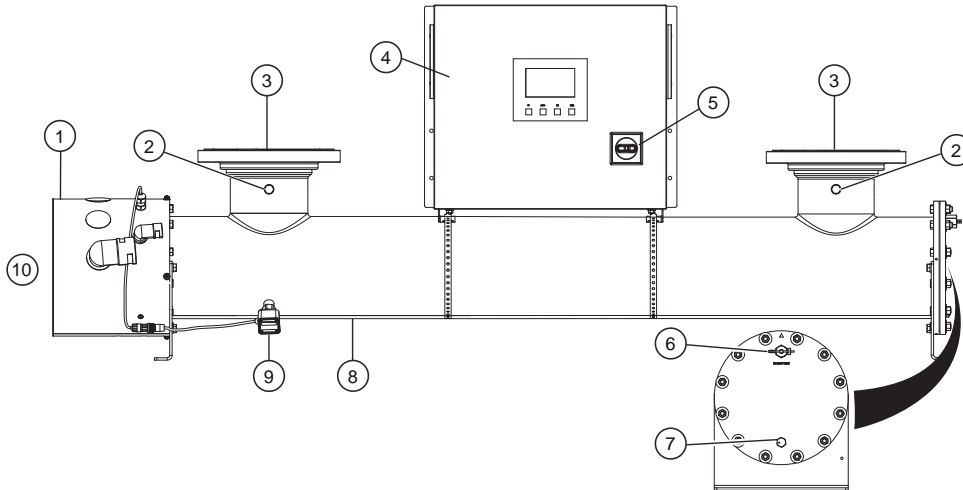


Figure 1 UV System with ANSI Flange Option

1	Service End Cap	2	Sample Port
3	Inlet/Outlet Connections - ANSI Flange	4	Control Power Panel
5	Disconnection Switch	6	Pressure Relief Kit
7	Drain Port	8	UV Chamber
9	UVI Sensor	10	Service End (Clearance required - Section 7.2)

Illustration showing UV System with ANSI Flange Option with local mounted CPP.

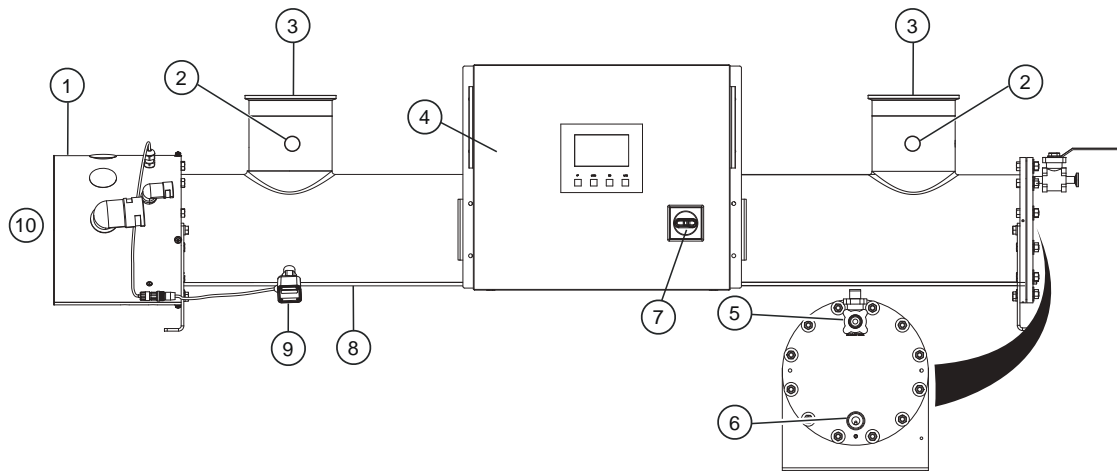


Figure 2 UV System with Sanitary Ferrule Option

1	Service End Cap	2	Sample Port
3	Inlet/Outlet Connections - Sanitary Ferrule	4	Control Power Panel
5	Pressure Relief Kit	6	Drain Port
7	Disconnection Switch	8	UV Chamber
9	UVI Sensor	10	Service End (Clearance required - Section 7.2)

Illustration showing UV System with Sanitary Ferrule Option with local mounted CPP.

3.4.1 UV Chamber

The UV Chamber contains the UV Lamps and Lamp Sleeves.

3.4.2 Control Power Panel

The CPP contains Lamp Drivers that power and control the UV Lamps.

For UV Systems without a Skid:

Depending on the UV System size, the CPP may be mounted locally on the UV Chamber or Remote to the UV Chamber. Refer to the provided General Outline drawing to determine CPP mounting options for the provided system.

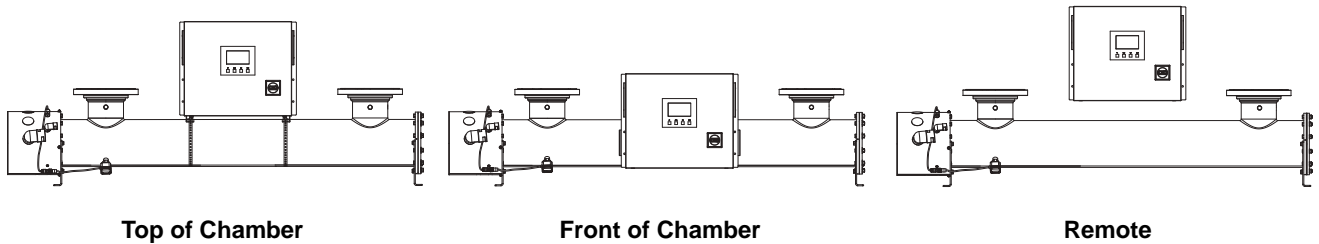


Figure 3 HMI Panel Locations

For UV Systems with a Skid:

The CPP will be mounted on the skid frame.

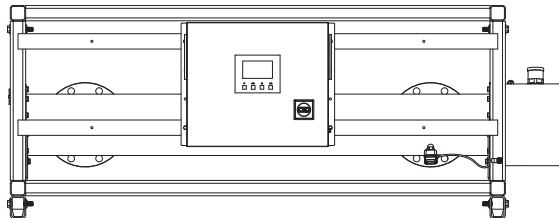


Figure 4 Control Power Panel (Skid Mounted)

Illustration showing Low Profile Skid Base.

3.4.3 Sample Ports

Two optional ports are available for obtaining fluid samples pre-and post UV Chamber.

3.4.4 UVI Sensor (Optional)

When a NIST traceable UVI Sensor is purchased the Certificate of Calibration is included with each unit. This certificate indicates the serial number of the UVI Sensor and provides date of calibration. Keep the certificate in a safe place.

The UVI Sensor is provided with O-Rings. The O-Rings are necessary to create the proper seal. Be sure that the O-Rings are present when installing the UVI Sensor into the Treatment Chamber.

Section 4 Lockout Tag Out

⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand the Operation and Maintenance Manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

The procedure in [Section 4.1](#) is the minimum lockout requirement. Use additional precautions, as needed. Obey all site-specific protocols.

4.1 Lockout Tag Out Procedure

4.1.1 Equipment Shutdown






Contact the plant manager or shift supervisor for help regarding equipment location and identification.



1. Ensure that no hazards will be created by equipment shutdown.
2. Shut down all equipment that will need lockout tag out.
3. Ensure that all moving parts come to a complete stop.

4.1.2 Deactivate Energy Sources

A hazardous energy source is any energy source that can cause serious personal injury or death. The potential hazardous energy sources in this manual are:

1. Identify and deactivate the main isolating device of each energy source:

-  Electrical Energy (Incoming Power)
-  Fluid Pressure (Potential Energy)
-  Thermal (Thermal Energy)
-  UV Light (Radiation Energy)
-  Mechanical (Kinetic Energy)

2.  Disconnect all electrical equipment from power:
 - Disconnect all electrical equipment
 - Power off and disconnect electrical power to hard-wired equipment
3.  Dissipate stored electrical energy in capacitors.
4. Close all shut-off valves.

Lockout Tag Out

4.1.3 Lockout Tag Out Energy Sources



1. Use a multi-lock scissor adaptor to lockout each energy source.
2. Attach a completed lockout tag. Include the required information:
 - Person and company applying the lockout
 - Reason for the lockout
 - Date of the lockout
3. Apply a personal lock.

4.1.4 Verify the Lockout



1. Ensure that the meter is working correctly with a test before and after measuring the de-energized source:
 - a. Test the voltmeter to a known, energized 24 VAC/120 VAC source.
 - b. Use the same voltmeter to test the locked-out energy sources to verify that there is no voltage.
 - c. Test the voltmeter again to a known, energized 24 VAC/120 VAC source.
2. Ensure that the stored energy sources have dissipated.
3. Try to start the de-energized equipment and verify that it does not start.

4.2 Remove the Lockout Tag Out

When the work is finished and the system has been restored to full operational condition, including closing all enclosure doors, the lockout tag out can be removed.

1. Ensure that no hazards will be created by removal of the lockout.
2. Obey manufacturer's instructions and safe work procedures to energize and start the equipment.

Section 5 System Startup and Shutdown

⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

NOTICE

Do not operate the UV System until the UV Chamber is completely filled with process fluid.

To prevent alarm conditions, overheating or equipment damage, process fluid level and flow in the UV Chamber must be established and maintained at all times when UV Lamps are in operation. Follow all provided site-specific instructions about automatic or manual power to operate the system.

5.1 Start-Up Procedure

5.1.1 Pre-Start Checklist:

1. UV Chamber should be filled with process fluid to be treated. The flow of fluid for the initial filing should not exceed 50 GPM (3.15 L/s). Failure to comply may result in Lamp Sleeve breakage. Ensure there are no system leaks and no piping connection leaks.
2. Check for complete assembly:
 - UV Chamber is fully assembled.
 - Make sure that drainage and by-pass provisions are ready.
 - UV Lamps and Lamp Sleeves are fully assembled and installed.
 - There is fluid in the UV Chamber.
 - There are no leaks in the UV Chamber.
 - The Service End Cap is fastened and secure at the end of the UV Chamber
 - If supplied, installation of UVI Sensor is complete, otherwise port is plugged.
 - Verify all incoming power connections conductors, including the ground conductor, are properly terminated.
 - Verify that the primary over-current protection device and circuit breaker are in the closed position.
 - Turn the main power disconnect switch to the “ON” position. The enclosure fans, Control Power Panel display screens and the Lamp Drivers will be energized.
3. For local ON/OFF control:
 - At the CPP → Turn the local disconnect switch to the ON position.
 - At the CPP HMI → Press ENTER, to power on the UV Lamps. Refer to [Section 8](#).
4. For remote ON/OFF control:
 - At the CPP HMI → Enable. These terminals require only a contact closure to operate the remote relay. When the microprocessor is set to “REMOTE” operation, the closure at these terminals will “START/STOP” the system from a remote location.

5.2 Shutdown Procedure

5.2.1 UV Unit

1. The Plant:

Stop the process flow through the UV Chamber as per site specific protocols.

2. For local ON/OFF control:

- At the CPP HMI → Press ENTER, to power on the UV Lamps. Refer to [Section 8](#).

3. For remote ON/OFF control:

- These terminals require only a contact closure to operate the remote relay. When the microprocessor is set to "REMOTE" operation, the closure at these terminals will "START/STOP" the system from a remote location.

4. At the CPP → Turn the local disconnect switch to the OFF position.

Section 6 Shipment and Storage

6.1 Shipping Contents

The system consists of two major components, the UV Chamber and the Control Power Panel. Some components may be disconnected at the UV Chamber for shipment.

6.2 How the equipment is shipped

The system is delivered to the site by truck. System components are packed in crates labeled with the component name. Other labels identify components which are fragile or breakable and components which must be kept dry.

To prepare for installation, remove only the shipping straps and bolts that secure the panel to the pallet.

6.3 Storage requirements before the install

The manufacturer recommends indoor storage of the system equipment. The equipment should be stored in a dry warehouse. Heating is not necessary during storage. However, before system start up, the equipment must be warmed to greater than 60°F (15°C) for a period of 24 hours.

Storage area conditions:

- Ambient air temperature between -4°F to 104°F (-20°C to 40°C)
- Relative humidity from 10% to 90%, non-condensing
- Free from dust and dirt ingress
- Must not contain corrosive or explosive gases
- Free from salt air
- Vermin free

If indoor storage is not possible, the panel may be stored outdoors, with additional conditions:

- Equipment is stored on high ground that is not susceptible to flooding.
- Equipment is elevated a minimum of 12 inches (300 mm) above the ground or as appropriate to prevent flooding.
- Equipment is completely covered with waterproof tarps to prevent exposure to the elements (e.g., rain, snow, sand, dust etc.). Tarps must be tight fitting, attached securely and examined regularly. Water and snow accumulation should be removed regularly.
- Equipment stored in crates should not be exposed to direct sunlight.
- Equipment can be stored in sea containers.

6.4 Overview of Equipment Connections

Refer to the general layout drawings provided by the manufacturer. If the supplied layout drawings do not match the site conditions, contact the manufacturer for assistance.

Section 7 Installation

⚠ DANGER



Obey all warning and caution statements. Refer to [Section 2](#).


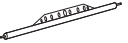
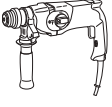
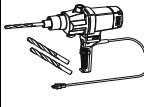
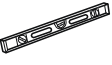

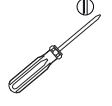



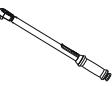




Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

7.1 Tools and Materials

Tools and materials are to be provided by the Installation Contractor unless otherwise specified.

Symbols	Description	Symbols	Description
	Lifting straps (properly sized and rated for equipment load)		Spreader Bar (properly sized and rated for equipment load)
	Drill - Concrete Hammer		Drill with bits
	Level		Tape measure
	Flat Screw Driver		Philips Screwdriver
	Wrench		Wrench - Adjustable
	Wrench - Torque		Wrench - Socket
	Punch Tool (for a 3/8" dowel pin)		Punch, Small Hammer
	Anti Seize		

All Aquafine products are carefully inspected and tested before shipment from our plant. Upon delivery, check the packaging and equipment for damage that occurred during shipment.

7.2 Pre-Installation

1. When preparing the site for installation, allow for valves, drain and bypass as part of your plumbing circuit.
2. It is recommended to have a provision to bypass and isolate the UV Chamber from flow, to allow for UV Chamber shutdown for maintenance and/or service purposes.
3. Connecting pipes to the UV System should be supported, to avoid any undue strain on the UV Chamber.
Note: *The UV System should not bear any load of the attached piping.*
4. For CPP side and front clearance refer to local codes for local minimum requirements.
5. Allow for sufficient service access around the UV Chamber. Depending on the UV Lamp length, the service clearance area required will vary:

UV Lamp Length	Service Area Clearance (Figure 1 and Figure 2)
15 inch	26 inches (660 mm)
30 inch	48 inches (1220 mm)
60 inch	72 inches (1830 mm)

6. If your piping system is subject to impulse pressure resulting in “water hammer” condition, a surge tank or other means must be provided to remove this condition; otherwise the extreme momentary pressure may rupture and fracture the Lamp Sleeves.
7. Avoid locations that experience vibration within proximity of heavy equipment or from erratic pumps. Excessive vibration from other equipment can cause damage to UV Lamps within the UV Chamber.

7.3 UV Chamber

The UV Chamber may be installed with or without a skid.

Installations without a skid

The UV Chamber is required to be supported by piping supports provided by others (Section 7.3.1). The Control Power Panel can be wall mounted or it can be mounted onto the UV Chamber, either on top or in front (Section 7.4).

Installations with a Skid

The UV Chamber and the Control Power Panel are supported by the supplied skid. Skids are capable of stacking one (1), two (2) or three (3) UV Chambers and Control Power Panels high (Section 7.3.4). The base skid provided may be either Low Profile (Section 7.3.2) or High Profile (Section 7.3.3).

Note: *The UV Chamber and Control Power Panel will be assembled onto the skid prior to shipment.*

NOTICE

FOR LIQUID SUGAR, FOOD & BEVERAGE APPLICATIONS

Good Manufacturing Practice (GMP) requires a thorough cleaning of food contact surfaces. Ensure all wetted surfaces in the UV Chamber are cleaned and sanitized in accordance with the facility standard operating procedures and / or local regulatory requirements.

7.3.1 Install the UV Chamber without a Skid

7.3.1.1 Orientate the UV Chamber

Prerequisites:

- Clear area where the UV Chamber will be installed.
- Remove UVI Sensor if lifting straps interfere with the UVI Sensor Assembly. Refer to [Section 9.8](#).

Tools:



Materials:



- Mounting hardware (by others)
- Shim (by others)

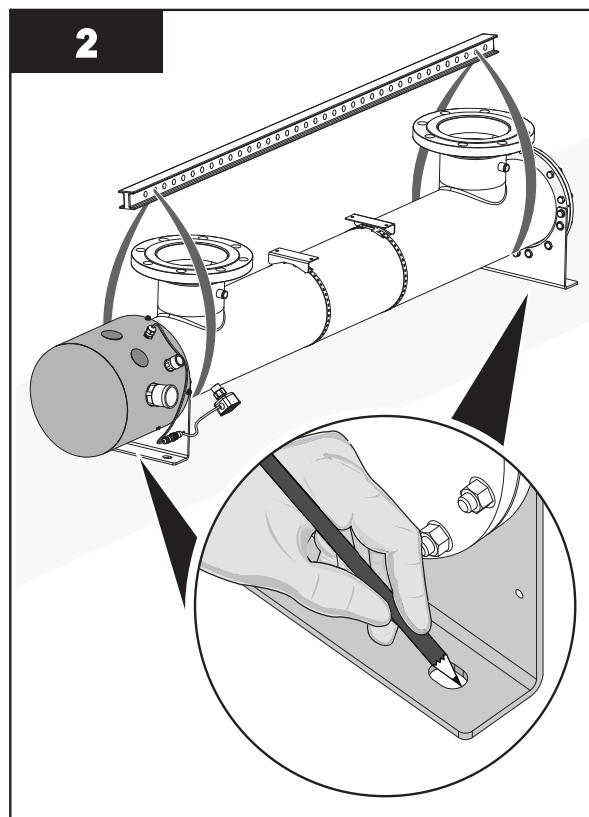
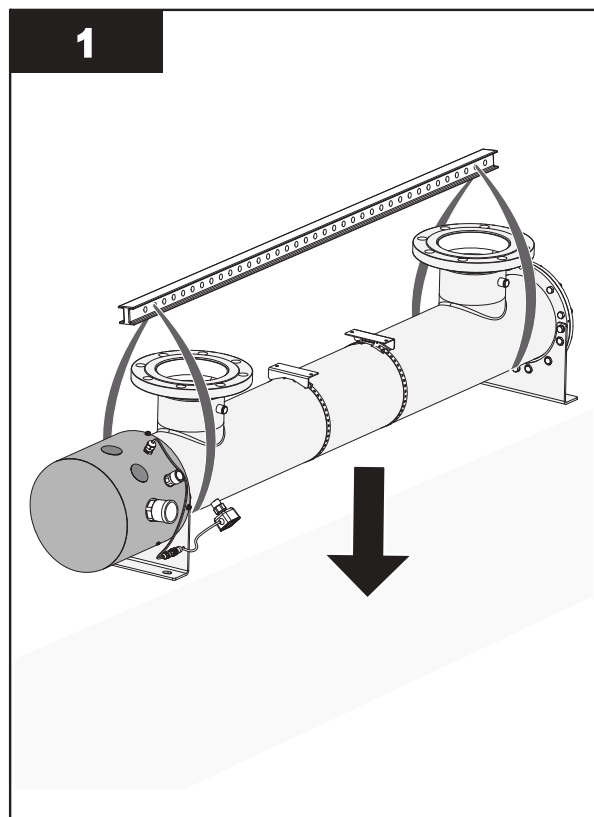
Procedure:

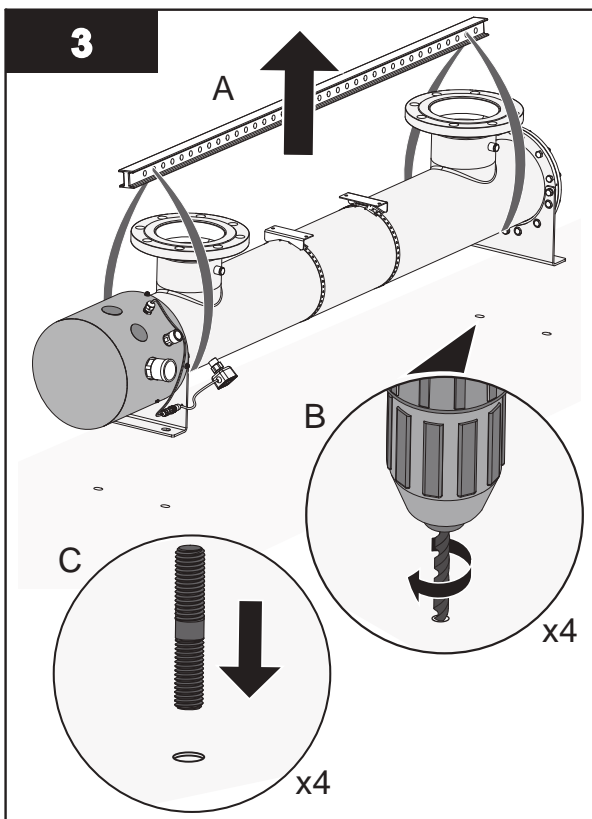


NOTICE

Orientate the service end (i.e. Service End Cap) in the required service direction. Allow sufficient service access clearance for the UV Lamps and Lamp Sleeves, refer to table in [Section 7.2](#), step 5.

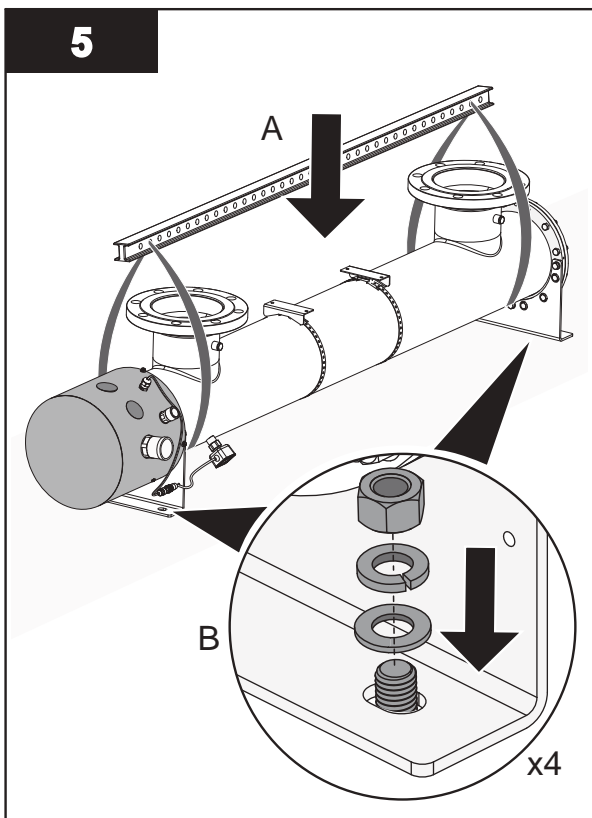
UV Chambers are delivered with the inlet and outlet connections in a 12 o'clock orientation. Follow the steps in [Section 7.3.1.2](#) to change the orientation.





4. If the UV Chamber is:

- a. required to be rotated to a 3, 6 or 9 o'clock orientation, proceed to [Section 7.3.1.2](#).
- b. not required to be rotated, proceed to step 5.



Note: Loosely install the mounting hardware.

6. Level the UV Chamber from side to side and front to back (horizontal).
7. Tighten the mounting hardware.
8. Remove the lifting straps.
9. Install UVI Sensor, if previously removed. Refer to [Section 9.8](#).
10. Connect UV Chamber Inlet and Outlet to Plant process piping:
 - For UV Chamber with ANSI Flanges, refer to [Section 7.3.5](#).
 - For UV Chamber with Sanitary Flanges, refer to [Section 7.3.6](#).

7.3.1.2 Rotate the UV Chamber Inlet and Outlet Connections

The UV Chamber is delivered with the inlet and outlet connections in a 12 o'clock orientation. Depending on site-specific requirements, the UV Chamber can be rotated to a 3'o, 6'o or 9 o'clock orientation. Refer to [Figure 5](#).

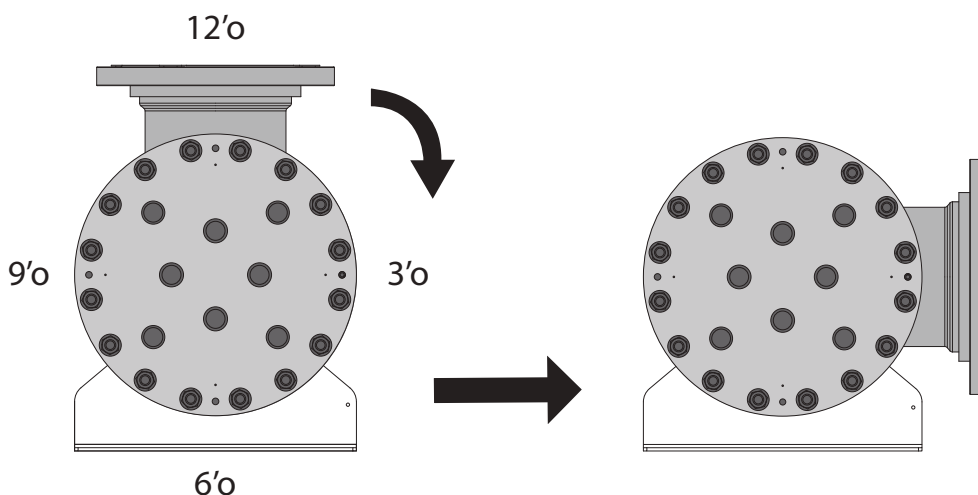


Figure 5 UV Chamber Inlet and Outlet Orientations

Prerequisites:

- Orientate the UV Chamber. Refer to [Section 7.3.1.1](#)

Tools:



Materials:

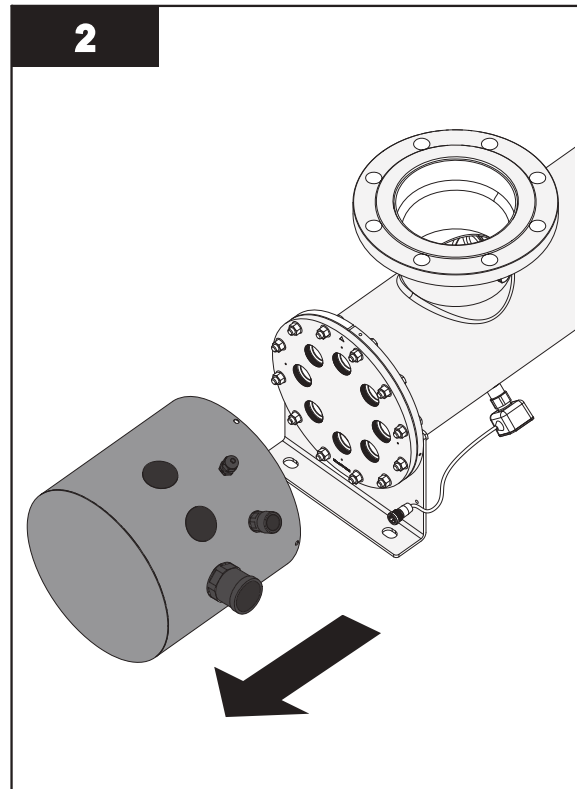
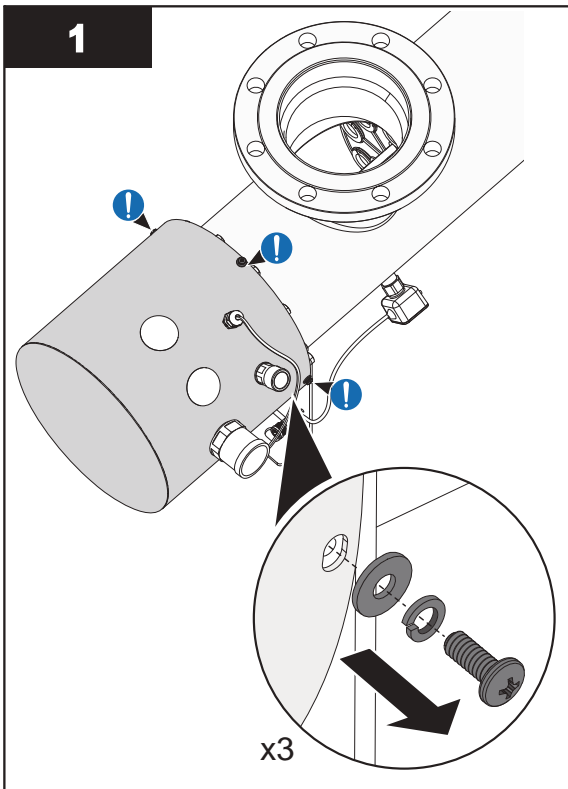


- Mounting hardware (by others)
- Shim (by others)

Procedure:

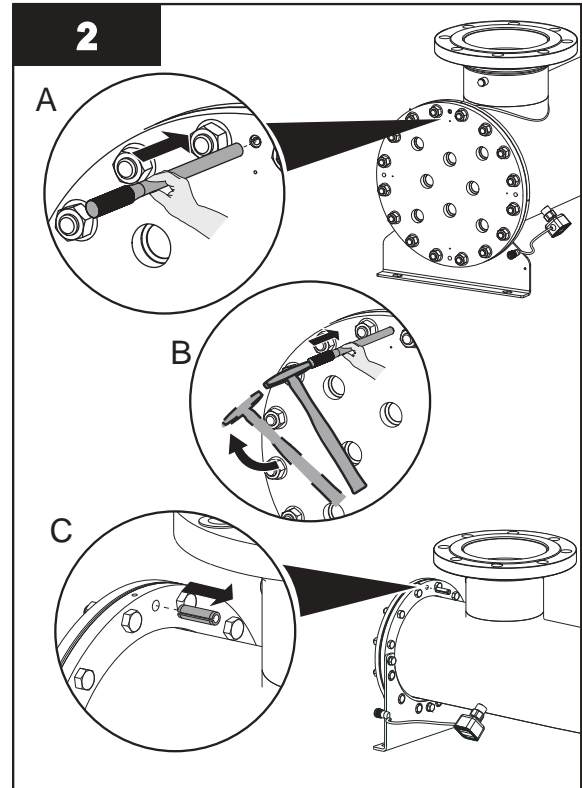
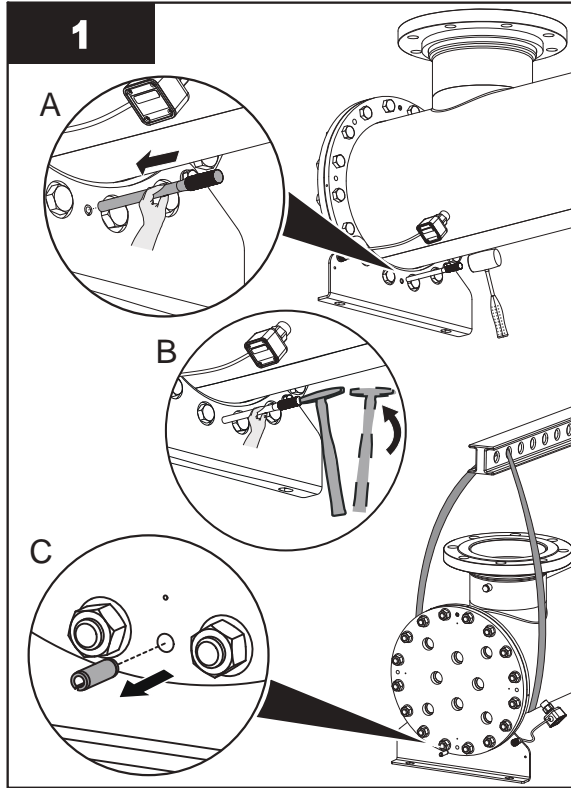


Note: The procedure below demonstrates rotating the UV Chamber from 12'o to 3 o'clock orientation. The procedure will vary depending on site-specific orientation required.

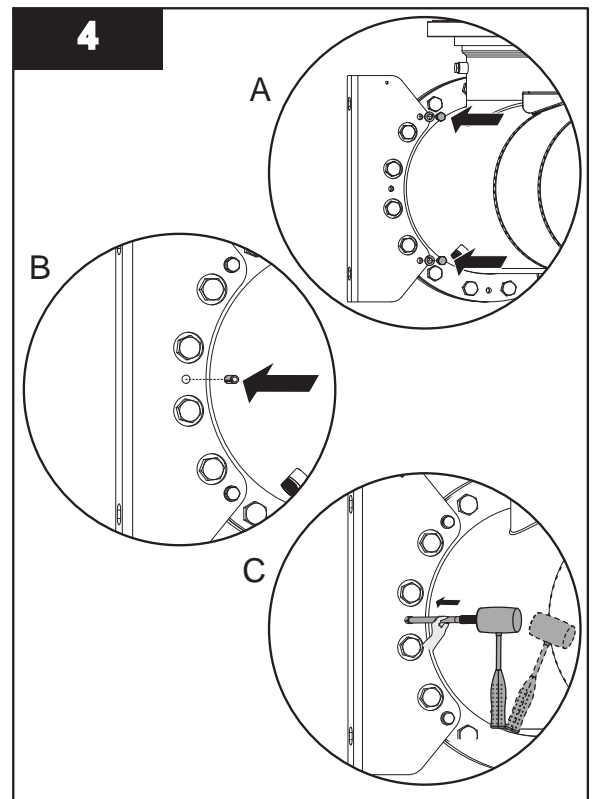
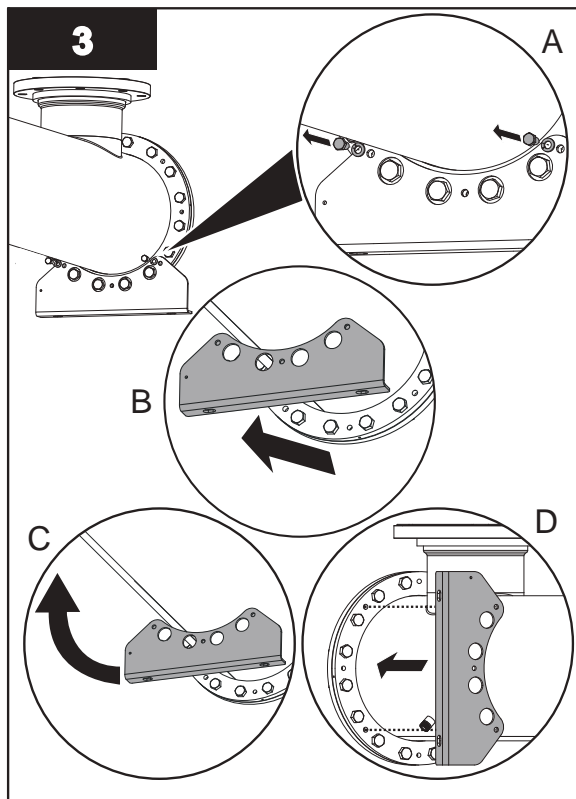


3. For UV Chamber Diameter:
- a. 12 Inches or greater, go to [Section 7.3.1.2.1](#).
 - b. 10 Inches or less, go to [Section 7.3.1.2.2](#).

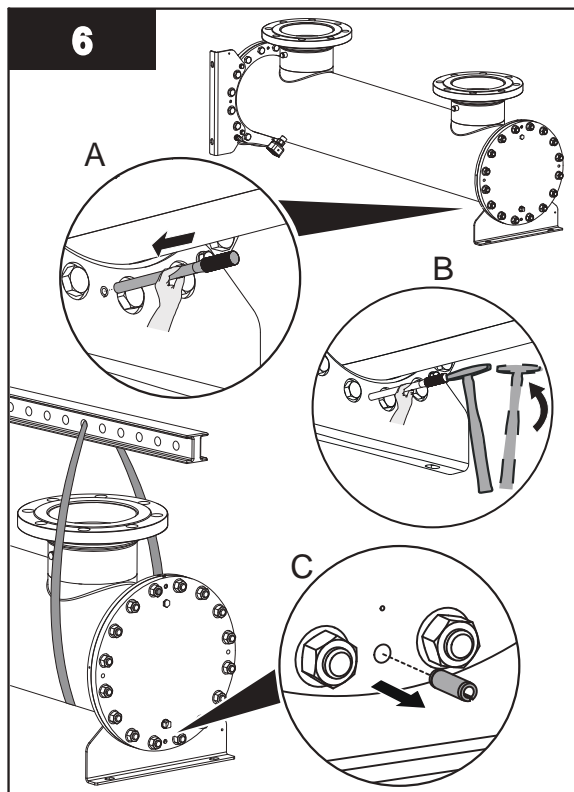
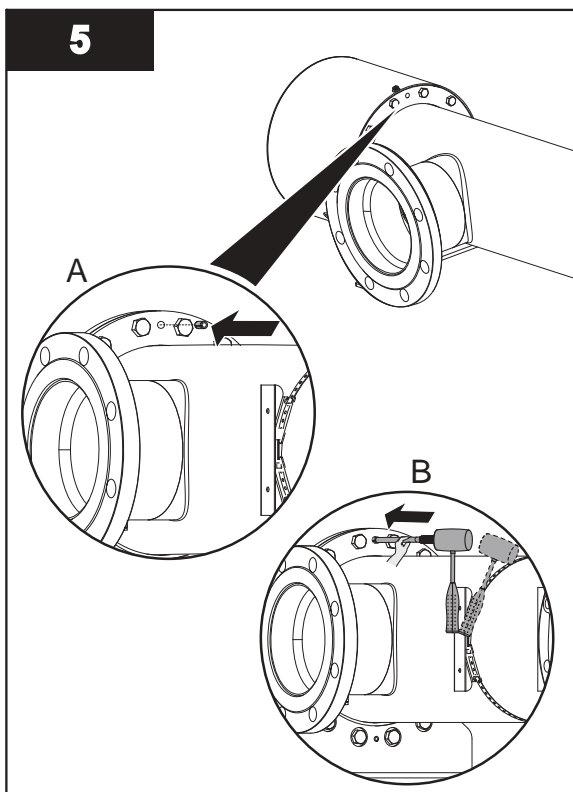
7.3.1.2.1 UV Chamber Diameter: 12 inches or greater



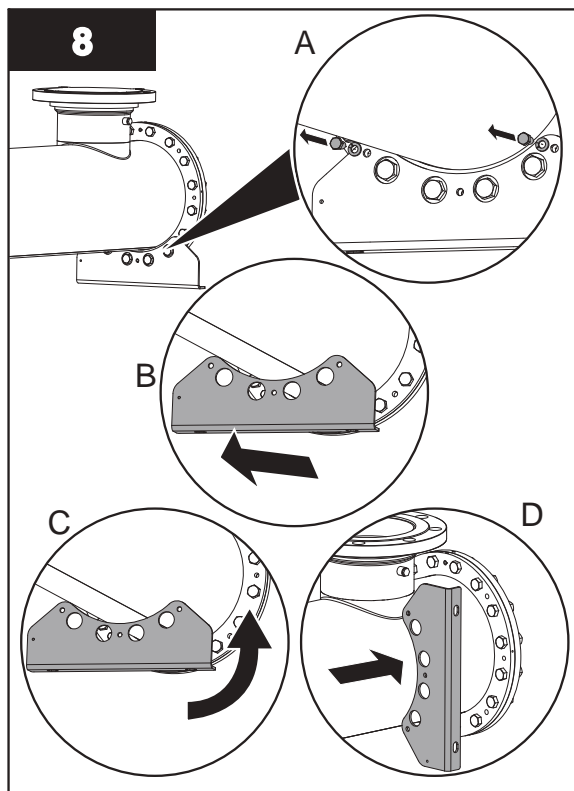
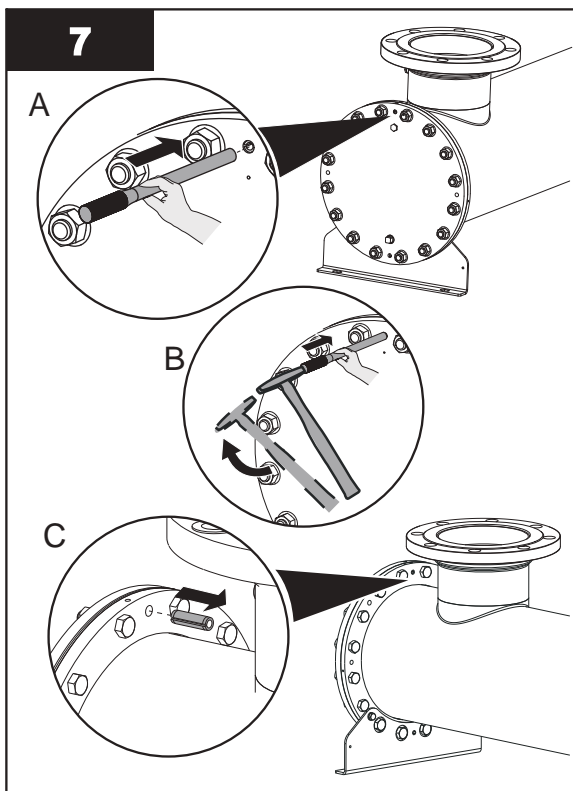
Note: Lift the UV Chamber as required before removing the spring pin.

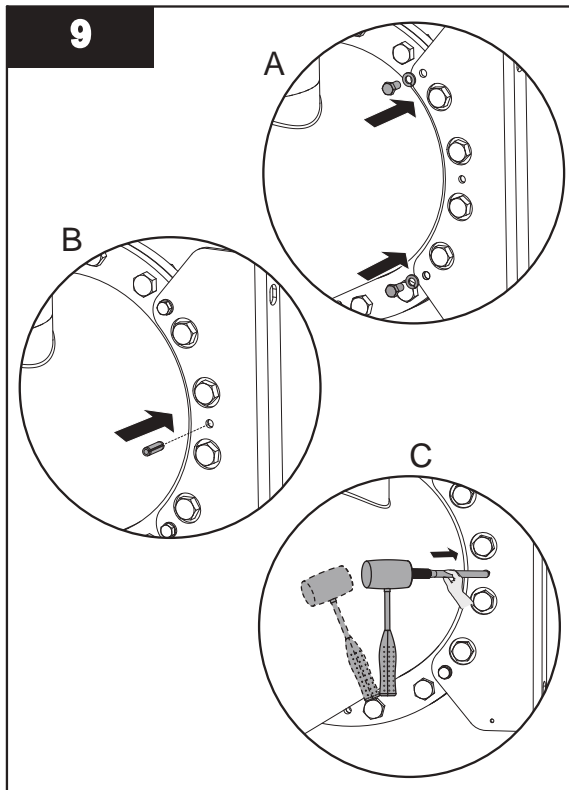


Note: Do not tighten down bolts and washers until the dowel pin is secured in place.

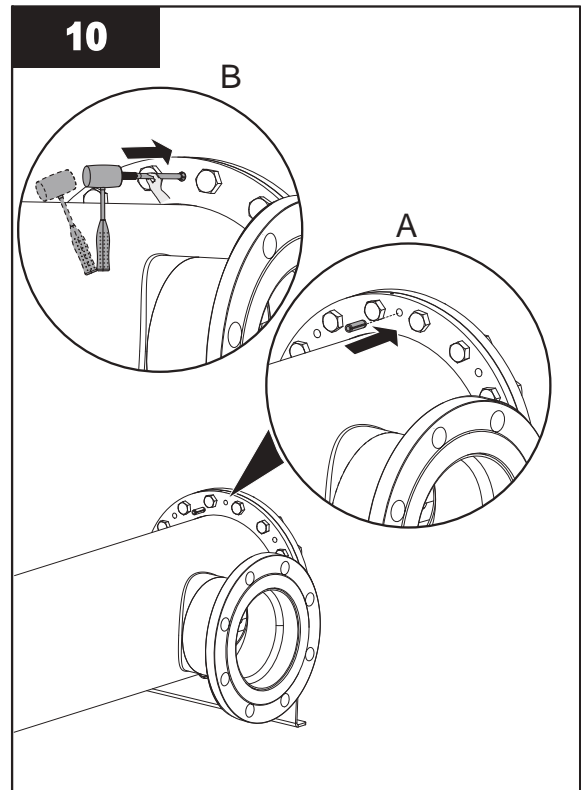


Note: Install the spring pin removed in Step 2 into the hole at the top of UV Chamber.

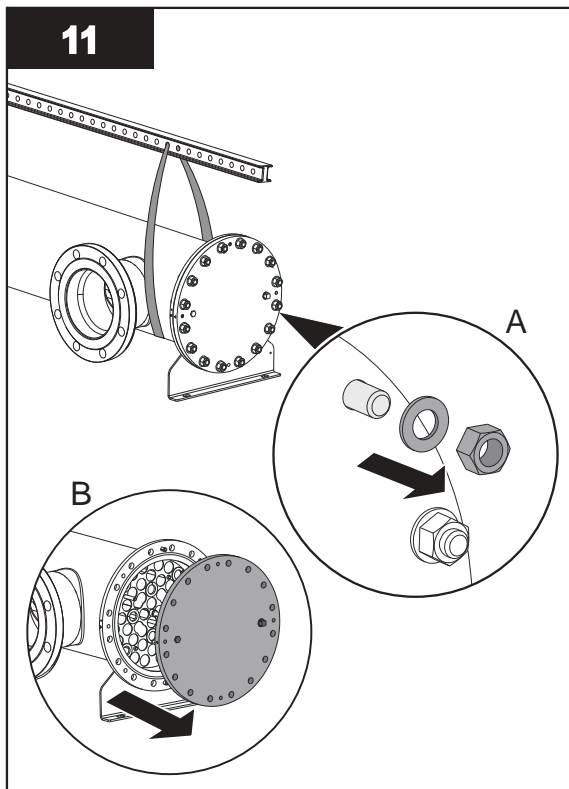




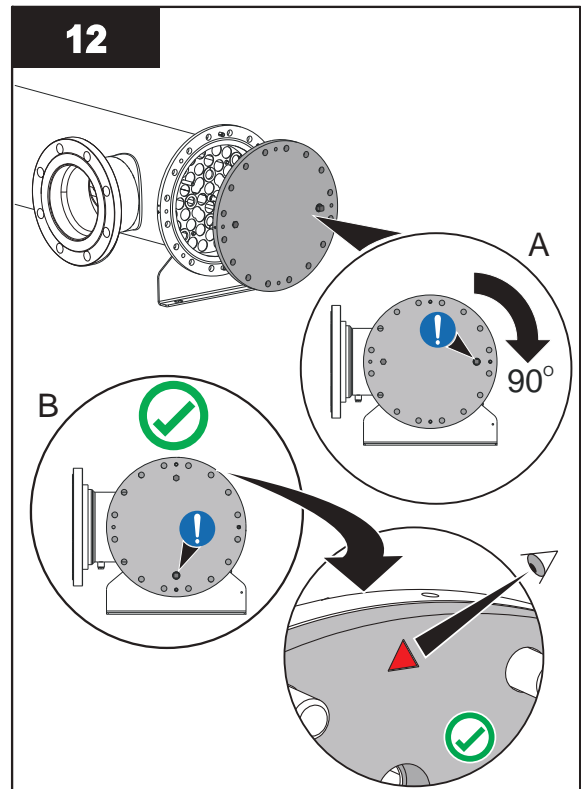
Note: Do not tighten down bolts and washers until the dowel pin is secured in place.



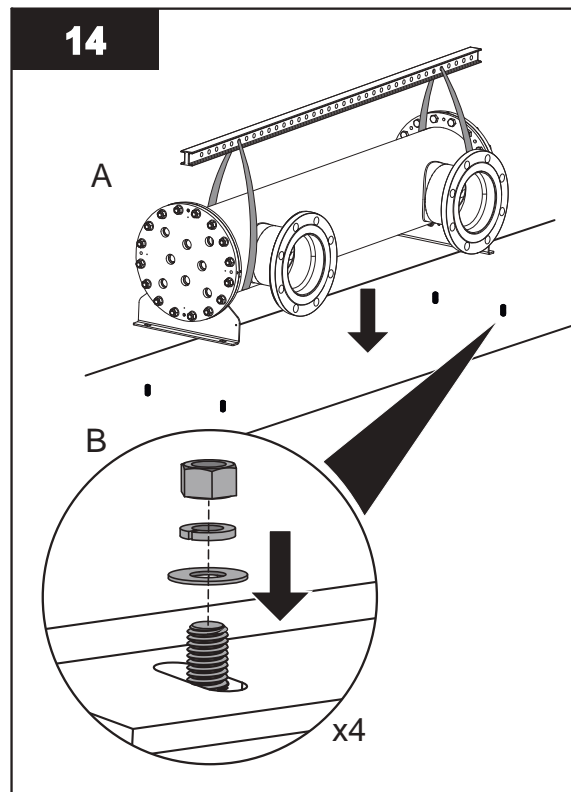
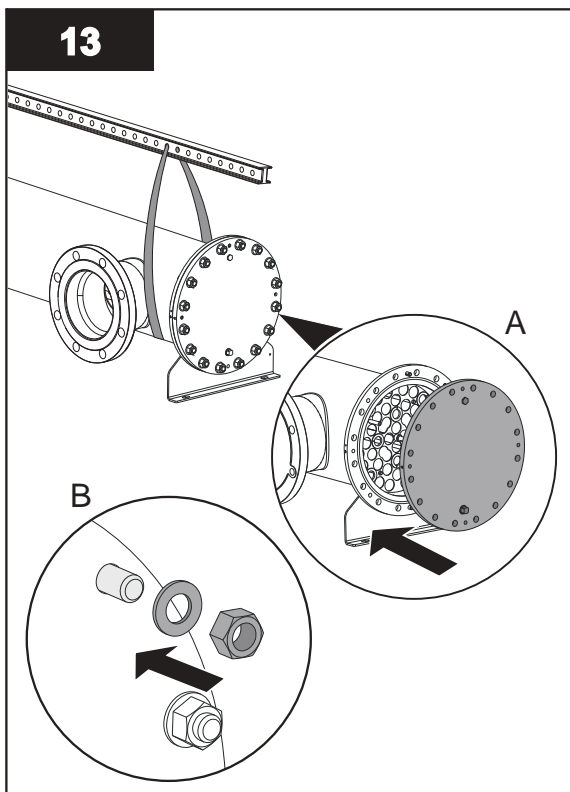
Note: Install the spring pin removed in Step 7 into the hole at the top of UV Chamber.



Note: Remove all end plate mounting hardware.



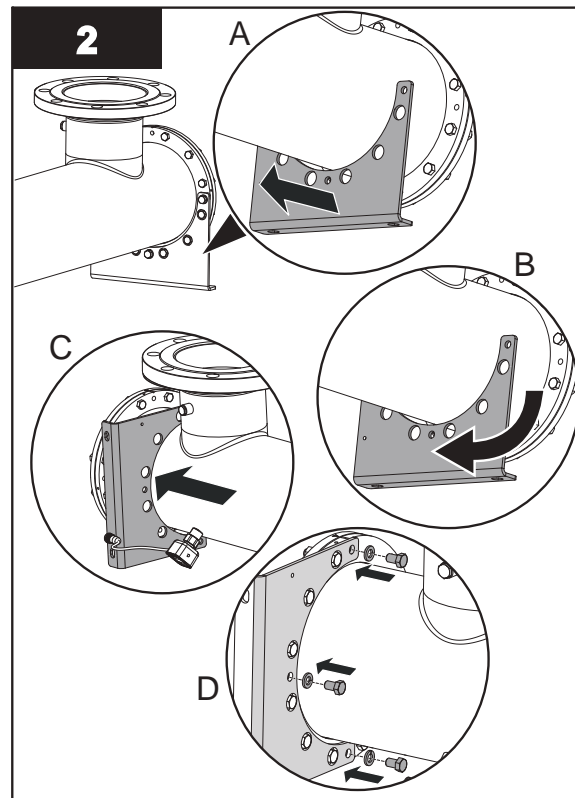
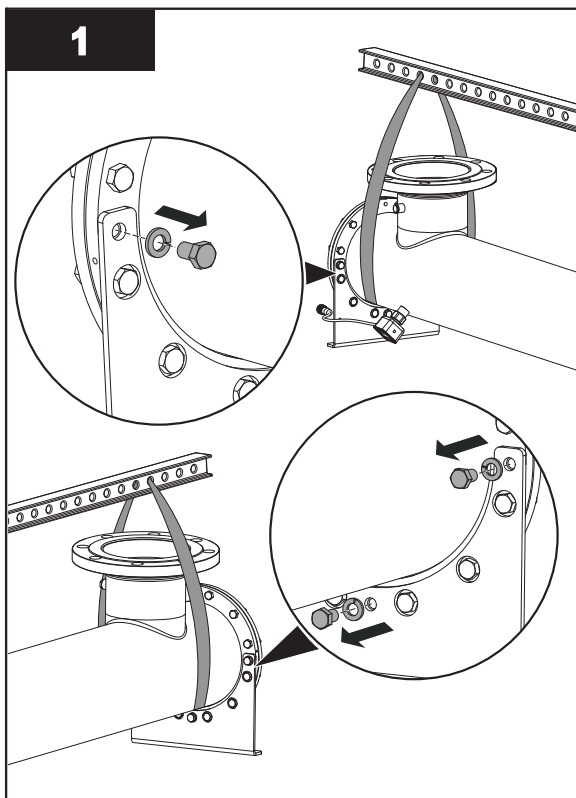
Notes: 1) Position the drain at the bottom of the end plate.
2) Make sure the orientation mark on the end plate is pointing up as shown.

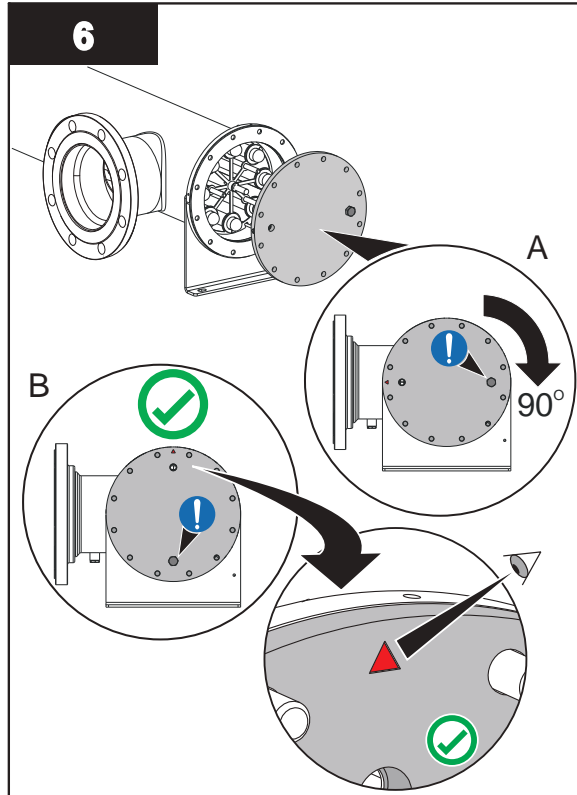
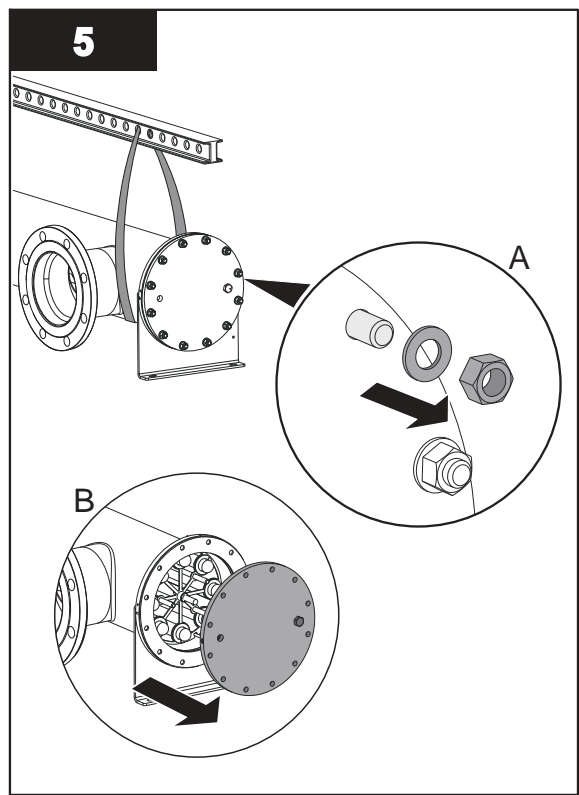
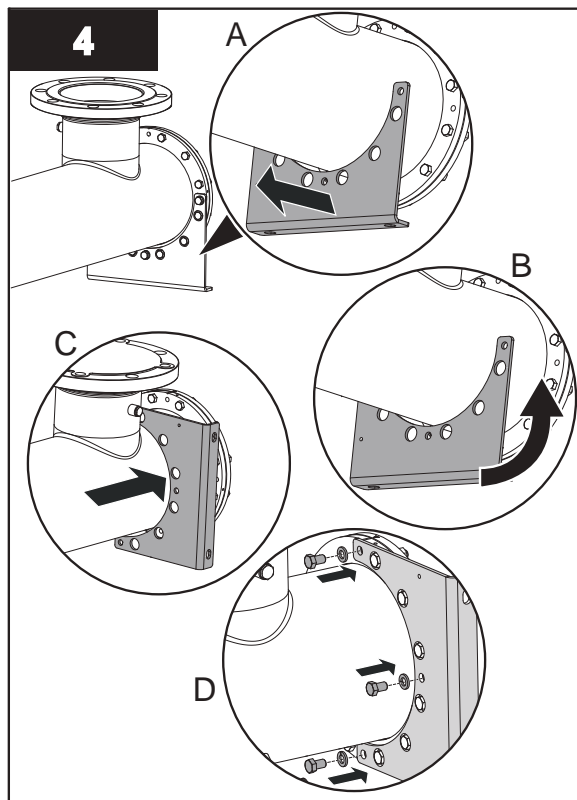
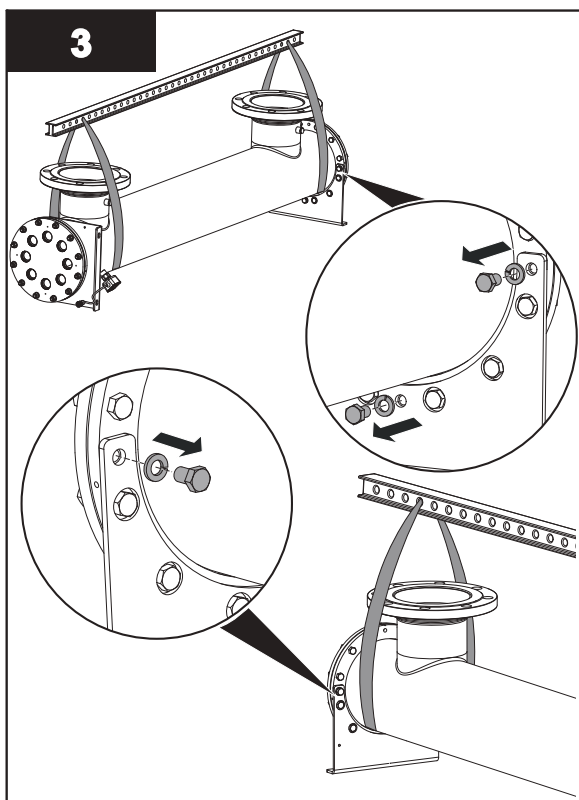


Note: Install all end plate mounting hardware.

15. Go to [Section 7.3.1.2.3](#).

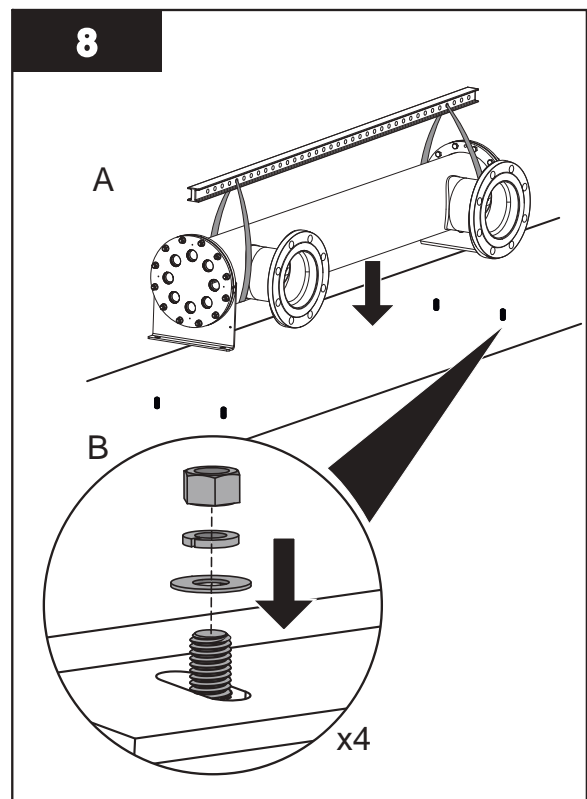
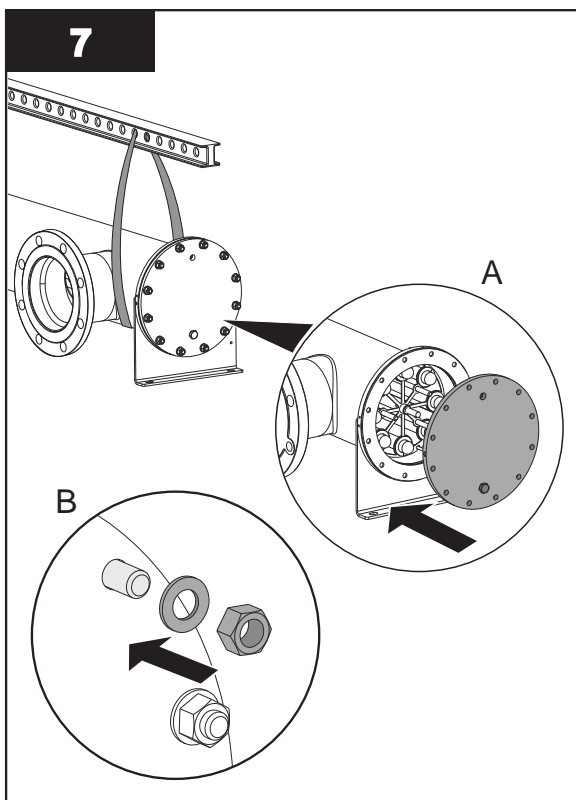
7.3.1.2.2 UV Chamber Diameter: 10 inches or less





Note: Remove all end plate mounting hardware.

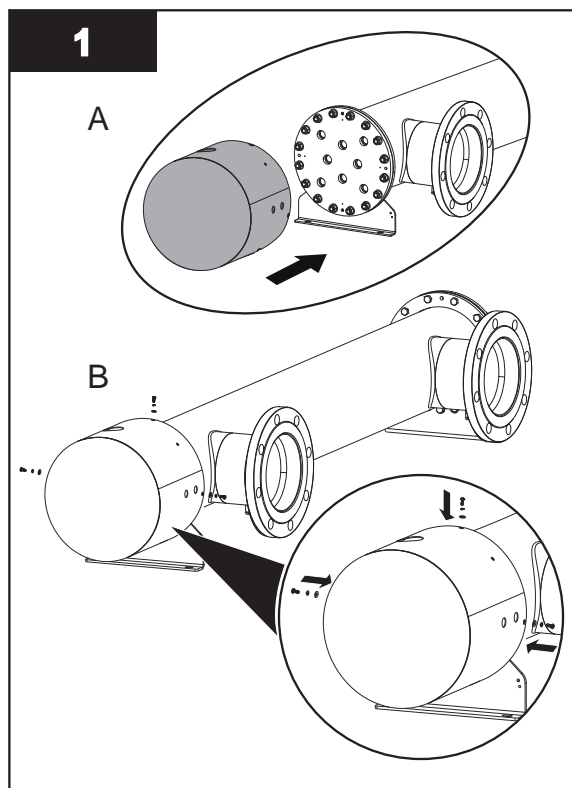
Notes: 1) Position the drain at the bottom of the end plate.
2) Make sure the orientation mark on the end plate is pointing up as shown.



Note: Install all end plate mounting hardware.

9. Go to [Section 7.3.1.2.3](#).

7.3.1.2.3 Service End Cap Installation



Note: It is recommended to orientate the lamp cable connection side of the service end cap, opposite to the UV Chamber inlet and outlet connections.

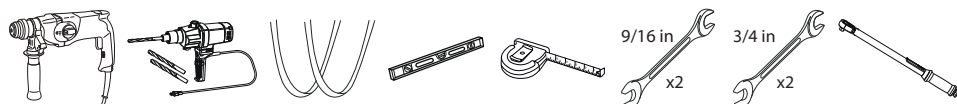
2. Remove the lifting straps.
3. Install UVI Sensor, if previously removed. Refer to [Section 9.8](#).
4. Connect UV Chamber Inlet and Outlet to Plant process piping:
 - For UV Chamber with ANSI Flanges, refer to [Section 7.3.5](#).
 - For UV Chamber with Sanitary Flanges, refer to [Section 7.3.6](#).

7.3.2 Install a UV Chamber with Low Profile Skid Base

Prerequisites:

- Clear the area where the UV Chamber will be installed.

Tools:



- Lifting Strap protective pads (x4) (by others)

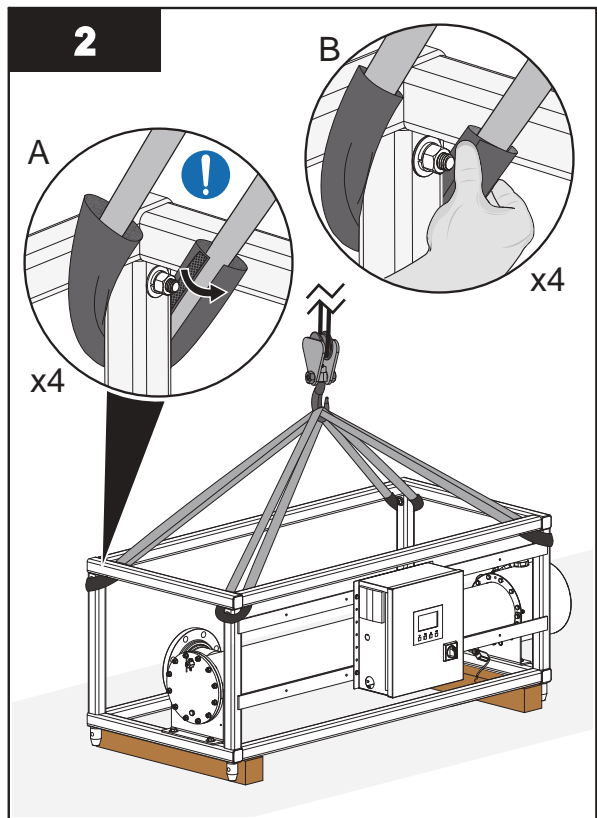
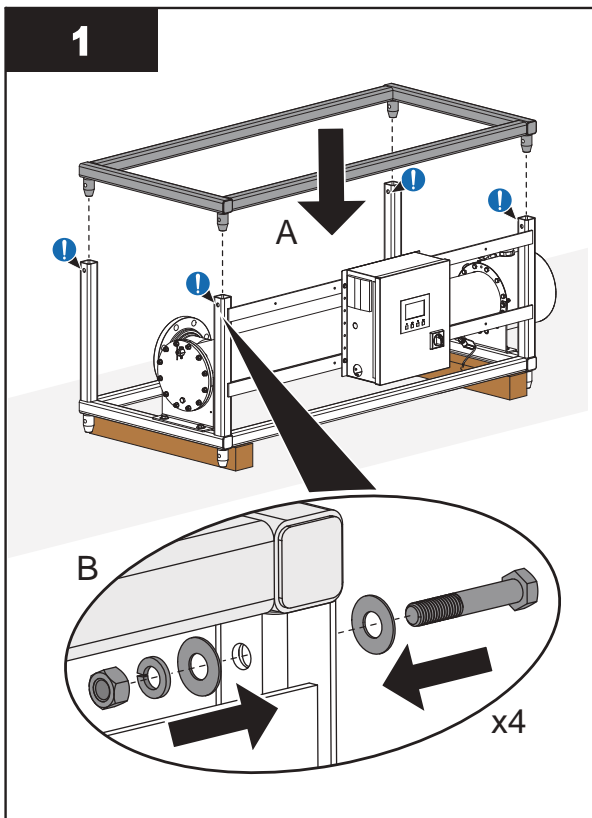
Materials:



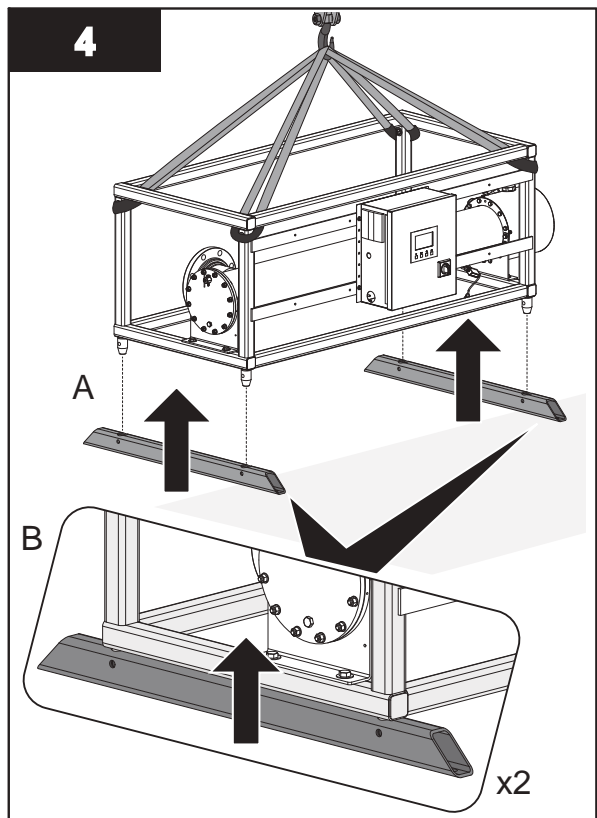
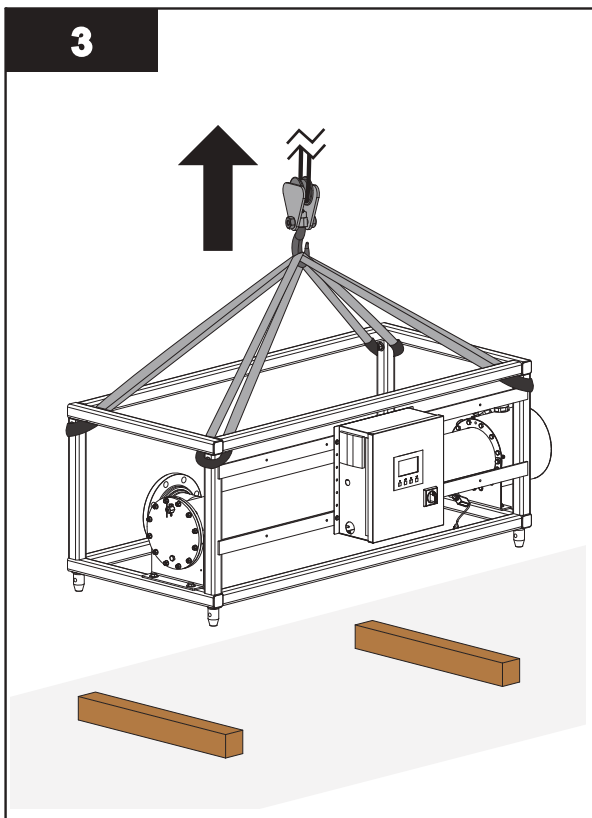
- Anchoring hardware (by others)
- Skid Mounting and Assembly Hardware (provided)
- Shims, if required (by others)

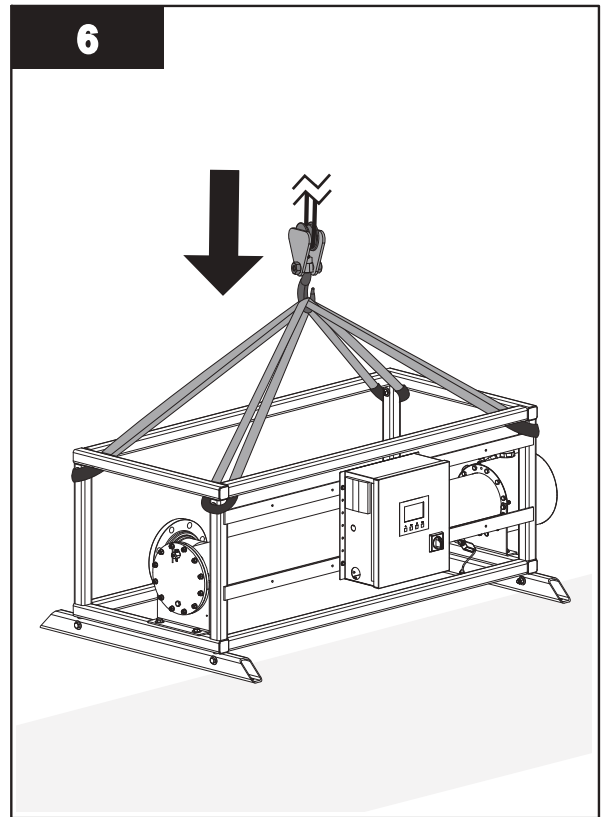
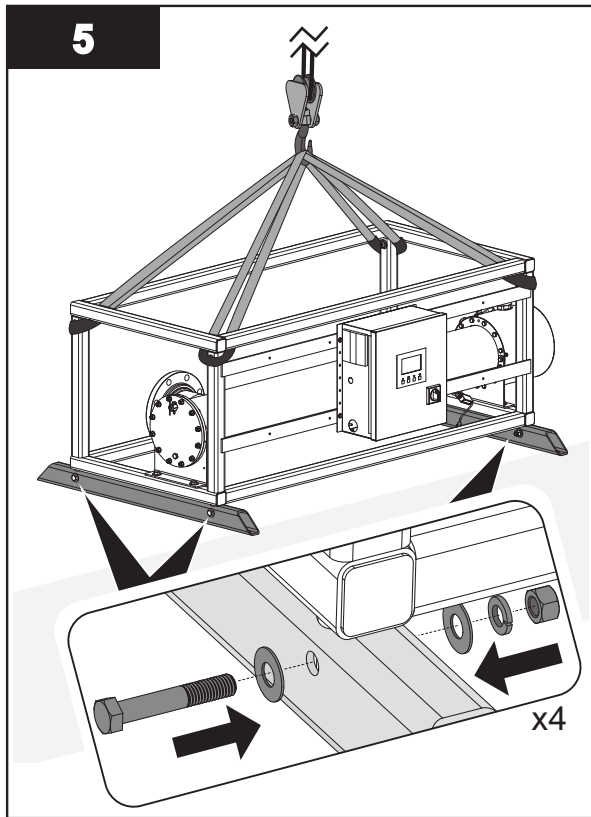
Procedure:



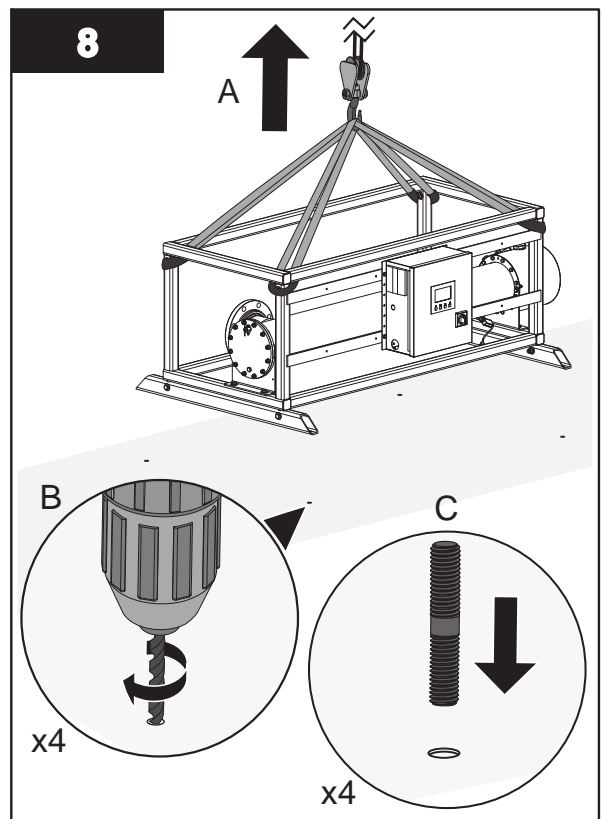
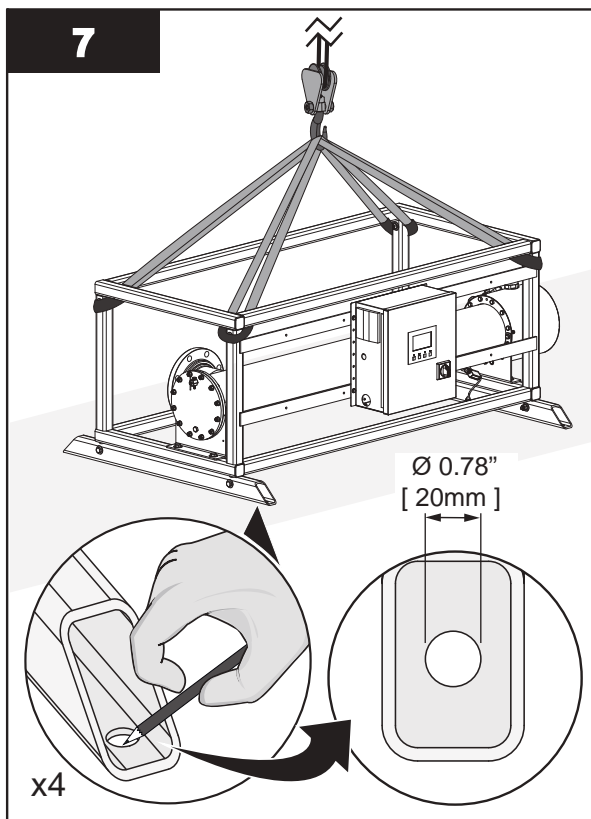


Notes: 1) Install lifting straps.
 2) Install and position strap protectors between the skid frame and the lifting straps to prevent the straps from tearing.

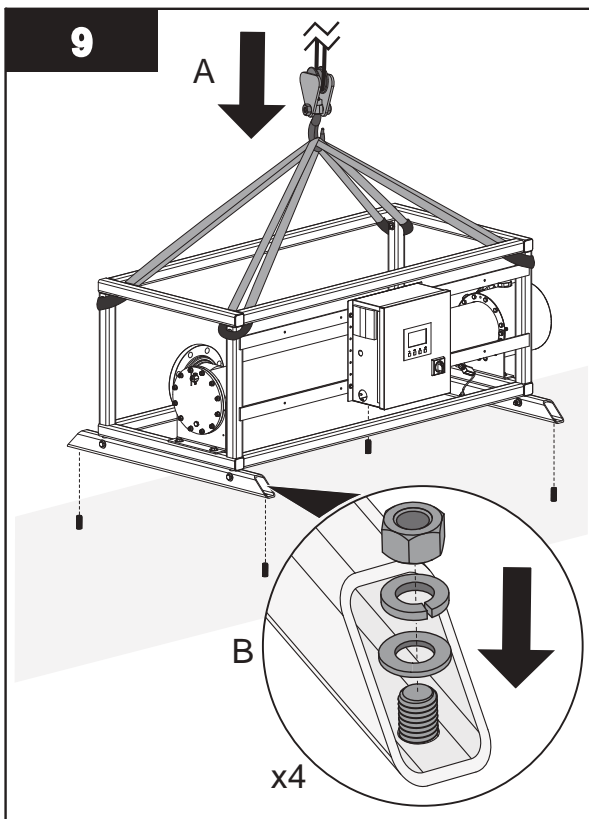




Note: Move UV Chamber Skid to the final installation location.

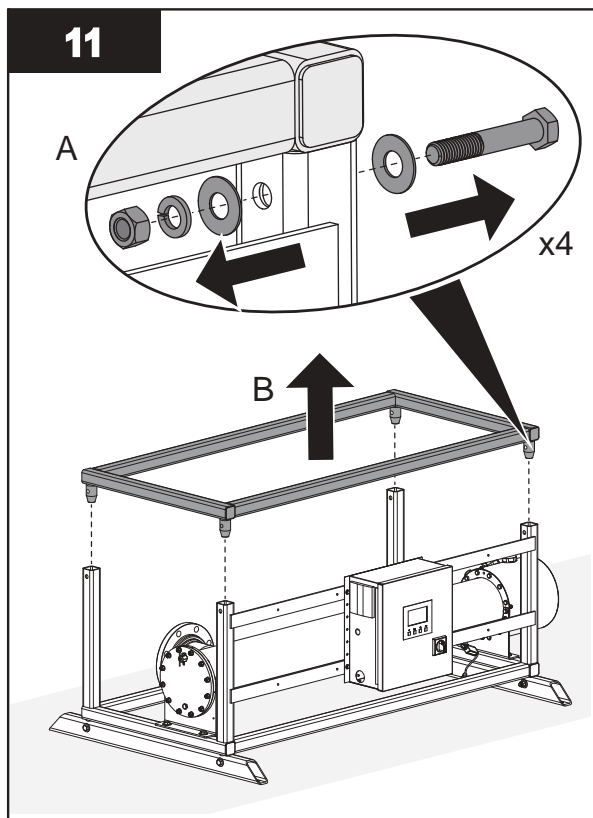


Note: Temporarily move the UV Chamber Skid away from the work area.



10. If a UV Chamber is:

- required to be stacked onto the base assembly, proceed to Step 11.
- not required to be stacked onto the base assembly, proceed to:
 - [Section 7.3.5](#) for UV Chamber with ANSI Flanges.
 - [Section 7.3.6](#) for UV Chamber with Sanitary Flanges.



Note: Remove the Top Frame.

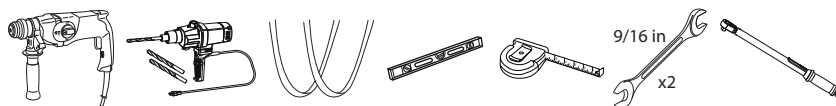
12. Go to [Section 7.3.4](#).

7.3.3 Install a UV Chamber with High Profile Skid Base

Prerequisites:

- Clear area where the UV Chamber will be installed.

Tools:



- Lifting Strap protective pads (x4) (by others)

Materials:

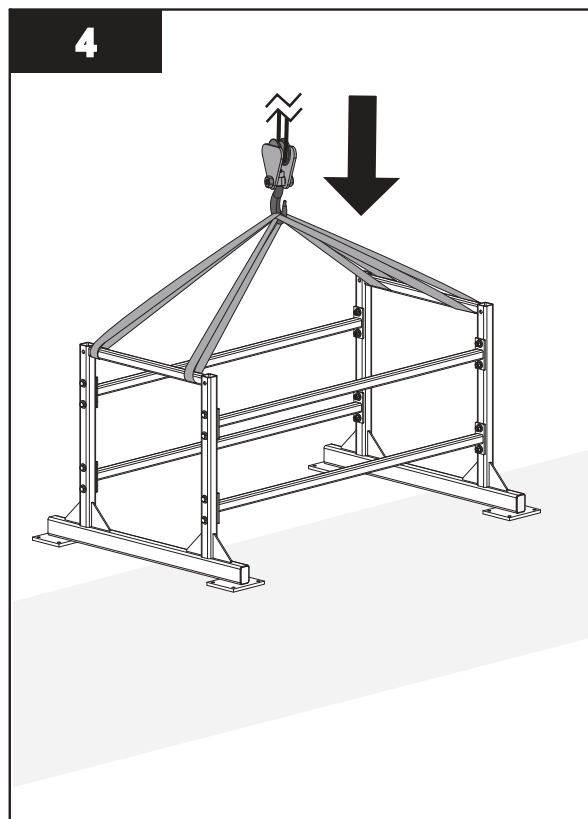
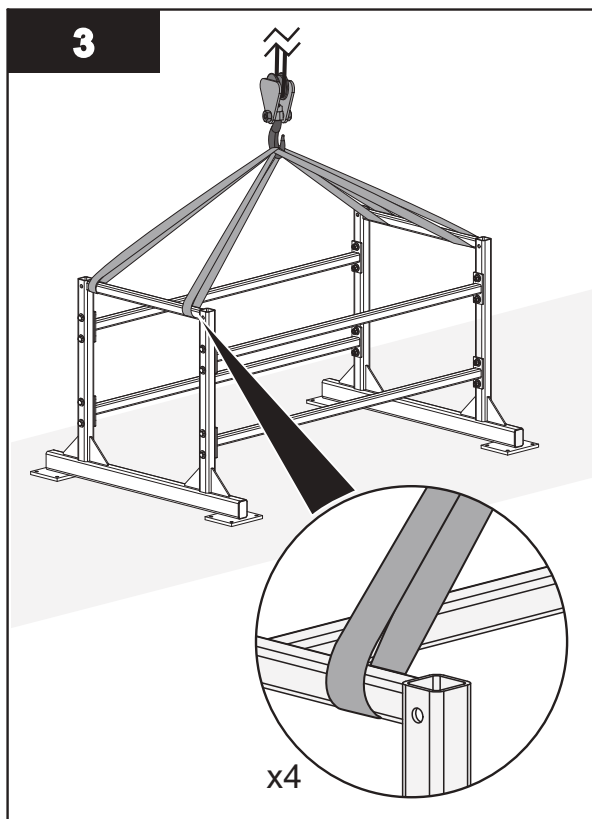
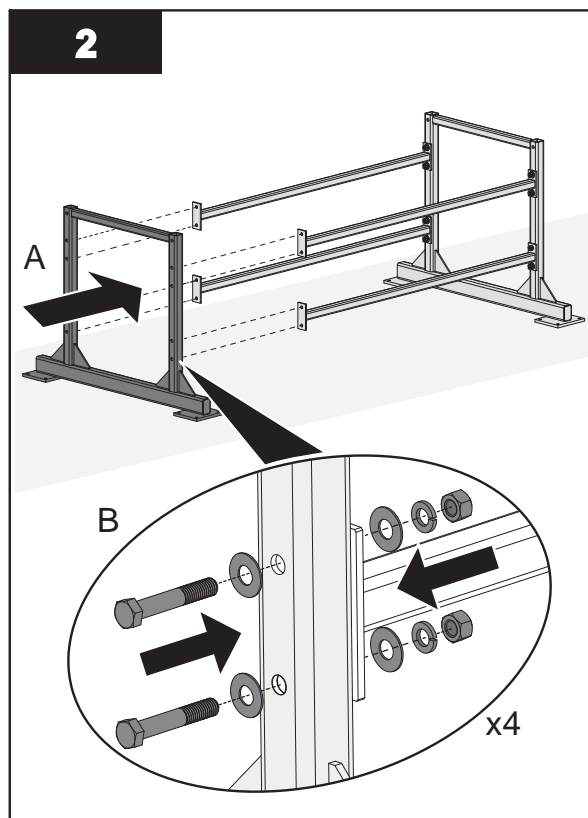
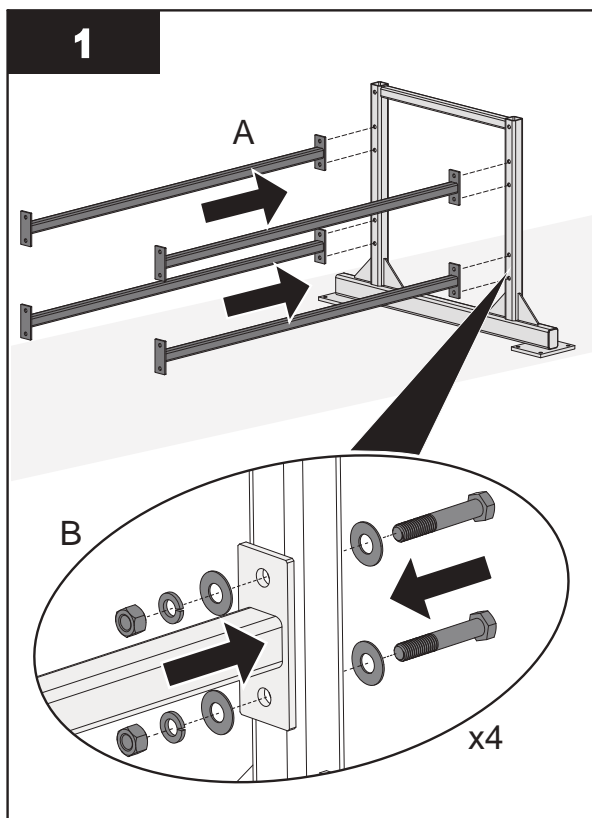


- Anchoring hardware (by others)
- Skid Mounting and Assembly Hardware (provided)
- Shims, if required (by others)

Procedure:

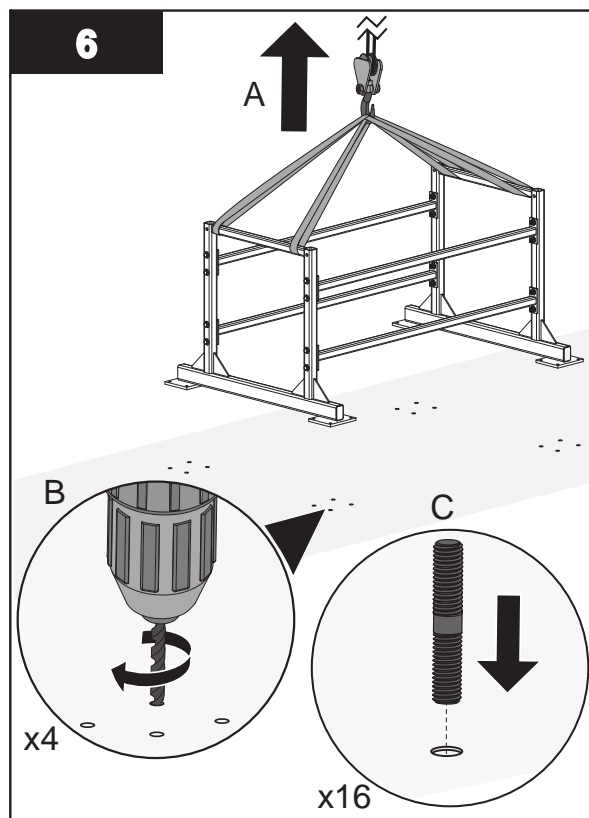
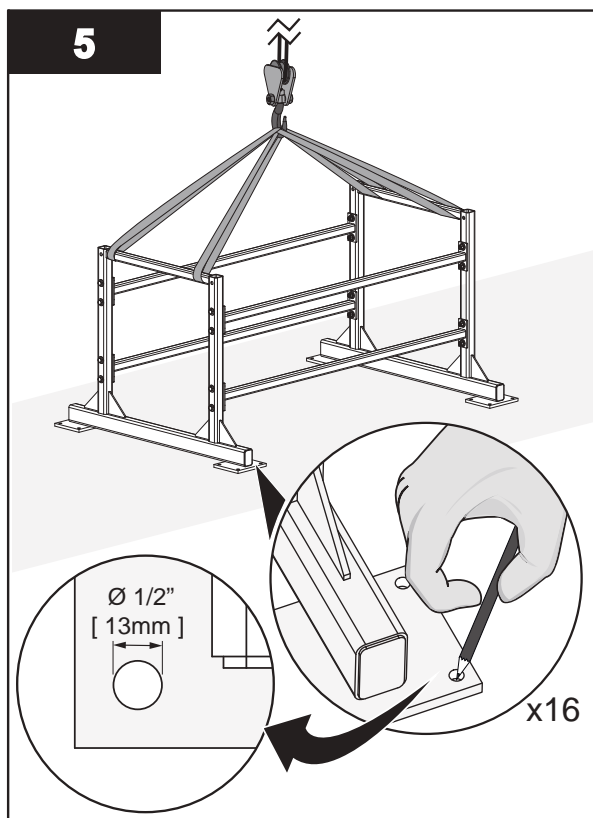


Installation

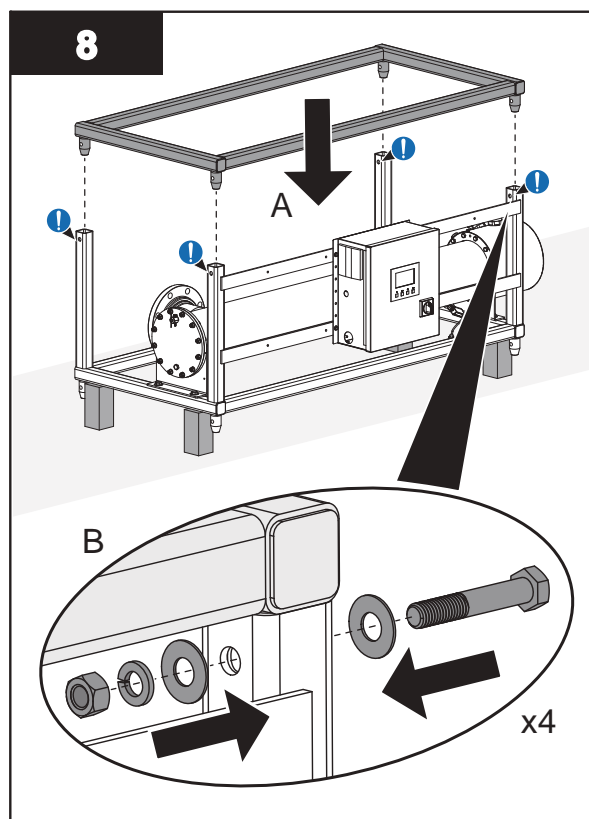
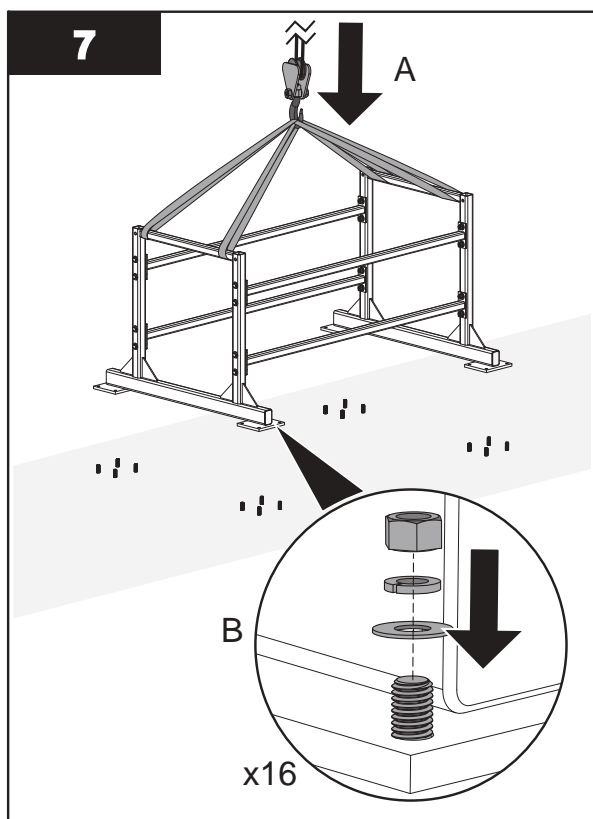


Note: Install lifting straps.

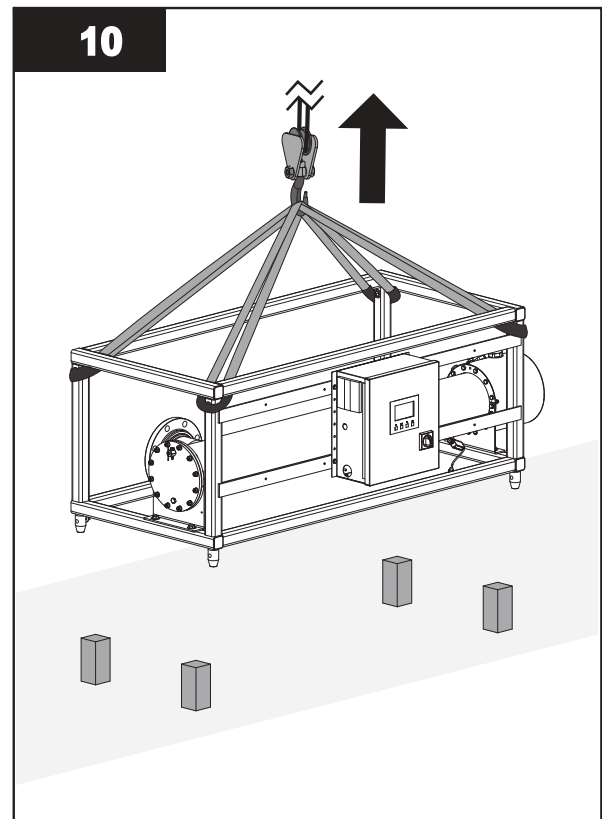
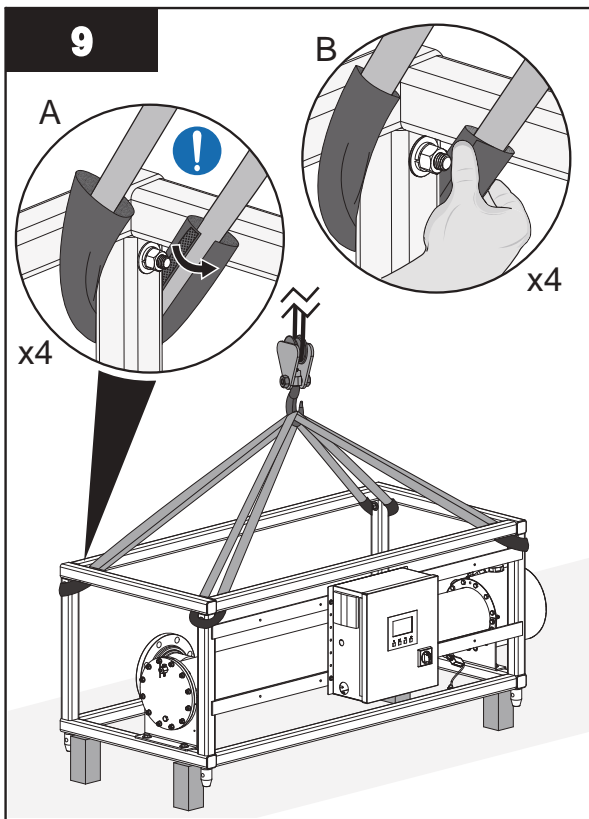
Note: Move the skid to the final installation location.



Note: Temporarily move the skid away from the work area.

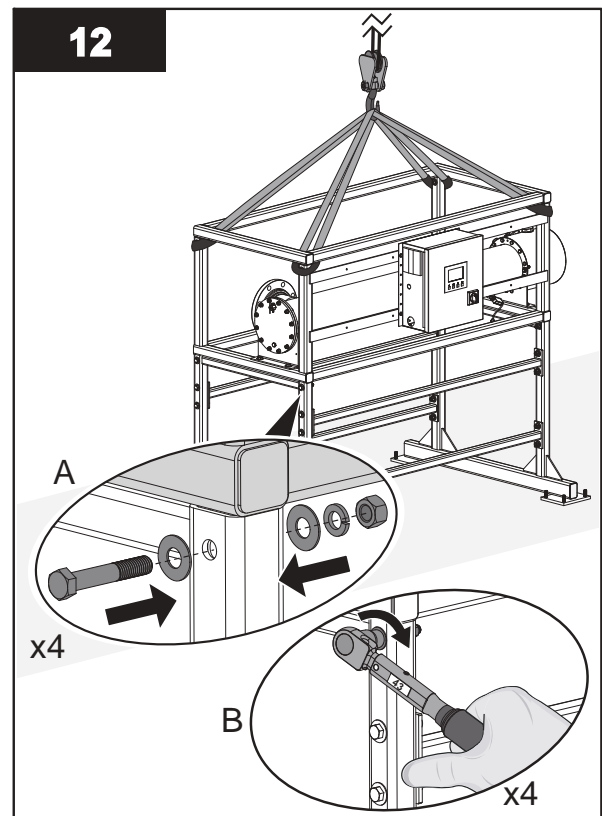
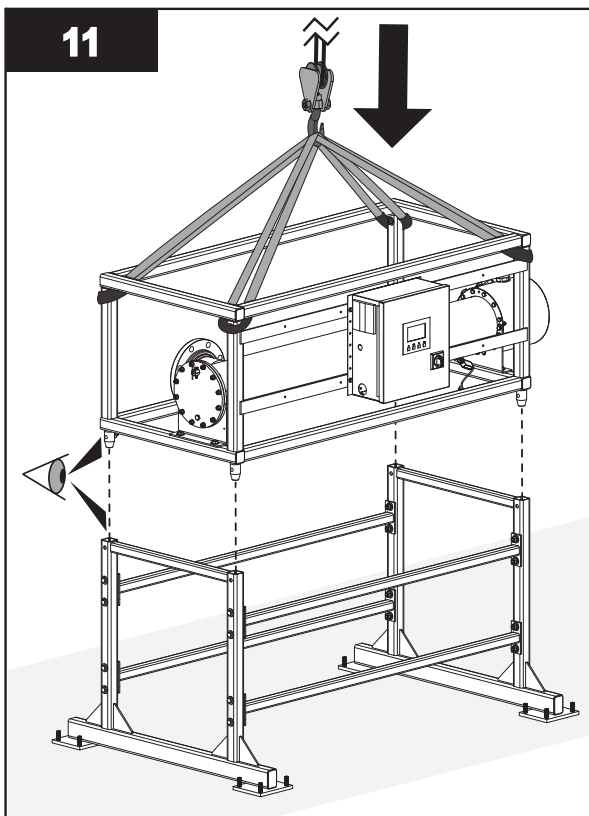


Installation



Notes: 1) Install lifting straps.
2) Install and position strap protectors between the skid frame and the lifting straps to prevent the straps from tearing.

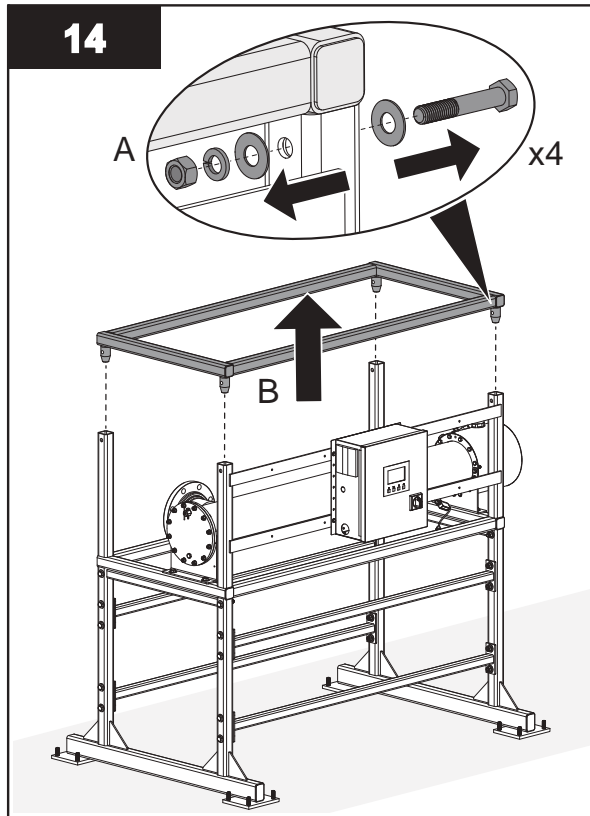
Note: Move UV Chamber Skid to the final installation location.



Note: Torque the bolts to 58.3 N.m (43 lbf.ft).

13. If a UV Chamber is:

- required to be stacked onto the base assembly, proceed to Step 14.
- not required to be stacked onto the base assembly, proceed to:
 - [Section 7.3.5](#) for UV Chamber with ANSI Flanges.
 - [Section 7.3.6](#) for UV Chamber with Sanitary Flanges.



Note: Remove the Top Frame.

15. Go to [Section 7.3.4](#).

Installation

7.3.4 Install a Stacked UV Chamber

Refer to [Figure 6](#) to [Figure 9](#) to determine the UV Chamber stacking arrangement for the provided system. UV Systems that have a UV Chamber diameter of ≤ 8 inches and use a large CPP must be assembled as shown in [Figure 7](#).

Note: The type of Skid Base does not affect the arrangement of the UV Chamber Skids.

UV Chamber Diameter : 8 Inches or less

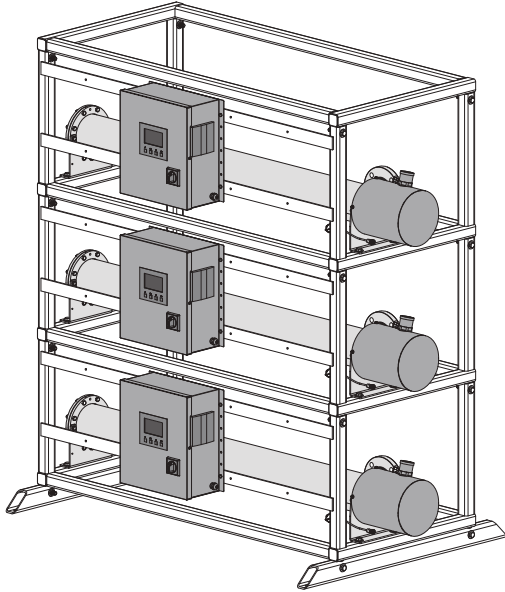


Figure 6 Skid Assembly With Small/Medium CPP

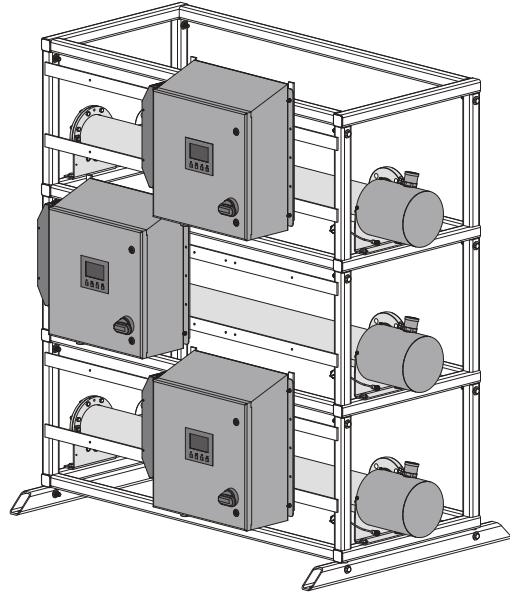


Figure 7 Skid Assembly With Large CPP

UV Chamber Diameter : 10 Inches or greater

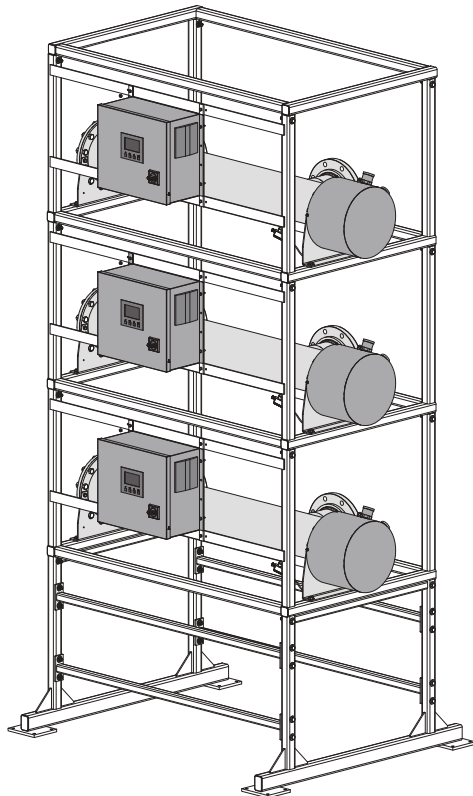


Figure 8 Skid Assembly with Medium CPP

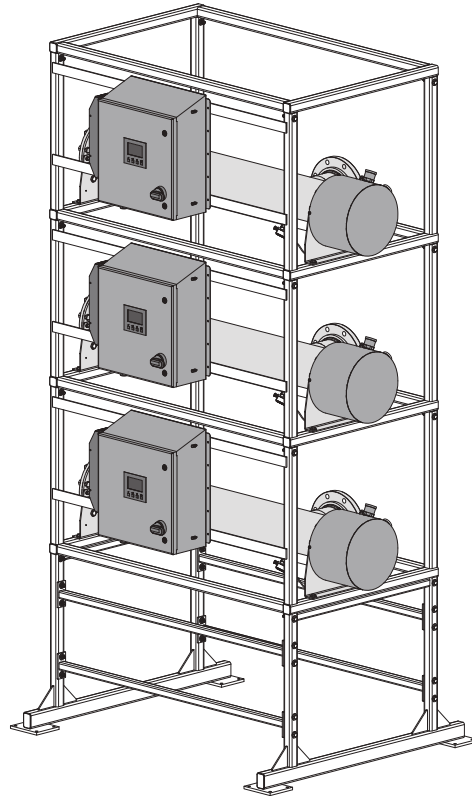


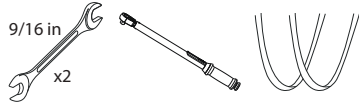
Figure 9 Skid Assembly With Large CPP

Prerequisites:

- Install a UV Chamber with a Low Profile Skid Base. Refer to [Section 7.3.2](#).
- OR
- Install a UV Chamber with a High Profile Skid Base. Refer to [Section 7.3.3](#).

Note: The procedure below shows the Stacked UV Chamber installed on a Low Profile Skid Base for illustration purposes, the procedure will be the same for a High Profile Skid Base.

Tools:



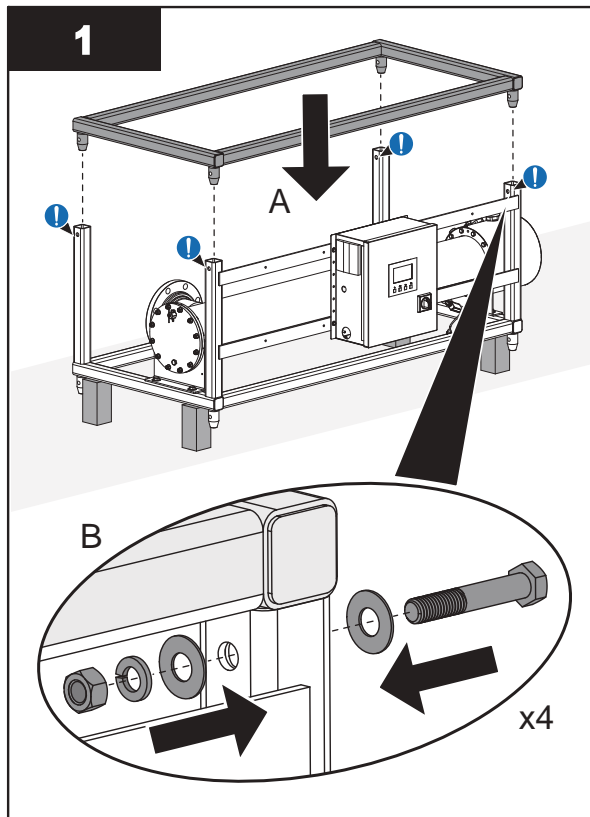
- Lifting Strap protective pads (x4) (by others)

Materials:

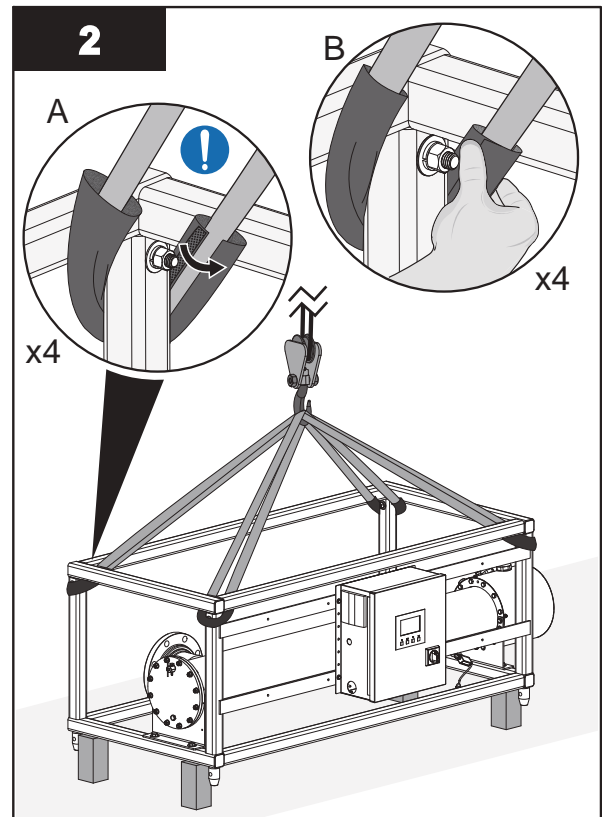


- Skid Mounting and Assembly Hardware (provided)
- Shims, if required (by others)

Procedure:

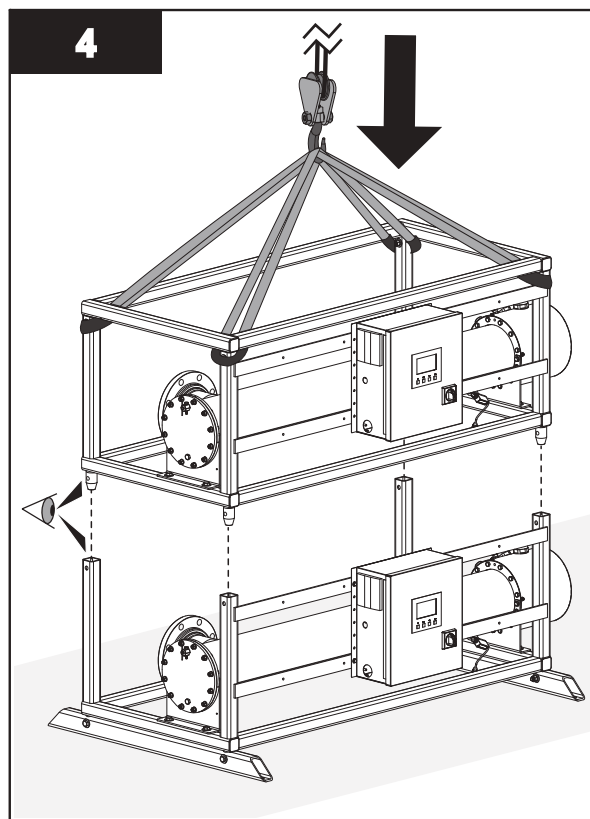
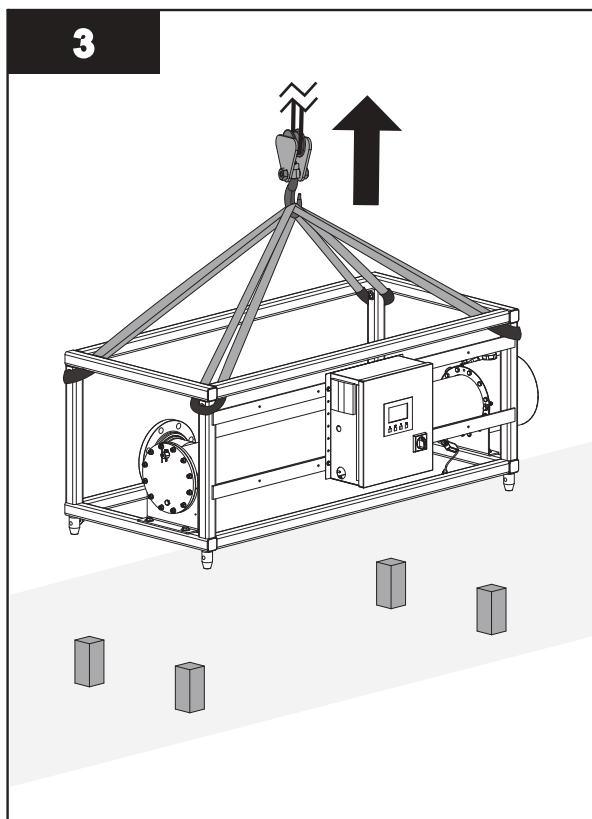


Note: Install the removed Top Frame onto the UV Chamber Skid to be stacked.

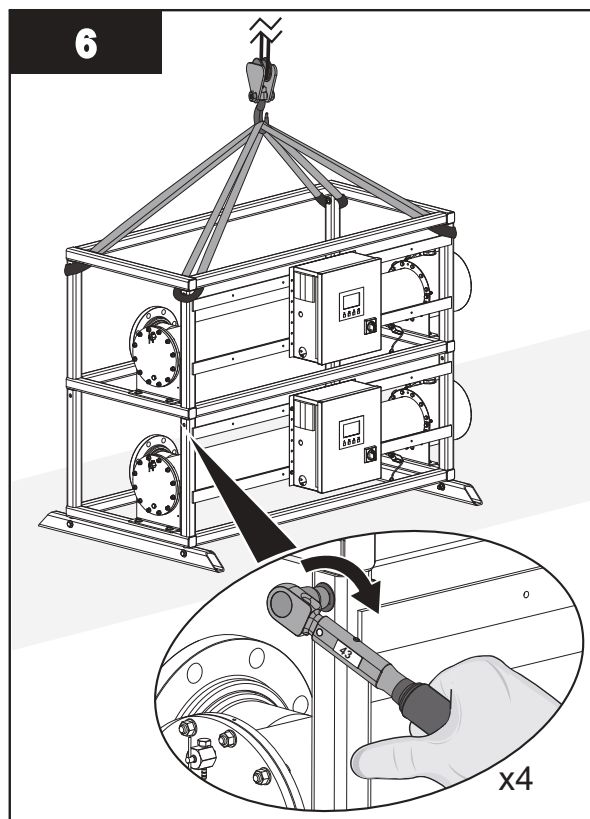
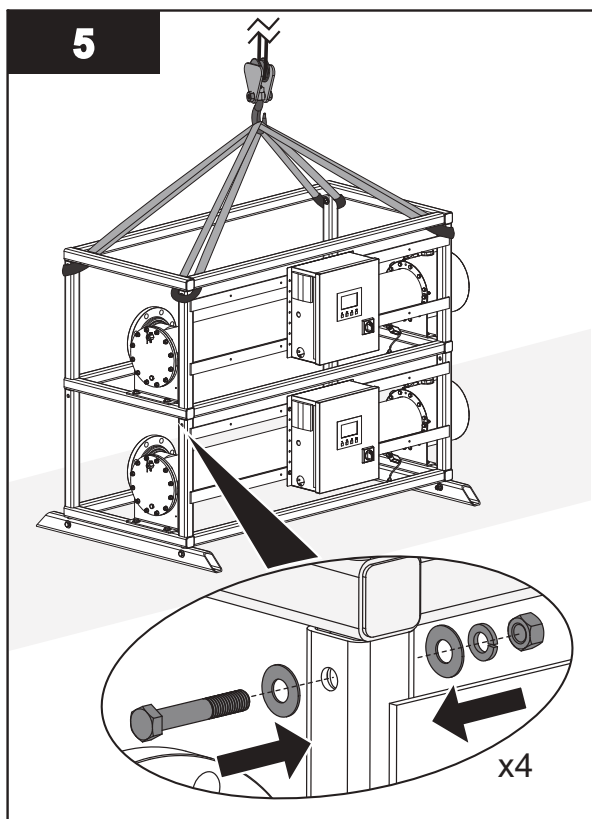


Notes: 1) Install lifting straps.
2) Install and position strap protectors between the skid frame and the lifting straps to prevent the straps from tearing.

Installation



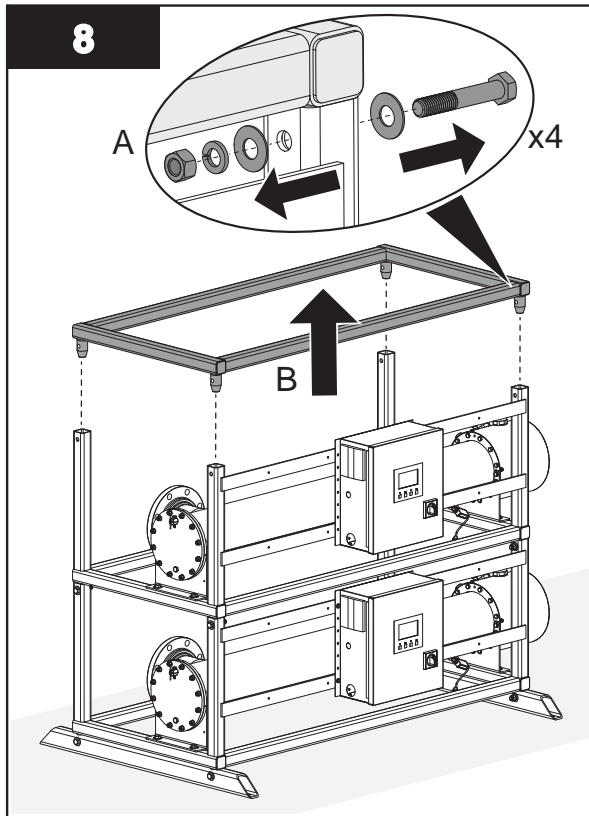
Note: Move UV Chamber Skid to the final installation location.



Note: Torque the bolts to 58.3 N.m (43 lbf.ft).

7. If there are:

- additional UV Chambers to be stacked, proceed to Step 8.
- no additional UV Chambers to be stacked, proceed to:
 - [Section 7.3.5](#) for UV Chamber with ANSI Flanges.
 - [Section 7.3.6](#) for UV Chamber with Sanitary Flanges.



Note: Remove the Top Frame.

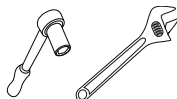
9. Repeat steps 1 to 6 in this procedure.

7.3.5 Connect Inlet and Outlet Process Piping to the UV Chamber (ANSI Flanges)

Prerequisites:

- Install the UV Chamber(s).
- Clean and inspect inlet and outlet connections for any damage (i.e. scratches, nicks, gouges and burrs).

Tools:



Materials:



- Bolts and hardware (by others)
- Gaskets x 2 (by others)

Installation

Procedure:

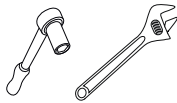
1. Install gasket on UV Chamber inlet connection.
2. Apply anti-seize lubricant and install bolts.
3. Tighten bolts to bolt manufacturers torque recommendation.
4. Repeats steps 1-3 for the UV Chamber outlet connection.

7.3.6 Connect Inlet and Outlet Process Piping to the UV Chamber (Sanitary Fitting)

Prerequisites:

- Install the UV Chamber(s).
- Clean and inspect inlet and outlet connections for any damage (i.e. scratches, nicks, gouges and burrs).

Tools:



Materials:



- Sanitary Flange Clamps (by others)

Procedure:

1. Loosely install the sanitary clamp on the UV Chamber inlet flange to the plant inlet supply piping.

Note: The UV Chamber will not bear the load of process piping or other equipment. Make sure all piping is properly supported independent of the UV Chamber.

2. Repeat step 1 for the outlet piping.
3. Level the UV Chamber from front to back.

Note: The UV Chamber must be installed such that it remains full of process fluid at all times during operation and must be mounted level to ensure it drains properly when service is required.

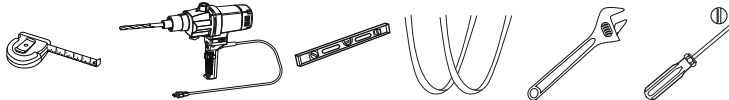
4. Secure the sanitary clamp and torque to the manufacturer's specifications.

7.4 Control Power Panel

Prerequisites:

- Clear area where CPP will be installed.

Tools:



Materials:



- If Wall Mounted: Mounting hardware (by others)
- If UV Chamber Mounted: Mounting Hardware (provided)

Procedure:



The CPP may be installed either:

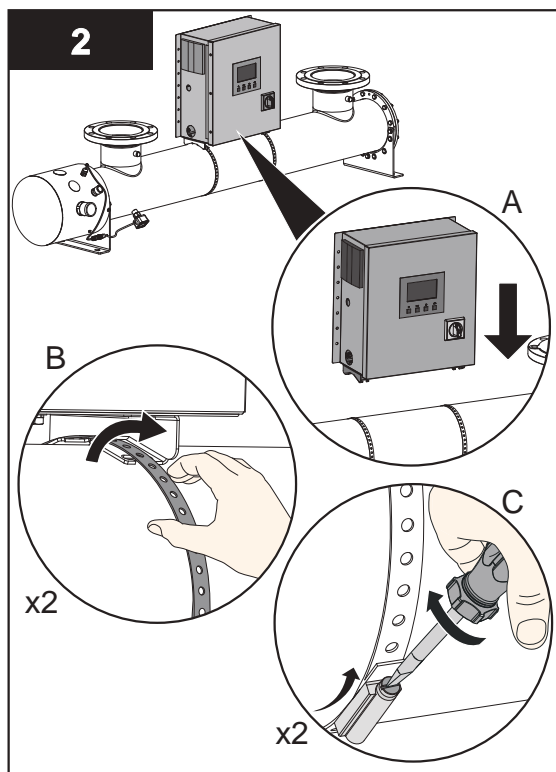
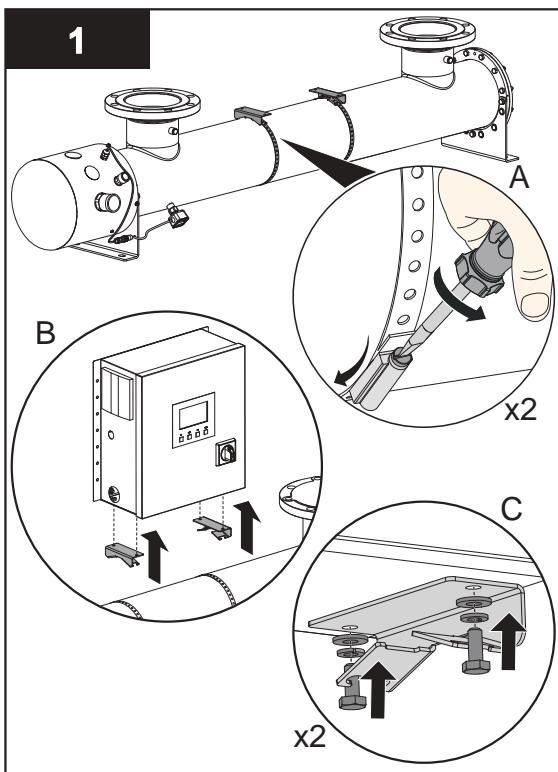
- On top of the UV Chamber (maximum 8 UV Lamp Systems only)
- In front of the UV Chamber (maximum 4 UV Lamp Systems only)
- Remote from the UV Chamber (all systems)
- Mounted on a Skid Frame

Note: Skid mounted CPP's will be shipped mounted to the skid. Skip this procedure and proceed to [Section 7.4.1](#).

Refer to [Section 3.4.2](#) for example on mounting locations.

Follow the appropriate installation instruction below.

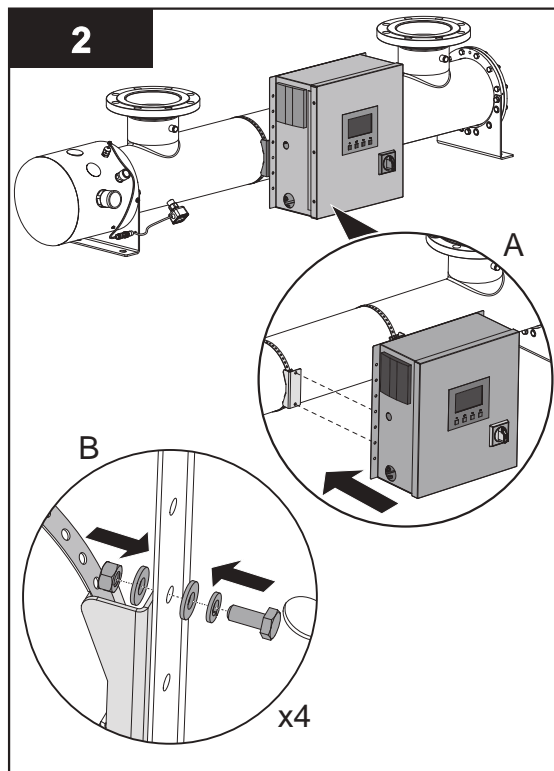
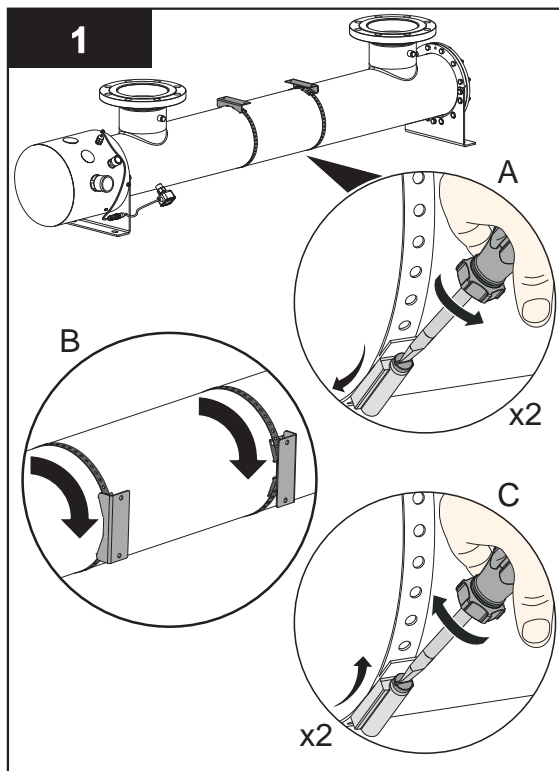
Mounting CPP: Top



Note: Level the CPP front to back.

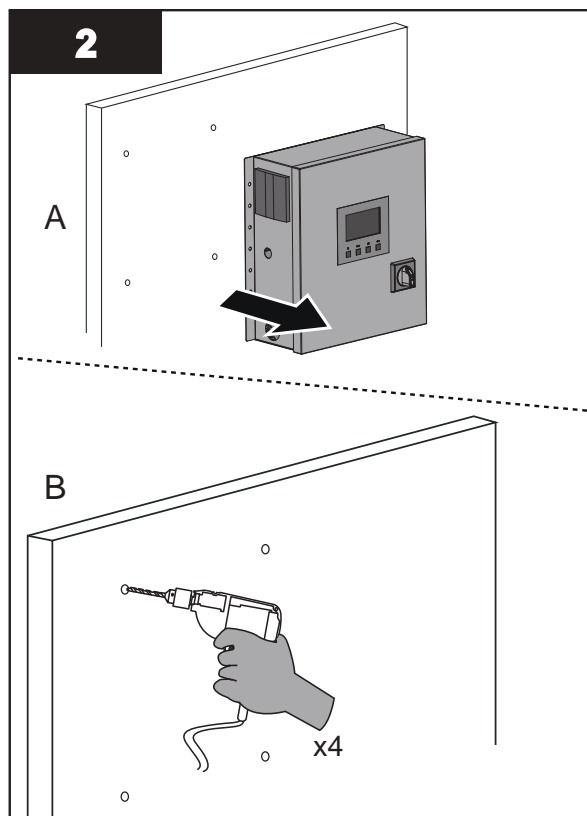
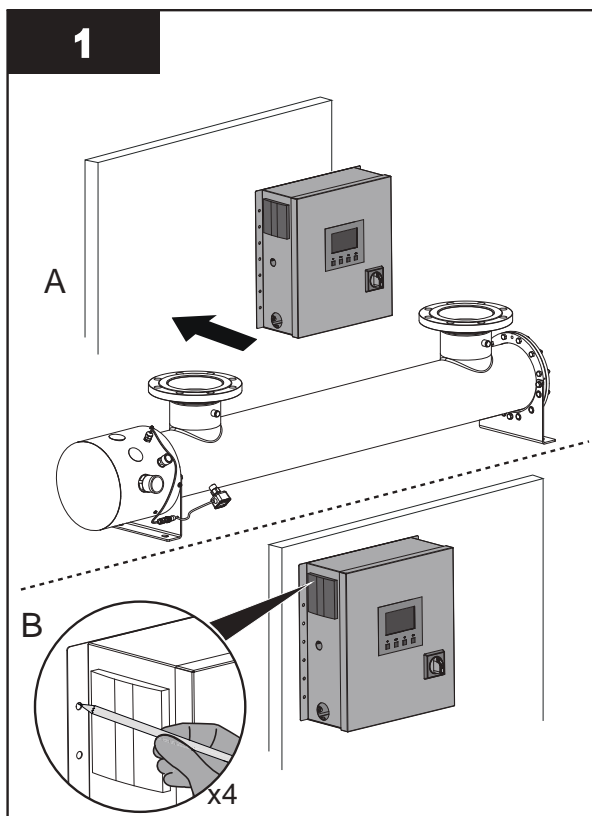
Installation

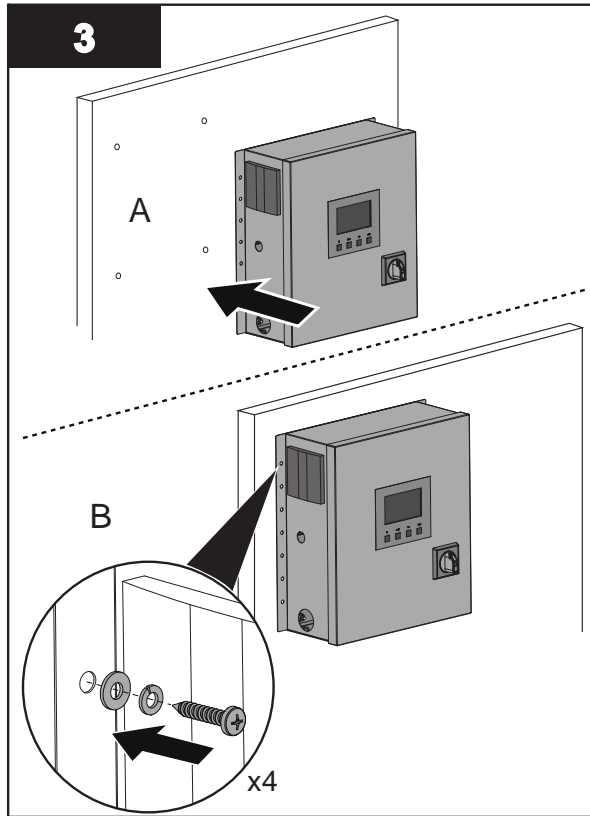
Mounting CPP: Front



Note: Level the CPP top to bottom.

Mounting CPP: Remote





Note: Level the CPP top to bottom and front to back.

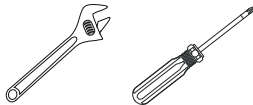
7.4.1 Electrical Connections

Prerequisites:



- Apply lockout tag out devices as necessary. Refer to [Section 4](#).
- Install the UV Chamber(s) - with or without skid. Refer to [Section 7.3](#).
- Install the CPP (for standalone CPP only). Refer to [Section 7.4](#).
- Remove the Service End Cap. Refer to [Section 9.5](#).

Tools:



Materials:



- Cable conduit (by others)
- Electrical Drawings (supplied with the system)
- Strain Relief – for incoming power (by others)

Installation

Procedure:

1. Connect the Lamp Cables to the CPP. The individual lamp connectors are numbered with wire tags for convenient connection; match these numbers to their corresponding number on the UV Chamber end plate. Refer to Electrical Wiring Diagrams for termination points.
2. There are four (4) mounting points (as shown in [Figure 10](#)) for the temperature switch and conduit grounding. The top most mounting point should be used for the temperature switch. Refer to Electrical Wiring Diagrams for termination points.

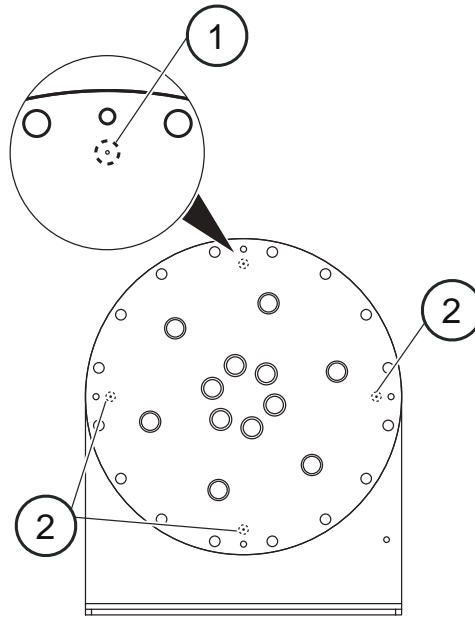


Figure 10 Temperature and Ground Wire Connections

1 Mounting Point reserved for Temperature Switch	2 Mounting Point reserved for Ground Wire
--	---

- Route and terminate AC power to the CPP (Figure 11), matching voltage and power specifications on the serial label of the system. Refer to the wiring diagram to match wire tag numbers.

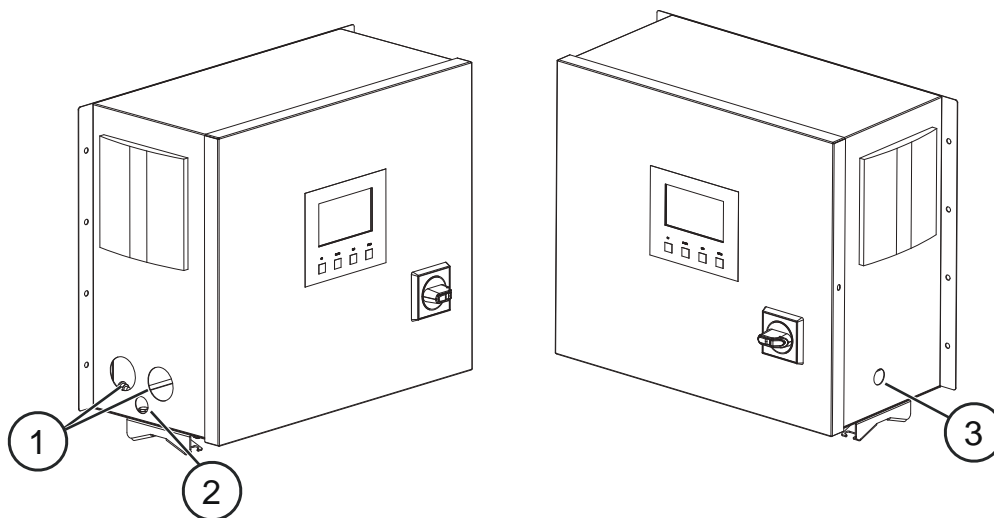


Figure 11 CPP Wiring

1 Cutout for Lamp Cable Conduit (i.e. Lamp, Instrumentation) [Ø 1.75" (44.5mm)]	3 Cutout for Incoming Power Wires [Ø 0.85" (21.6mm)]
2 Cutout for Instrument Wiring (i.e. Temperature, UVI) [Ø 0.88" (22.4mm)]	

Notes: 1) All openings created on the cabinets **MUST** be filled with equipment marked with the same type rating as the enclosure.

2) CPP shown for representative purposes only, CPP appearance may vary depending on system size and enclosure type rating requirements.

- Complete Hydrostatic Test. Refer to [Section 7.5](#).

7.4.2 For all Voltages

- Control wiring should reference appropriate wiring diagram. Control wiring is based upon customer requirements and installed options. Should your requirements differ, contact your local Aquafine representative or Aquafine Customer Service.

Note: UV performance is line voltage sensitive. Line voltage should be $\pm 10\%$ of the rating on the electrical nameplate. Voltage outside of these limits will affect the performance of the UV equipment.

7.5 Hydrostatic Test

Prerequisites:



- Complete Electrical Connections. Refer to [Section 7.4.1](#).
- Remove UV Lamps (if installed). Refer to [Section 9.6.2](#).
- Inspect condition of sleeves for visible cracks or damage. Replace if necessary.
- Make sure the drain valve is closed.

Materials:



Installation

Procedure:



1. Fill the UV Chamber with process fluid.
 - a. Stand off to the side and make sure the area is clear of all plant personnel.
 - b. Pressurize the UV Chamber. Refer to [Section 9.4](#).
 - c. Check for leaks.
 - d. Wait twenty minutes.
2. If leaks are found:
 - a. Depressurize and drain the UV Chamber. Refer to [Section 9.3](#).
 - b. Fix the leaks.
 - c. Fill the UV Chamber and do a pressure test. Check for leaks.
3. If there are no leaks, depressurize the UV Chamber. Refer to [Section 9.3](#).
4. Install the UV Lamps. Refer to [Section 9.6.2](#).
5. Install the Service End Cap. Refer to [Section 9.5](#).

Section 8 Operation

DANGER



Obey all warning and caution statements. Refer to [Section 2](#).

Read and understand this manual before operating this equipment. Read all user documentation before performing operations, inspections, repair, or maintenance on this equipment.



Only competent personnel should undertake operation, repairs, maintenance, or servicing of equipment described in this section of the manual. If you do not understand the information or procedure explanations in this manual, STOP and contact your Service Provider for assistance.

NOTICE

The Microprocessor user interface screens on the CPP vary with the system configuration. The screens described in this section of the manual may not be the same as the screens shown on the CPP.

8.1 User Interface

The microprocessor user interface ([Figure 12](#)) on the CPP is a HMI display that is programmed with custom screens.

The Microprocessor user interface has two levels of user access: operator-level and technician-level. A user with operator-level access cannot view all the screens that a user with technician-level access can. Operator level requires no log in or password and is the default level.

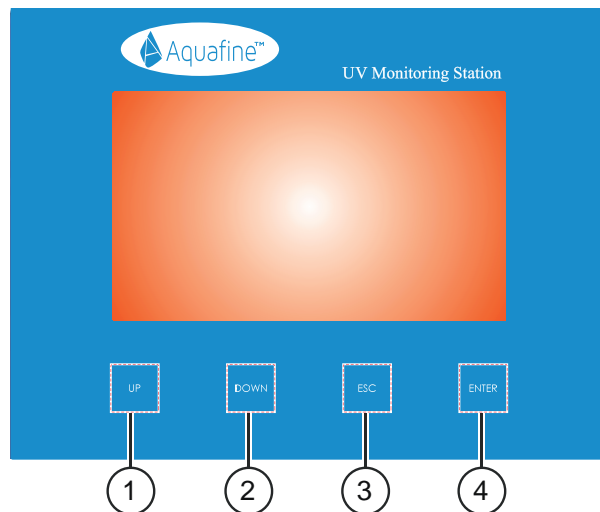


Figure 12 Microprocessor Interface

1 UP Button	2 DOWN Button
3 ESC - Escape Button	4 ENTER Button

8.1.1 Navigate between screens:

1. Use the UP/DOWN ([Figure 12](#)) keys to scroll to the required navigation button → ENTER.
2. The Login Screen will display → Input User password ([Section 8.3](#)).
3. Press ESC to exit.

8.1.2 To return to the Main Screen from any screen:

1. Press ESC.

8.2 Main Screen

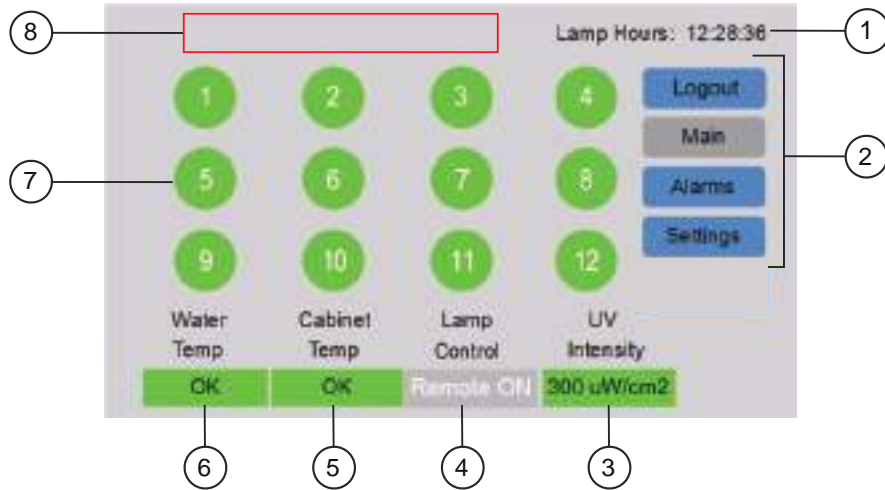







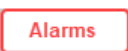




Figure 13 Main Screen

Item		Description	Display Options
1	Lamp Hours	Displays UV Lamp runtime	Hours: minutes: seconds
2	Navigation Bar	The Navigation Screen allows the user to navigate between the different sections of the HMI application.	Refer to Section 8.2.1 .
3	UV Intensity	Displays the UV Intensity measured by the sensor in uW/cm ² or %. Note: Only displayed when the system is configured for UV Monitoring Mode.	<ul style="list-style-type: none"> • uW/cm² - Displays the UVI Sensor reading. • % - Displays the relative UVI Sensor reading as a percentage of the UV Intensity 100% value.
4	Control Mode	Displays the Control Mode	Control Mode: <ul style="list-style-type: none"> • Local ON - Lamp(s) is controlled locally and is in ON mode. • Local OFF - Lamp(s) is controlled locally and is in OFF mode. • Remote ON - Lamp(s) is controlled remotely and is in ON mode. • Remote OFF - Lamp(s) is controlled remotely and is in OFF mode.
5	Cabinet Temperature	Displays the status of the Cabinet Temperature.	OK - The cabinet temperature is within design range.
			OverTemp - The cabinet temperature has exceeded design range.
6	Water Temperature	Displays the status of the UV Chamber Temperature	OK - The UV Chamber temperature is within design range.
			OverTemp - The UV Chamber temperature has exceeded design range.
7	Individual Lamp Status	The lamp circle changes color based on the status of the UV Lamp.	Refer to Section 8.2.2 .

Item		Description	Display Options
8	Alarm Display	Displays current active alarms. Notes: 1) If multiple alarms occur at the same time, each alarm will display for one second before displaying the next. If an alarm is not present, information will not be displayed. 2) Alarm text will be visible on every screen.	Water Temp High - Water temperature reading is greater than the maximum temperature alarm setpoint.
			Cabinet Temp High - Cabinet temperature reading is greater than the maximum temperature alarm setpoint.
			UVI Low - UV Intensity is lower than the UVI Low alarm setpoint
			Lamp Out Alert - A UV Lamp needs to be replaced
			Lamp Expire Soon - A UV Lamp runtime hours is approaching the maximum hours.
			Lamp Expired - UV Lamp runtime hours has exceed the maximum hours.

8.2.1 Navigation Bar

Unselected Button	Selected Button	Screen	Description	Refer to:
		Login	Users must login to access the Settings Screen. The Login button toggles to Logout when a user is currently logged in.	Section 8.3
		--	The Login button toggles to Logout when a user is currently logged in. Note: Make sure to log out before leaving the HMI.	--
		Main	The Main Screen is designed to provide key system operation information.	Section 8.2
		Alarms	The Alarm Screen shows the fifteen (15) most recent alarms in the order they occurred, older alarms will be overwritten when the buffer is full. The Alarm Screen displays the time and alarm information.	Section 8.5
		Settings	The user must be logged in at User level to access the Settings Screens. Select the white text boxes to enter new setting values. The Settings Screen has two (2) available modes, Basic Unit and UV Monitoring. The information displayed on the Settings Screen varies based on mode type used. The mode type used is site dependent.	Section 8.4