

CONTRACT DOCUMENTS

**TOWN OF NORTH HAVEN
CONNECTICUT**

**TROJAN UV 3000 PLUS
INSTALLATION PROJECT**

PROJECT #16-19

FINANCE

INVITATION TO BID

TOWN OF NORTH HAVEN

Sealed bids from qualified contractors to install a TROJAN UV 3000PLUS at the Town of North Haven Water Pollution Control Facility at 1122 Universal Drive, North Haven, Connecticut will be received at the Finance Office, Memorial Town Hall, 18 Church Street, North Haven, Connecticut, until January 6, 2016 at 10:00 am, at which time and place they will be opened and publicly read. Specifications may be obtained from the Finance Office. After bids are received the Director of Finance and Administration may analyze whether vendors have submitted comparable bids and meet the requirements called for. In reviewing the bids, the Director of Finance and Administration may consider the past performance, financial responsibility, and sales and service experience of the vendors. The Director of Finance and Administration reserves the right to reject any or all bids, to waive any defects in same, or to choose to make purchases other than strictly in accordance with price considerations, and/or to choose other than the lowest bidder, if it be deemed in the best interest of the Town of North Haven. **Bidders are advised hereby of the existence of an Ordinance concerning Bid Preference for Town-Based Businesses.**

Edward J. Swinkoski, C.P.A.
Director of Finance and Administration

BID Proposal

The undersigned _____, doing business in the City/Town of _____, submits herewith, in conformity with the general terms and conditions and specifications for the Town of North Haven Bid, Project 16-19 for the installation of TROJAN UV 3000PLUS at the Town of North Haven Water Pollution Control Facility at 1122 Universal Drive, North Haven, Connecticut.

GENERAL DESCRIPTION

The Town of North Haven is soliciting bids from qualified Contractors who have previous experience installing a TROJAN UV 3000PLUS system. The Ultraviolet Disinfection system will be purchased from Trojan Technologies by the Town of North Haven. All work will be completed under the guidance of the Trojan Technologies Installation Manual (see attached). It will be the contractor's responsibility to work with representatives of both Trojan Technologies and representatives of the Town of North Haven.

SCOPE OF WORK

The Scope of Work shall include, but not be limited to, the following:

1. Furnish all labor, materials, equipment, and appurtenances required to remove the existing TROJAN 2000 system. (Demolition material to be stored on site in a location determined by the Town. The Town will be responsible for the disposal of the material.)
2. Furnish all labor, materials, equipment, and appurtenances required to install the TROJAN UV 3000PLUS system. (Town to supply TROJAN UV 3000PLUS system.)
3. The UV system will be completed and operational with all control equipment and accessories.
4. The contractor will install and test the system with Trojan Technologies.
5. The contractor will be responsible for concrete installation anchor bolts, expansion anchors and inserts.
6. Electrical work associated with the installation of the Ultraviolet Disinfection system.

COMPLETION OF WORK

The above Scope of Work shall be completed no later than ninety (90) days after the award of the Contract. Extension of work related to changes in the bid shall be agreed upon by the Town of North Haven and the successful Bidder.

GENERAL INSTRUCTIONS TO BIDDERS

All Bid Proposals are to be:

- a. Submitted in duplicate unless otherwise indicated in the Bid Specification.
- b. Submitted using the proposal forms furnished with the Bid.
- c. Submitted in a sealed envelope with the Bidder's name and address in the upper left-hand corner of the envelope.

d. Made out and signed in the corporate, or other, name of Bidder. In addition, an authorized person must fully and properly execute the bid.

Proposals received later than the time and date specified in the Invitation to Bid will not be considered.

Amendments to, or withdrawal of proposals received later than the time and date set for the bid opening will not be considered.

Bidders or their representatives may be present at the bid opening.

The Town of North Haven may require further information and references on any individual or company placing a bid prior to the awarding of a bid.

The Director of Finance and Administration reserves the right to correct an award erroneously made as a result of a clerical error on the part of the Town of North Haven.

A contract shall not be awarded to any corporation, firm or individual that has an unpaid and overdue debt to the Town of North Haven by nonpayment of taxes, by debt or contract, or who is in the default as surety or otherwise by any obligation to the Town of North Haven.

BIDS MUST BE SUBMITTED ON THIS FORM

BID PRICE **Total Bid Price \$**_____

Bids Submitted By:

Date:

Name of Firm

Telephone # Fax #

Address

Printed Name Title

City, State, Zip

Authorized Signature

GENERAL CONDITIONS

ARTICLE 1 CONTRACT AND CONTRACT DOCUMENTS

- (a) Wherever the words "Contract" or "Contract Documents" are used, they shall mean and include Specifications and Addendum (or Addenda) enumerated in the Contract, the Advertisement for Bids, the Information for Bidders, and the Bid (Proposal) as accepted by the Owner and as evidenced by the Owner's Notice of Award to the Contractor, the Supplemental General Conditions, the General Conditions, the Special Conditions, the Technical Specifications and the Appendices, shall form parts of this Contract, and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, heading, running headlines and marginal references to various provision of the Contract Documents are in no way to affect, limit, or cast light upon the interpretation of the provisions to which they refer.
- (b) The Contractor hereby agrees to commence work under this Contract on or before a date to be specified in a written "Notice to Proceed" from the Owner and to fully complete the project within 60 (sixty) consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of \$100.00 (one hundred) for each consecutive calendar day thereafter as hereinafter provided in the Contract and General Conditions.

ARTICLE 2 DEFINITIONS:

- (a) The word "Municipality" as used in the Contract Documents or in discussions concerning or appertaining to the work as a whole shall mean the Town of North Haven, Connecticut. The words "Town" or "Owner", when used, shall also mean the Town of North Haven, Connecticut, acting herein through its First Selectman and/or Engineer.
- (b) Whenever the words "Governing Body" are used in the Contract Document, they shall mean the Finance Department, Town of North Haven, Connecticut.
- (c) Whenever the word "Engineer" is used in reference to the work or any part thereof or in the Contract Documents, it shall mean the Town Engineer.
- (d) Whenever the word "Inspector" is used in the Contract Documents, it shall mean such a person or persons engaged by the Town of North Haven to make inspections of the work performed and materials furnished by the Contractor.
- (e) Whenever the word "Bidder" is used in the Contract Documents, it shall mean any individual, partnership, firm or corporation submitting an approved proposal for the work contemplated.
- (f) Whenever the word "Contractor" is used, it shall mean the person or persons or co-partnership or corporation contracted to perform the work to be done under the Contract Documents or the legal representative of such party or parties.

ARTICLE 2 cont'd

DEFINITIONS:

- (g) Whenever the word "Subcontractor" is used in the Contract Documents, it shall mean the person, firm or corporation supplying labor and materials or only labor for work at the site of the project for and under separate contract or agreement with the Contractor.
- (h) Whenever the word "Surety" is used in the Contract Documents, it shall mean the corporate body which is Surety on the Contractor's bond for the payment of all debts for materials and labor used or employed in the execution of the contract and for the acceptable performance of the work.
- (i) Whenever the words "Town Attorney" are used, they shall mean the Town Attorney of the Town of North Haven, Connecticut.
- (j) Whenever the word "Bid" is used in the Contract Documents, it shall mean the proposal submitted by the bidder and similarly the "Proposal" shall be bid.
- (k) Whenever the word "Specifications" is used in the Contract Documents, it shall mean the description, directions, provisions and requirements contained in the Contract Documents, together with all written agreements made or to be made pertaining to the method and manner of performing the work or to the quantities and qualities of materials to be furnished under this contract.
- (l) Whenever the word "Addendum" is used in the Contract Documents, it shall mean any written interpretation, clarification, amendment or addition to the Plans or Specifications issued by the Town Engineer.
- (m) Whenever the word "Project" is used, it shall mean the entire work to be executed under the contract.
- (n) Whenever the word "Contract" is used in the Contract Documents, it shall mean the contract covering the performance of the work and the furnishing of materials required therefore as evidenced by the Contract Documents.
- (o) Whenever the phrases "substantial completion" or "substantially complete" are used in the Contract Documents, they shall mean the completion of construction of all installations, completely tested and accepted and being sufficiently completed so that the project or specified part can be used for the purposes for which it is intended.

ARTICLE 3**SCOPE OF WORK:**

- (a) The Contractor shall furnish all labor, materials, equipment, power, water, light, heat, fuel, tools, appliances, supplies and all other means of construction necessary and proper for executing and completing the project; he shall do all work including extra and additional work and pay all costs connected therewith; pay cost of all insurance; bear all losses due to the nature of the work and costs incidental to suspension or discontinuance of the work except as otherwise provided; assume all responsibility of whatever nature of kind, indemnify the Owner from all claims; secure and pay for all permits unless otherwise provided; conform to all county, state, municipal or federal legislation and requirements; he shall do all work necessary to conform the project to the Contract Documents and shall leave intact the work of any adjoining contractors unless otherwise ordered by the Owner; perform and complete the work in a manner best calculated to permit rapid construction, consistent with safety of a life and property and satisfactory to the Owner and in strict accordance with the Contract Documents; he shall protect the work during construction, clean up the work during and after construction and maintain it until final acceptance, as hereinafter provided.
- (b) The Contractor shall do all work and pay all costs of protecting, supporting, maintaining, repairing if damaged, relocating and restoring all surface, subsurface or overhead structures and all other property including pipes, conduits, ducts, tubes, chambers and appurtenances, public or private, in the vicinity of the work, except as otherwise specified.
- (c) The Contractor shall obtain all necessary permits required.
- (d) Furnish all labor, materials, equipment, and appurtenances required to remove the existing TROJAN 2000 system. (Demolition material to be stored on site in a location determined by the Town. The Town will be responsible for the disposal of the material.)
- (e) The UV system will be completed and operational with all control equipment and accessories.
- (f) The contractor will install, meet all specifications and test the system with Trojan Technologies.
- (g) The contractor will be responsible for concrete installation, anchor bolts, expansion anchors and inserts and electrical work associated with the installation of the Ultraviolet Disinfection system.

ARTICLE 4**INTERPRETATION OF SPECIFICATIONS:**

In the event the meaning of any portion of the specifications or instructions of the Engineer is doubtful, the best type of construction, both as to materials and workmanship, which reasonably can be interpreted is to be implemented. All materials and workmanship must be strictly in accordance with the specifications. The Contractor shall construct the work exactly in accordance with such instructions of the Engineer.

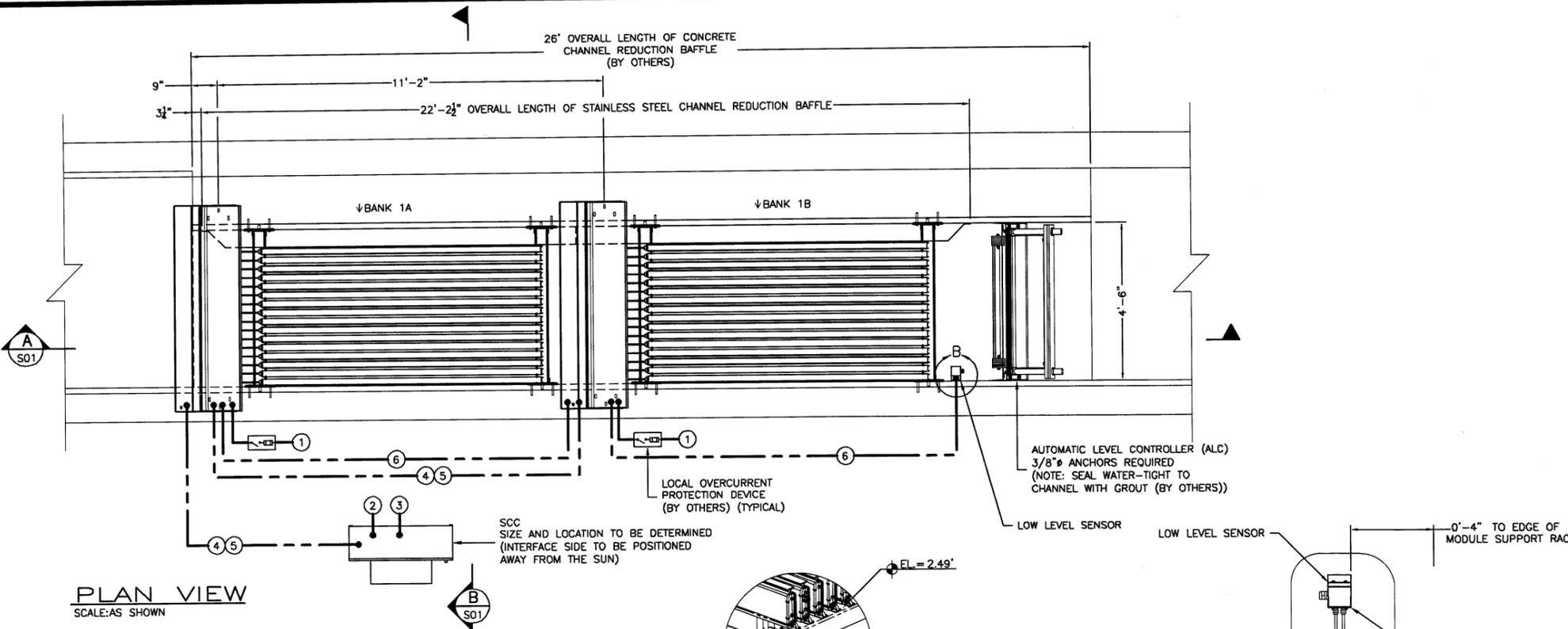
TROJAN UV3000 PLUS[™]

EQUIPMENT INTERCONNECTIONS

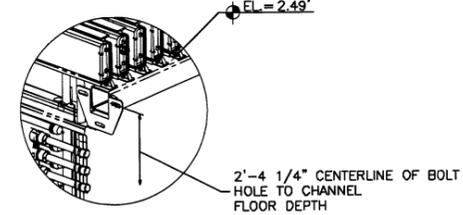
No.	DESCRIPTION	FROM	TO
1	POWER DISTRIBUTION CENTER (PDC) POWER SUPPLY 480Y/277V, 3 PHASE, 4 WIRE + GROUND 24.5 kVA/PDC POWER DRAW 33.2 AMPS MAXIMUM CURRENT/PHASE	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC
2	SYSTEM CONTROL CENTER (SCC) POWER SUPPLY 120V, 1 PHASE, 2 WIRE + GROUND 15 AMPS	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	SCC
3	FLOW METER 4-20 mA, DC ANALOG INPUT (BY OTHERS)	FLOW METER PANEL (NOT SHOWN) (BY OTHERS)	SCC
4	GROUND LINK 14 AWG TYPE TWH STRANDED	SCC	PDC(s) (DAISY CHAINED)
5	MODBUS 1 SHIELDED TWISTED PAIR	SCC	PDC(s) (DAISY CHAINED)
6	DISCRETE LOW LEVEL SIGNAL 12 VDC 2 CONDUCTORS	LOW LEVEL SENSOR	PDC(s) (DAISY CHAINED)

NOTES:

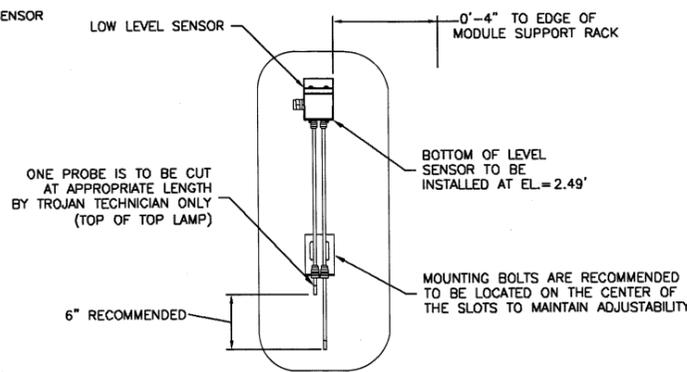
- : DO NOT SLOPE CHANNEL FLOOR.
- : CHANNEL WIDTH & DEPTH MUST BE KEPT WITHIN A TOLERANCE OF + OR - 1/8".
- : ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES.
- : SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
- : ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY.
- : ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
- : REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON.
- : MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
- : CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
- : EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATED WITH TROJAN EQUIPMENT ONLY.
- : EFFLUENT LEVELS MAY BE ALTERED DUE TO CHANNEL DEBRIS OR GEOMETRY.
- : GRATING IMMEDIATELY ABOVE UV MODULES TO BE OPEN TYPE (EG. PERFORATED) TO ALLOW ADEQUATE COOLING OF THE UV MODULES.
- : TOLERANCE AT ALC IS CHANNEL WIDTH +1".



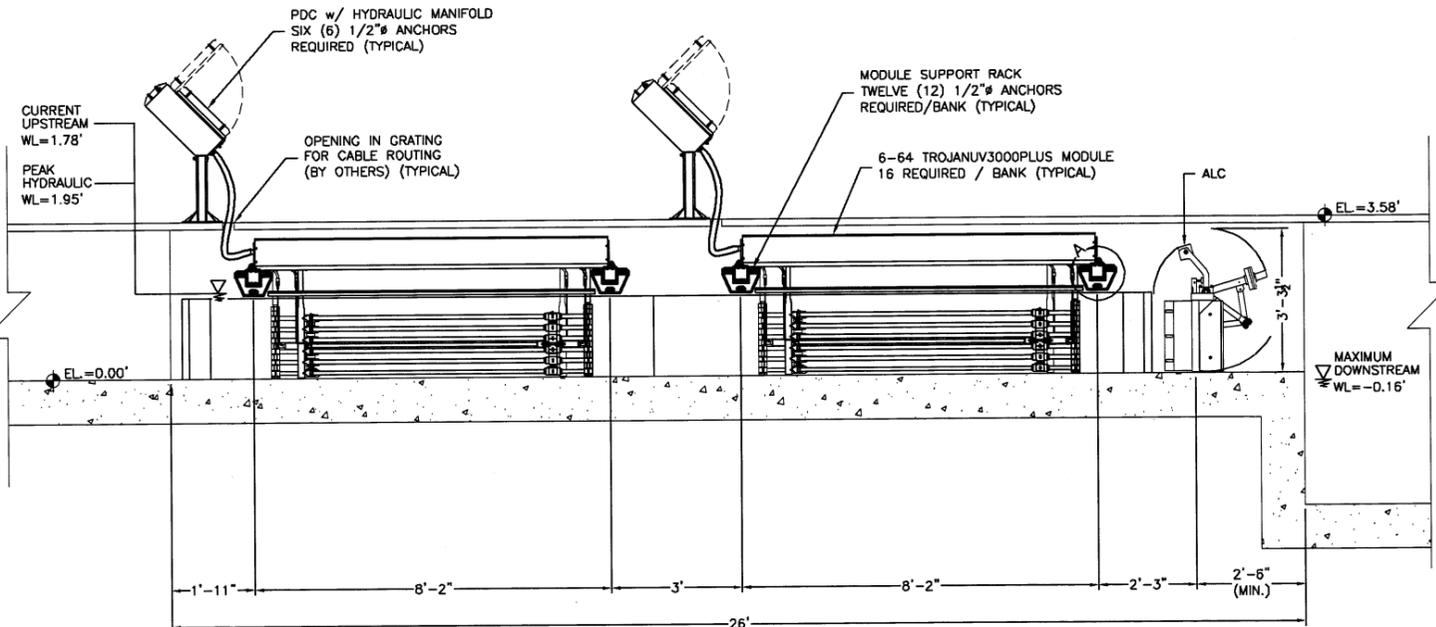
PLAN VIEW
SCALE: AS SHOWN



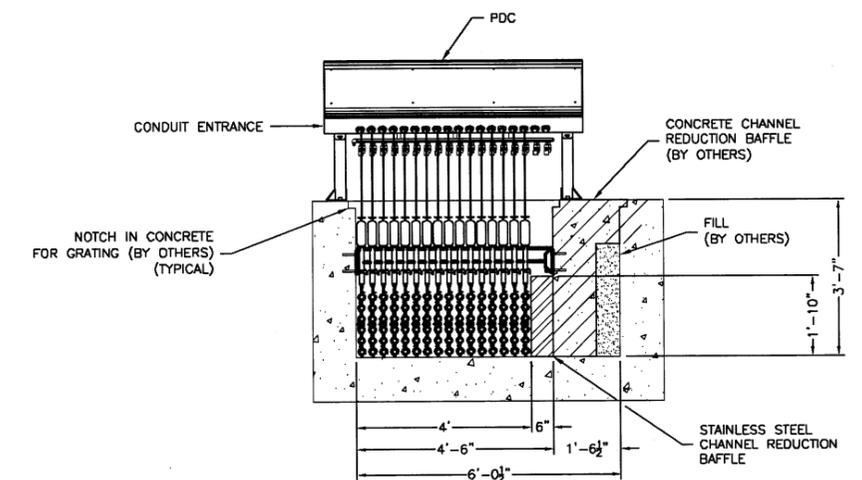
DETAIL A
SCALE: NOT TO SCALE



DETAIL B
SCALE: NOT TO SCALE



SECTION A
SCALE: AS SHOWN



SECTION B
SCALE: AS SHOWN
NOTE: SCC NOT SHOWN FOR CLARITY.

PRELIMINARY, NOT FOR CONSTRUCTION
VERIFY DIMENSIONS BEFORE COMMENCING CIVIL OR DESIGN WORK

DESIGN CRITERIA	VALUE
PEAK FLOW	10.70 (CURRENT) 13.50 (PEAK HYDRAULIC) MGD
U.V TRANSMITTANCE AT 253.7 nm	65 %
SUSPENDED SOLIDS	30 mg / l
DISINFECTION STANDARD	200 FC / 100ml

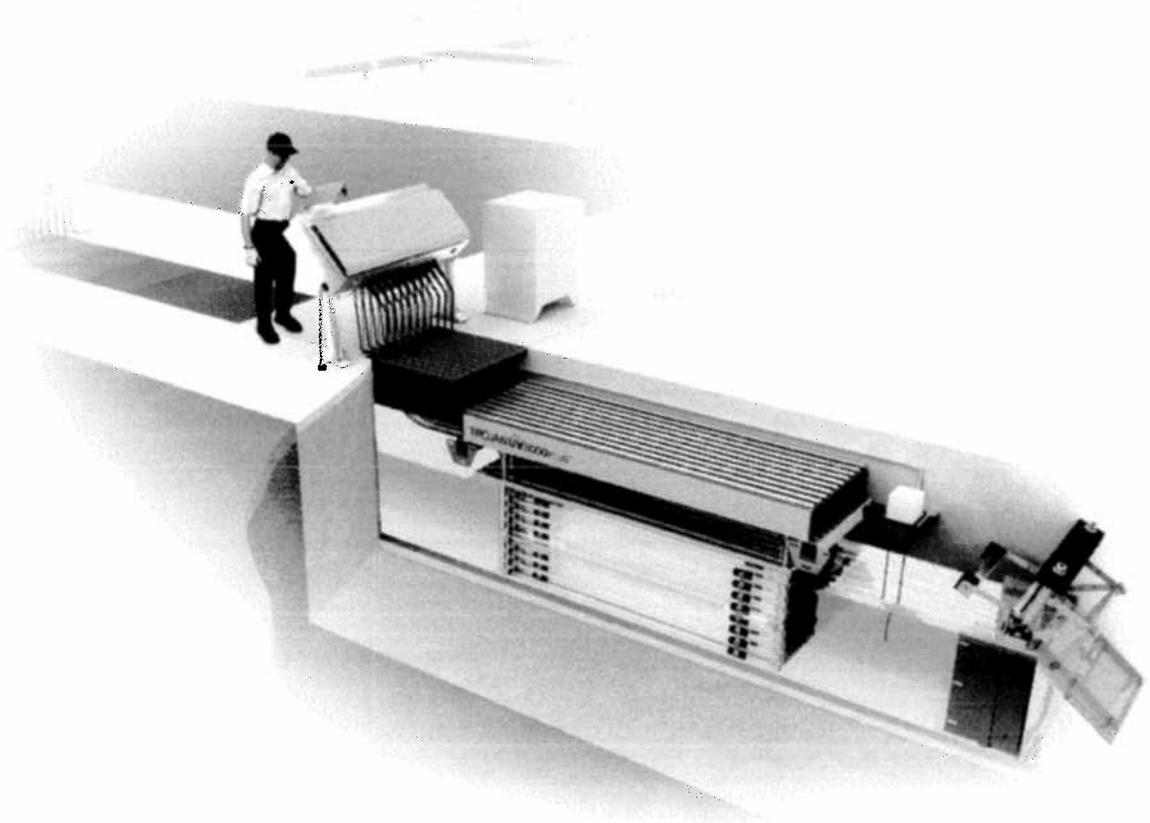
TROJAN UV
A TROJAN TECHNOLOGIES COMPANY
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DESCRIPTION:		QUOTE NO.
LAYOUT, TROJANUV3000PLUS NORTH HAVEN CT		LUD1377
DRAWN BY: RLM	DATE: 150C20	PROJECT NO. 512013
CHECKED BY:	DATE:	DWG NO. S01
APPROVED BY:	DATE:	REV. A
SCALE (11x17): 1/4"=1'-0"		LOG NUMBER: N/A



TROJANUV3000PLUS™

Installation Manual
Original Instructions
Edition 4



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Section 1 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.

1.1 Safety information

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

1.1.1 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.

Note: Information that supplements points in the main text.

1.1.2 Precautionary labels

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

	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. Note: For return 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.
	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. If on the instrument, refer to the instruction manual for operation or safety information.
	This symbol indicates that a risk of electrical shock and/or electrocution exists.
	This symbol indicates that a risk of electrical shock and/or electrocution exists, and that all appropriate lock-out and tag procedures must be obeyed.

General information



This symbol indicates that a full face shield is required for protection against intense UV exposure.

1.2 Acceptable noise levels

The EMI noise produced by this system is not more than 70 dB(A).

1.3 Power cable specifications

Exact power cable specifications depend on local codes. Refer to the site-specific electrical drawings for power cable specifications.

1.4 Patents and permissions

The UV system described in this manual 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 <http://www.trojanuv.com>.

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

1.5 Important acronyms and abbreviations

Table 1 defines frequently used terminology abbreviations and acronyms that correspond to equipment names. The acronyms and abbreviations are found in this user manual and in other Trojan equipment documentation. These instructions define the minimum requirements for care of the TROJANUV3000PLUS equipment prior to the system being commissioned by the Trojan Service Department.

1.6 Purpose of the installation manual

Table 1 Acronyms and abbreviations

Acronym/abbreviation	Description
%T	Percent transmittance
ACS	ActiClean™ Cleaning System
ALC	Automatic Level Controller
CCB	Communication Control Board
COMM	Communications
HMI	Human machine interface
HSC	Hydraulic System Center
I/O	Input/output
MCB	Module Control Board
PDC	Power Distribution Center
PLC	Programmable Logic Controller
SCC	System Control Center
UI	User interface
UVI	Ultraviolet intensity
UVT	Ultraviolet Transmittance

This manual describes the duties and responsibilities of the contractor upon receipt of the TROJANUV3000PLUS™.

This manual describes the installation procedures for the major components of the system:

- Channel
- UV Module Support
- Power Distribution Center (PDC)
- Hydraulic System Center (HSC)
- Weirs
- System Control Center (SCC)

1.7 Shipment and storage

1.7.1 How the equipment is shipped

The TROJANUV3000PLUS is delivered to the site by truck. System components are packed in wooden crates labeled with the component name. Other labels identify components which are fragile or breakable and components which must be kept dry.

1.7.2 Storage requirements before the install

The manufacturer recommends indoor storage of the TROJANUV3000PLUS™ 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 15 °C (60 °F) for a period of 24 hours.

Storage area conditions:

- Ambient air temperature between -40 °C to 55 °C (-40 °F to 130 °F).
- 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 UV Modules, PDCs, water level controller(s), HSC and hydraulic manifolds 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 300 mm (12 inches) 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.

1.8 Overview of equipment connections

NOTICE

Only Trojan Technologies Service Personnel or qualified service representatives can energize the TROJANUV3000PLUS™.

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

In general, the connections required for the system are:

- Conduit and communication cables (one (1) twisted, shielded pair) between the SCC, HSC and PDC(s)
- Conduit and communication cables (one (1) twisted, shielded pair) between the SCC and PDC(s)
- One main power feed terminated at the power distribution blocks for each PDC
- One power supply terminated at the termination block in the HSC
- One power supply terminated at the SCC
- One ground link daisy chained to the HSC & PDC(s)
- One discrete signal to the water level sensor from PDC where is closest to the sensor
- One remote I/O to the HSC
- For the UV Transmittance Controller and Sensor, an analog UV Transmittance signal terminates at the SCC.
- UV Transmittance Sensor communication cable (provided by Hach) connects to the On-Line UV Transmittance Controller. Refer to the Hach UVAS sc Sensor User Manual provided in the equipment appendix.
- Electrical connections for turbidimeter or ultrasonic level sensor (if applicable) are specified in the manufacturer's manual. Refer to the manufacturer's literature provided with the technical documentation.

1.9 Startup and system commission

After the shipment of the UV system, the contractor will be issued documentation for a start-up request. These documents must be completed and returned to the issuer before a commission date can be scheduled.

Section 2 Electrical lock-out and tag-out

⚠ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

⚠ DANGER



Electrocution hazard. Be aware that an electrical panel may be fed from multiple sources and may have stored energy. Make sure that all stored capacitance has been effectively drained. Obey all site-specific protocols.

⚠ DANGER



Electrocution hazard. Lock-out and tag-out electrical power.

⚠ WARNING



UV light exposure hazard. Wear a UV resistant face shield. Unprotected exposure to ultraviolet light can cause severe burns to the eyes and skin. A face shield should be worn as the primary protection against exposure. Never look directly at energized lamps.

⚠ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

The procedure in section 2.1 is the minimum lock-out requirement. Use additional precautions as needed. Obey all site-specific protocols.

2.1 Lock-out and tag-out procedure

2.1.1 Equipment shut-down

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

1. Make sure that no hazards will be created by equipment shut-down.
2. Shut down all the equipment that will need lock-out and tag-out.
3. Make sure that all moving parts come to a complete stop.

2.1.2 Deactivate energy sources

1. Identify and deactivate the main isolating device of each energy source:
 - Electrical energy
 - Kinetic energy
 - Potential energy

Electrical lock-out and tag-out

- Radiation
 - Chemical energy
 - Thermal energy
2. Disconnect all electrical equipment from power:
 - Unplug 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.
 5. Disconnect electrical power to pumps and compressors.
 6. Make sure that hydraulic and pneumatic lines are not pressurized.
 7. Secure moving parts to avoid unintended movement.

2.1.3 Lock-out and tag-out energy sources

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

2.1.4 Test the lock-out

▲ DANGER

Electrocution hazard. Maintain the continuity of the lock-out and tag-out between shifts.

1. Make sure 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 confirm that there is no voltage.
 - c. Test the voltmeter again to a known, energized 24 VAC/120 VAC source.
2. Make sure that stored energy sources have dissipated.
3. Make sure that hydraulic and pneumatic lines are not pressurized.
4. Try to start the de-energized equipment.

2.2 Remove the lock-out and tag-out

When the work is finished, the lock-out and tag-out can be removed.

1. Make sure that no hazards will be created by removal of the lock-out.
2. Obey manufacturer's instructions and safe work procedures to energize and start the equipment.
3. Clean up the work area.

Section 3 Channel installation

⚠ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

⚠ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

3.1 Concrete channels

For installation where stainless steel channels will not be used, a concrete UV channel must be poured by a customer-supplied contractor according to the dimensions specified on the drawings supplied by Trojan Technologies. Install all needed conduits (electrical, communication and hydraulic) before the concrete pad is poured. Do not terminate wires and hydraulic hoses. Refer to the layout and site plan drawings.

Section 4 UV module support rack

▲ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

▲ CAUTION

Wear safety glasses, protective gloves, hard hat and boots around the equipment.

▲ CAUTION

Do not connect the UV module to an electrical source. Do not connect to hydraulic lines.

NOTICE

The channel must be free of water upstream and downstream during installation.

4.1 UV module support rack

The UV module support rack is a stainless steel rectangular tube. Two module support racks are needed per module bank.

4.1.1 Install the channel bracket

NOTICE

Trojan Technologies personnel must install the UV modules in the channel and to the UV module support racks.

The UV module support rack is supported by channel bracket at each end of the rack. In concrete channels, the channel brackets are attached to the channel walls with customer-supplied M12 x 150 mm (½-inch x 6-inch) expansion anchor bolts. Anchor locations are shown in the layout drawing.

To install the UV module rack, refer to Figure 1 and the instructions in this section.

1. Examine and clean the bottom of the UV channel. Make sure that the floor is smooth and level.
2. Install the channel brackets to the channel wall. Use the horizontal and vertical dimensions provided in the layout drawing.
3. Mark the location for the anchor bolt holes in the center of each slot.
4. Drill the holes into the channel walls and attach the channel brackets to the wall with anchor bolts.
5. Place the clips into pre-drilled rack beam holes. Secure each spacer clip with the provided screws (Figure 2).
6. Put the rack beams into the channel brackets and attach the beams loosely with the provided set screws.

UV module support rack

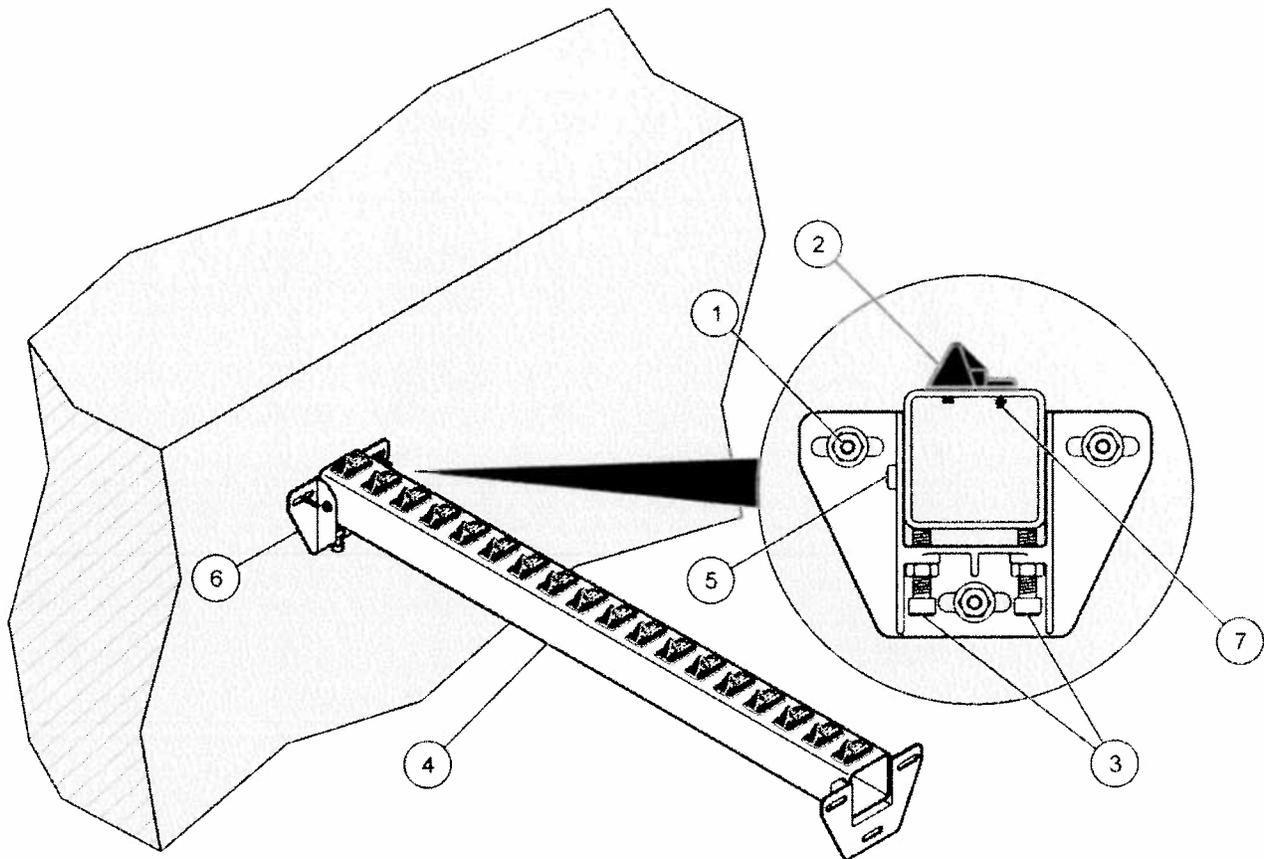


Figure 1 UV module support rack and channel bracket¹

1	Anchor bolt (3x)	5	Set screw (2 per rack beam)
2	Spacer clip	6	Channel bracket (2 per rack beam)
3	Level screw (2 per bracket)	7	Spacer clip screw
4	Rack beam		

¹ Left-hand rack beam and spacer clip are shown in Figure 1.

NOTICE

Trojan Technologies personnel must install the UV modules in the channel and to the UV module support racks.

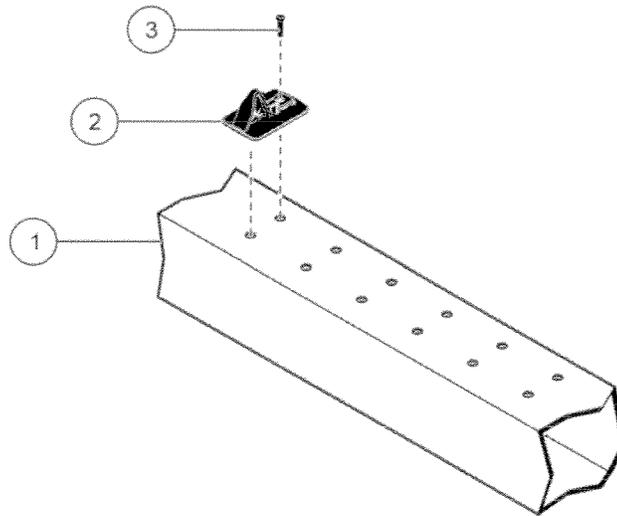


Figure 2 Spacer clip installation

1	Rack beam	2	Spacer clip	3	Screw
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4.2 Leveling

1. Install one UV Module and adjust the rack to achieve the correct distance between the channel floor and the bottom of the module leg (Figure 3).
2. Make sure that the UV module support rack is level in both directions. Vertical adjustment of the module rack is made with the level screws on the beam brackets.
3. When the module is level, tighten the channel brackets to the concrete wall.
4. Tighten all four set screws to hold the rack beams in place.
5. Remove the module after it is level.

UV module support rack

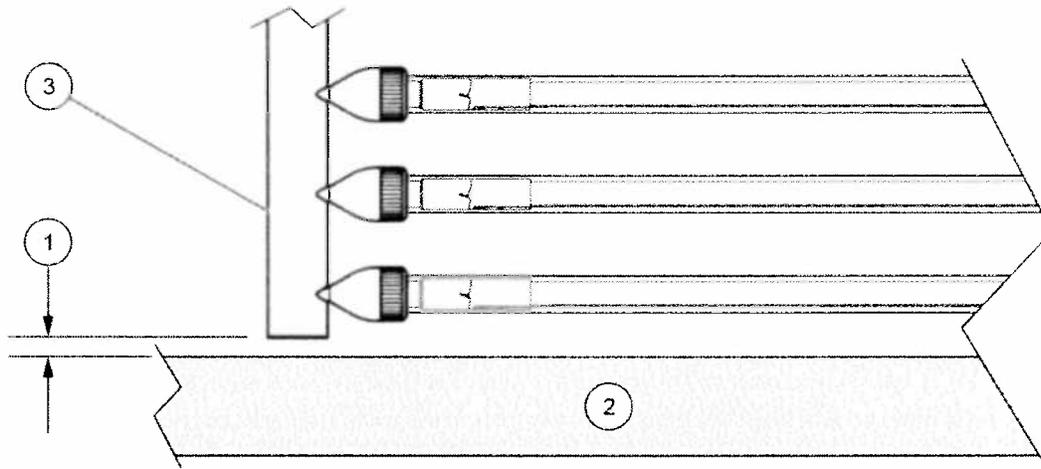


Figure 3 Spacing for UV module installation

1	6 mm (1/4 inch) - channel floor to the bottom of the module leg	2	Channel floor	3	UV Module
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4.3 UV module installation

NOTICE

Trojan Technologies personnel must install the UV modules in the channel and to the UV module support racks.

NOTICE

Do not submerge the module enclosures under water or the electrical components may be damaged. Module enclosures are water resistant, not waterproof.

Do not install the UV modules until Trojan Technologies personnel have confirmed the placement of the support racks and thoroughly examined all modules and channels.

Prior to the arrival of Trojan Technologies personnel, examine the modules and report any damage.

Section 5 Power Distribution Center (PDC)

⚠ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

⚠ DANGER



Electrocution hazard. Be aware that an electrical panel may be fed from multiple sources and may have stored energy. Make sure that all stored capacitance has been effectively drained. Obey all site-specific protocols.

⚠ DANGER



Electrocution hazard. Lock-out and tag-out electrical power. Refer to Section 2 on page 9 for general lock-out and tag procedures.

⚠ WARNING

Trip and fall hazard. When the channel is uncovered, use caution to avoid falling into the channel.

⚠ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

5.1 PDC overview

The PDC is a stainless steel, weather resistant enclosure that typically spans the width of the effluent channel and is attached to the concrete floor slab with the six expansion anchor bolts.

The PDC includes:

- Power distribution system, which distributes power to the UV Modules via individual relays and fuses
- Relays switch off power to the UV Modules and send data from the UV Modules receptacle when the modules are disconnected.
- Communication Control Board, which transmits and receives data between the SCC and the modules
- The ActiClean™ Cleaning System (ACS) is supplied as part of the TROJANUV3000PLUS™, a hydraulic manifold is anchored to the bottom of the PDC. The manifold is used to distribute hydraulic fluid to each module

The UV Module power cords attach to the receptacles on the PDC. The cable from the UV Sensor (one per bank) also plugs into the PDC at the receptacle labeled UVI (UV Intensity). Hydraulic hoses from the ActiClean™ Cleaning System are plugged into fittings on the hydraulic manifolds that hang below the PDC.

5.2 PDC installation

5.2.1 Mounting at the channel

Refer to Figure 4, Figure 5 and the instructions in this section to assemble and install the PDC.

1. Measure the width of the channel at the PDC location.
2. Use the hardware from the mounting kit to mount the PDC legs to the enclosure bracket at the measured channel width (Figure 4).
3. Put the PDC in the location and position specified in the layout drawing provided by Trojan Technologies.
4. Use the holes on the PDC legs to mark the hole locations on the concrete.
5. Remove the PDC. Drill the holes to accommodate M12 (1/2-inch) anchor bolts.
6. Install the anchors in the concrete. Put the PDC onto the anchor bolts. Make sure that the PDC feet are flush with the channel walls (Figure 5). If the channel has a notch for grating, the PDC feet should be flush with the notch. If needed, adjust the bolt that connects the PDC enclosure to the leg.

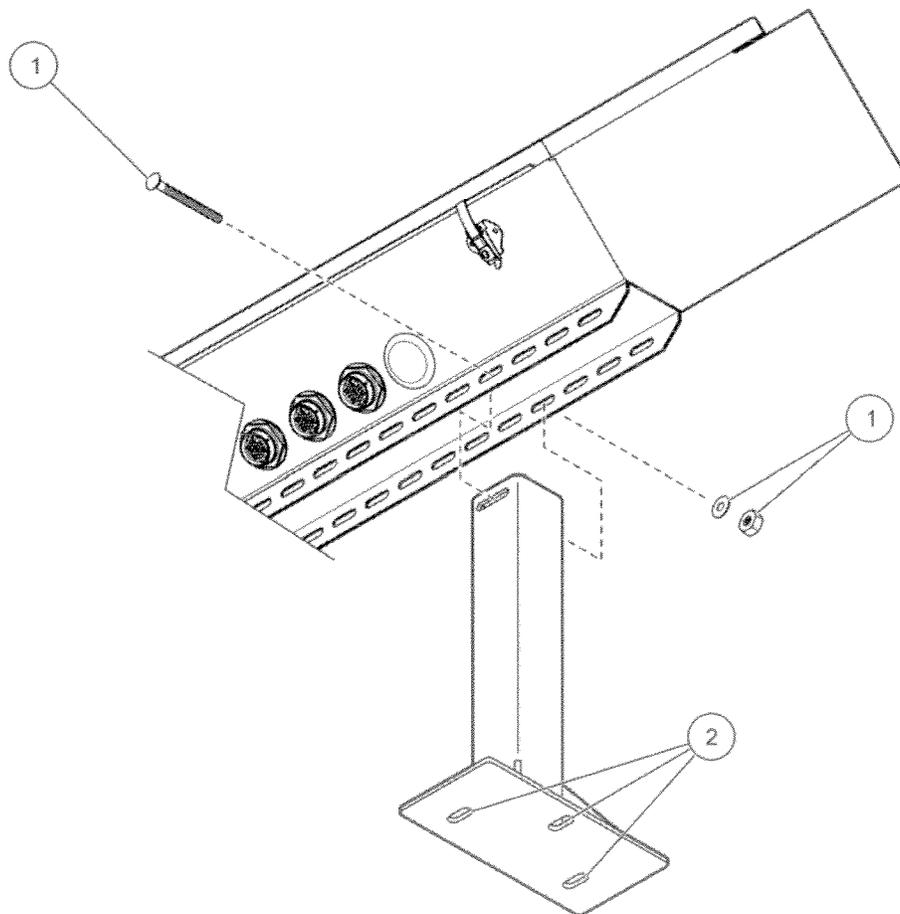


Figure 4 PDC leg assembly

1	Mounting kit hardware	2	Foot - slotted mounting holes
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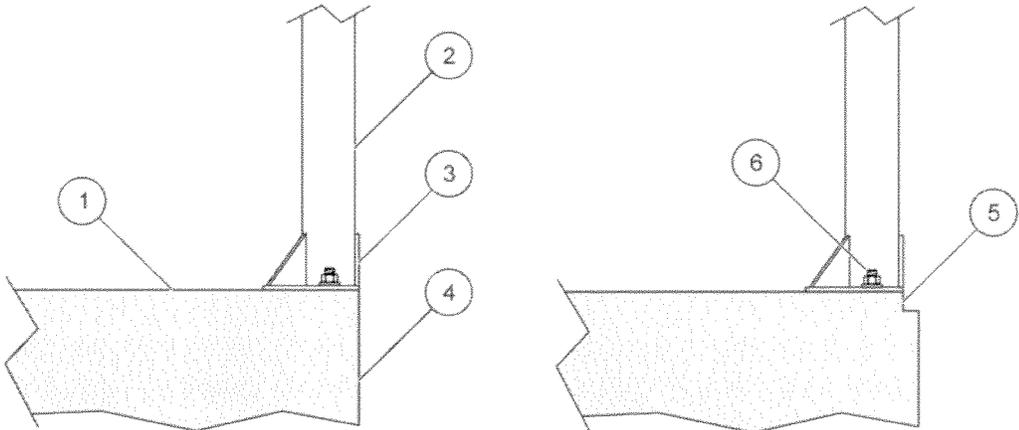


Figure 5 PDC leg position

1	Channel, top surface	4	Channel wall
2	PDC leg	5	Channel wall with notch for grating
3	PDC foot	6	Anchor bolt (3 per PDC leg)

5.2.2 Install the hydraulic manifold

Refer to Figure 6 to install the hydraulic manifold assembly for units with more than 10 modules:

1. Install the hydraulic manifold to the underside studs of PDC with the male Retract (R) hydraulic connections nearest the module electrical ports.
2. Attach the manifold with the hardware provided on the hydraulic manifold standoffs on the PDC.

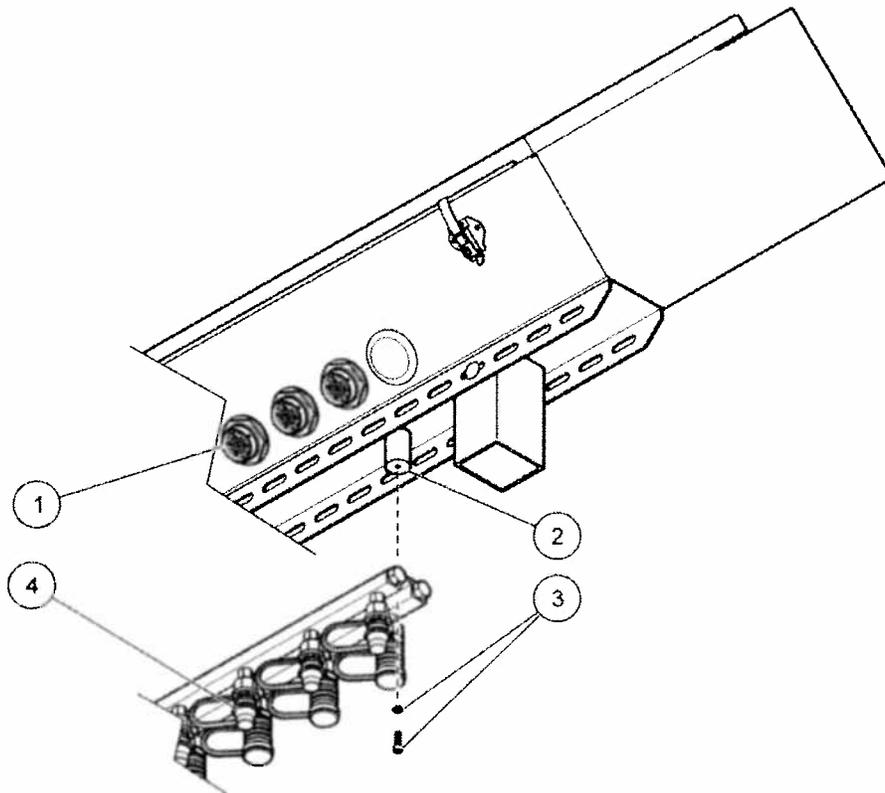


Figure 6 Hydraulic manifold (more than 10 modules)

1	Electrical port, UV Module	3	Bolt and washer
2	Standoff(s), hydraulic manifold	4	Hydraulic connector, male

5.2.3 Electrical installation

NOTICE

Before electrical installation begins, refer to the PDC electrical and layout drawings provided to determine wire sizes, routing and connections to other devices.

Refer to Figure 8 for PDC connections.

1. Locate the red label on the PDC enclosure. This is the end where electrical connections are made (Figure 7).
2. Put a cloth over equipment inside the PDC enclosure to protect from metal filings.
3. Drill pilot holes for the hydraulic knockout device.
4. Use the hydraulic knockout device to add holes to the PDC enclosure for incoming power feed and all applicable field wiring.

Note: If needed, install conduit to bring power across the PDC to the field and power connections (Figure 9 on page 23).

5. Carefully remove the protective cloth without dropping metal filings inside the PDC. Remove all metal filings in the PDC.

6. Install the power feed and all applicable field wiring. Include a local disconnect. Obey all local codes for main incoming power supplies and applicable field wiring.
7. If the optional power monitor is installed, make sure to put the three main power feeds through the three current transformers (identified as L1, L2 and L3) before they are connected to the main distribution blocks (identified as L1, L2 and L3). The current transformers are located in front of the main distribution blocks.
8. All connections must be watertight and weather-proof. Obey TYPE 4X or IEC IP66 standards for all electrical connections to the PDC.
9. Remove all protective films and red cut-out labels when the installation is complete.
10. Repeat steps 1 through 9 for each PDC.

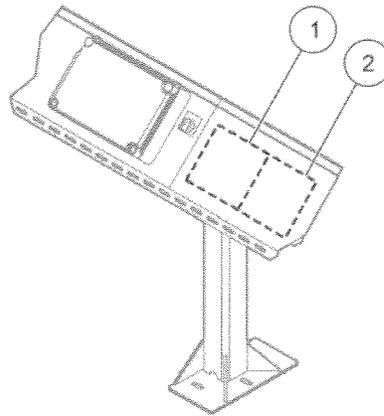


Figure 7 Electrical cutout placement

1	Low voltage field connections
2	High voltage power connections

Power Distribution Center (PDC)

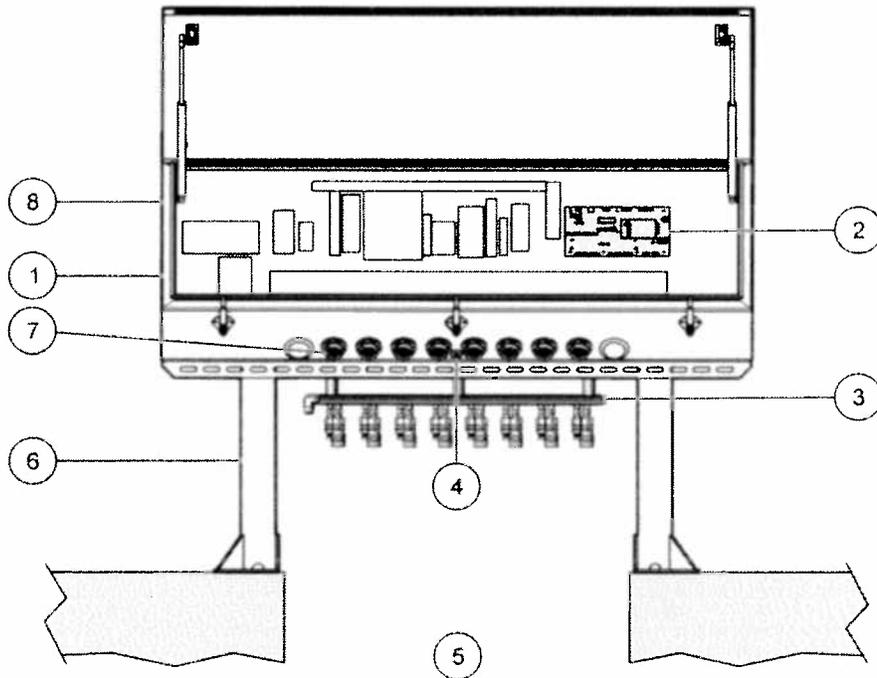


Figure 8 PDC connections

1	High-voltage power connections	5	Channel
2	CCB	6	PDC leg
3	Hydraulic connections (HSC systems only)	7	Electrical port, UV Module
4	UVI port	8	Low-voltage power connection

5.2.4 Conduit installation

Refer to Figure 9 to install conduit as required to bring power across the PDC to the field and power connections.

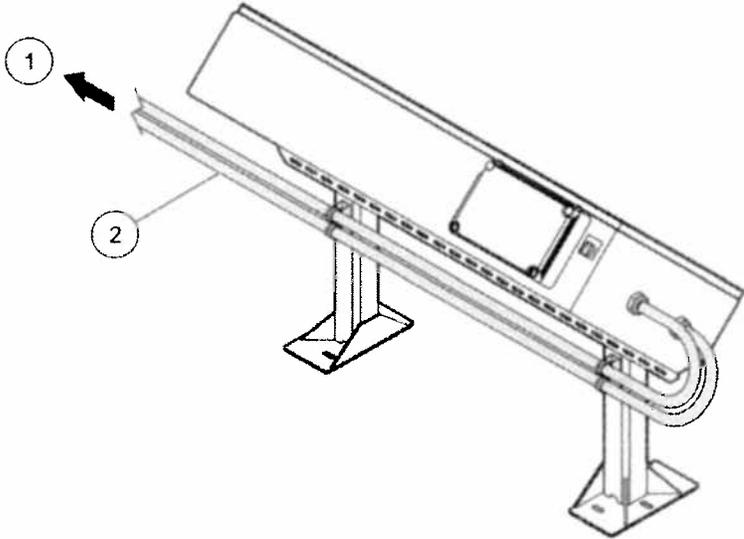


Figure 9 Conduit installation

1 To external connections	2 Conduit
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Section 6 Hydraulic System Center (HSC)

▲ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

▲ WARNING

Trip and fall hazard. When the channel is uncovered, use caution to avoid falling into the channel.

▲ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

6.1 Before installation

The HSC is installed close to the UV channel. Refer to the layout drawing for the exact location.

Note: The ACS wiper drive is hydraulically actuated with fluid pumped from the HSC.

The incoming electrical service of the HSC terminates at the power disconnect and feeds three-phase power to the hydraulic pump and 24 volt power supply. Electrical power is distributed to individual breakers provided to protect each circuit.

The manufacturer supplies a hydraulic hose kit with connections and hoses for installation by a qualified installation contractor.

6.2 Installation procedure

6.2.1 Mount the HSC

1. Put the HSC in the location specified in the layout drawing and site plan drawings. Keep bends and elevation changes in the hydraulic hoses to a minimum. The maximum hose distance for the HSC Multibank is 15.2 m (50 feet).
2. Mark the hole locations on the concrete with the holes on the HSC legs (Figure 10).
3. Drill the holes to accommodate the four M12 (1/2-inch) anchor bolts. Install the anchors. Secure the HSC with the washers and nuts.

6.2.2 Electrical installation

NOTICE

Before electrical installation begins, refer to the HSC electrical and layout drawings provided to determine wire sizes, routing and connections to other devices.

NOTICE

For indoor installations, electrical connections can be top mounted.

1. Locate the red label that indicates where electrical connections are made (Figure 10).
2. Put a protective cloth over equipment inside the HSC enclosure.

Hydraulic System Center (HSC)

3. Use the hydraulic knockout device to add holes to the HSC enclosure for incoming power feed and all applicable field wiring.
4. Carefully remove the protective cloth without dropping metal filings inside the HSC. Remove all metal filings in the HSC.
5. Install the power feed and all applicable field wiring. Include a local disconnect. Obey all local codes for main incoming power supplies.
6. All connections must be watertight and weather-proof. Obey NEMA 4X or IEC IP56 standards for all connections.
7. Remove protective films and cutout labels when the installation is complete.

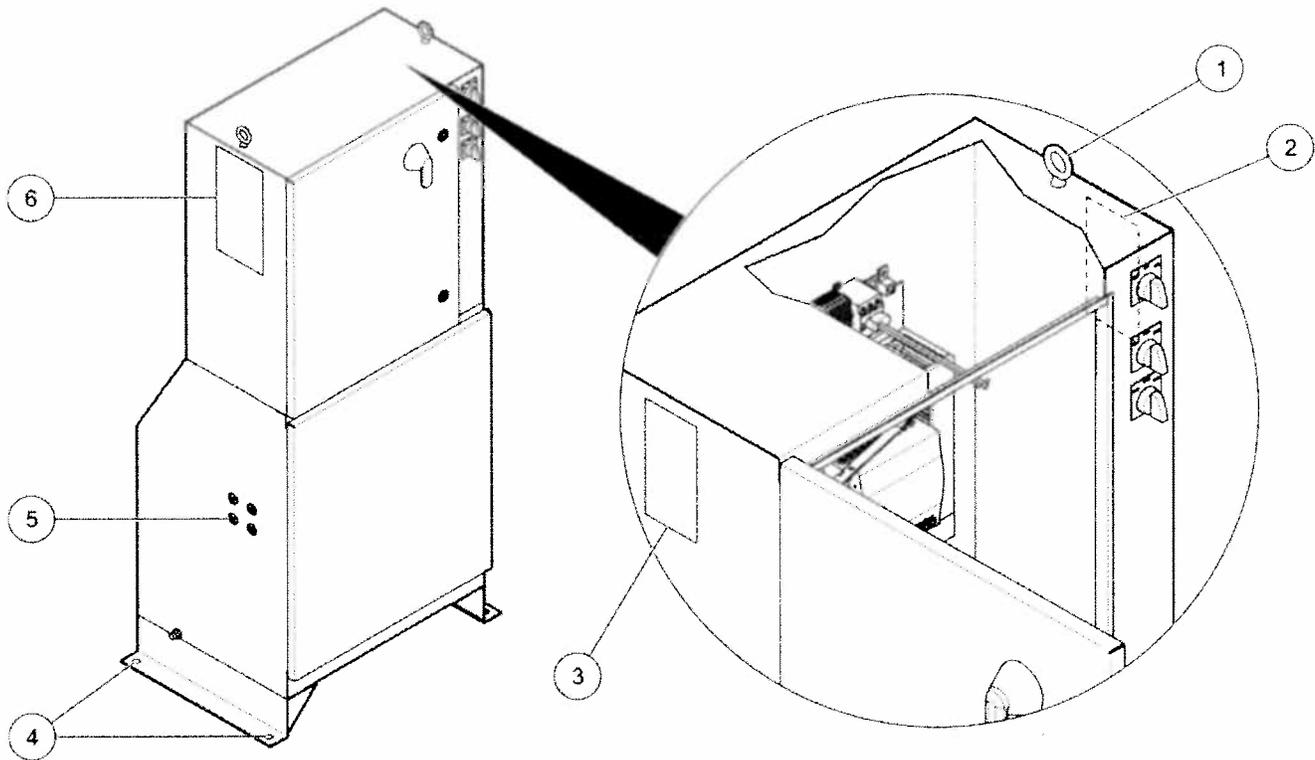


Figure 10 HSC Multibank electrical cutout for outdoor installations

1	Mounting holes (4x)	4	Lifting lugs (2x)
2	Low voltage location label	5	Hydraulic ports
3	High voltage location label		

6.3 Connect the hydraulic lines

⚠ DANGER



Electrocution hazard. Be aware that an electrical panel may be fed from multiple sources and may have stored energy. Make sure that all stored capacitance has been effectively drained. Obey all site-specific protocols.

⚠ DANGER	
	<p>Electrocution hazard. Lock-out and tag-out electrical power. Refer to Section 2 on page 9 for general lock-out and tag procedures.</p>

Refer to Figure 13 and the instructions in this section to connect hydraulic lines.

Before installation:

- Put a tray under the manifold to catch residual leakage during hydraulic line installation.
 - Refer to the layout and site plan drawings for the routing of the hydraulic lines
1. Remove one pair of Extend (E) and Retract (R) port plugs from the hydraulic ports on the side of the HSC for each wiper group found in section 1.2 of the Controls Philosophy.
 2. Install the 90-degree HSC connectors into the ports where the plugs have just been removed from the HSC. Tighten to 57 Nm (42 ft-lbs).
 3. Put the blue and black hoses through the conduit or the hose trough to the first or the last PDC hydraulic manifold in the series.
 4. Remove the protective caps from the Extend (E) and Retract (R) ports of the HSC.
 5. Connect a female straight hose barb to one end of the hydraulic black extend hose and another female straight hose barb to one end of the hydraulic blue Retract (R) hose closest to the HSC (section 6.3.1 and Figure 12 on page 29).
 6. Dry-fit the line pair. Keep the number of bends to a minimum. Use only the correct tools and keep the correct bend radius for DN15 pipe. Install the line pair between the HSC and the PDC manifold.
 7. Flare-fit the line at the HSC connection point. Attach the line marked E to the Extend (E) port on the HSC and attach the line marked R to the Retract (R) port for the hydraulic line pair. Make sure that the compression nuts are tight. (Figure 13 on page 30)
 8. Connect the black hose to the Extend (E) port and the blue hose to the Retract (R) port on the HSC. Tighten the connectors to one hex-side past finger-tight (Figure 11).
 9. Cut the Extend (E) and Retract (R) hose to length and attach the female 90-degree hose barbs to each hose (Figure 13 on page 30).
 10. Remove the end plugs from the end of the PDC hydraulic manifold where the hoses will be connected. Install the manifold connector into the ports. Tighten the connectors to 37 Nm (27 ft-lbs).
 11. Connect the black hose to the Extend (E) port and the blue hose to the Retract (R) port on the PDC hydraulic manifold. Tighten the connectors to one hex-side past finger-tight (Figure 11).
 - For systems with multiple banks per wiper group, continue with step 12.
 12. On the same manifold:
 - a. Remove the end plugs from the opposite end of the PDC hydraulic manifold. Install the manifold connector into the port. Tighten the connectors to 37 Nm (27 ft-lbs).

Hydraulic System Center (HSC)

- b. Connect a female 90 degree hose barb to one end of a new length of hydraulic black Extend (E) hose and another female 90 degree hose barb to one end of new length of hydraulic blue Retract (R) hose (Figure 13 on page 30).
- c. Connect the black hose to the Extend (E) port and connect the blue hose to the Retract (R) port on the end of the hydraulic manifold. Tighten the connectors to one hex-side past finger-tight (Figure 11).
- d. Put the blue and black hoses through the conduit or trough to the next PDC in series.
- e. Cut the Extend (E) and Retract (R) hose to length and attach the female 90-degree hose barbs to each hose (Figure 13 on page 30).
- f. Remove the end plugs from end of the PDC hydraulic manifold. Install the manifold connector into the ports. Tighten the connectors to 37 Nm (27 ft-lbs).
- g. Connect the black hose to the Extend (E) port and connect the blue hose to the Retract (R) port on the end of the hydraulic manifold. Tighten the connectors to one hex-side past finger-tight (Figure 11).

13. Repeat step 12 for each bank in series* in the wiper group.

Note: Each PDC controls one wiper group.

NOTICE

Do not fill system with hydraulic fluid.

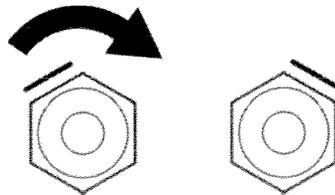


Figure 11 One side of the hexagonal connector (one hex-side)

6.3.1 Considerations for hose barb installation

Refer to Figure 12 for installation of the hose barb fittings.

- Do not use hose clamps with the barbs, because they are self-sealing.
- Make sure that the end of the hose is cut square.
- Use isopropyl alcohol or ethyl alcohol to lubricate the end of the hose before installation.

NOTICE

Do not use hydraulic oil as a lubricant for the hose barb fittings.

- Push the barb fitting into the hose, then push the fitting against a flat rigid surface to help insert the fitting. Apply enough force to seat the hose completely against the ring.

*Maximum of three banks in series

- Make sure that the barb ends are not damaged before installation of the hose.

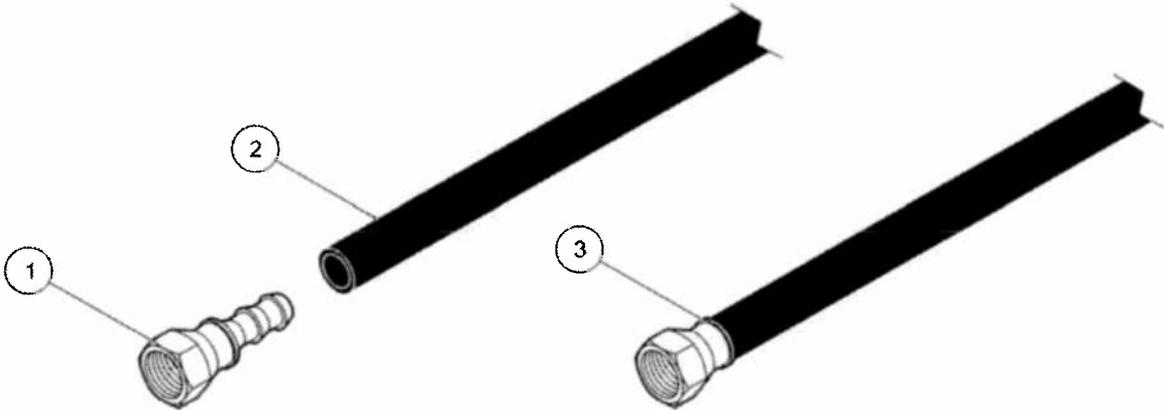


Figure 12 Straight hose barb (female) installation

1	Hose barb	2	Hydraulic hose	3	Ring
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Hydraulic System Center (HSC)

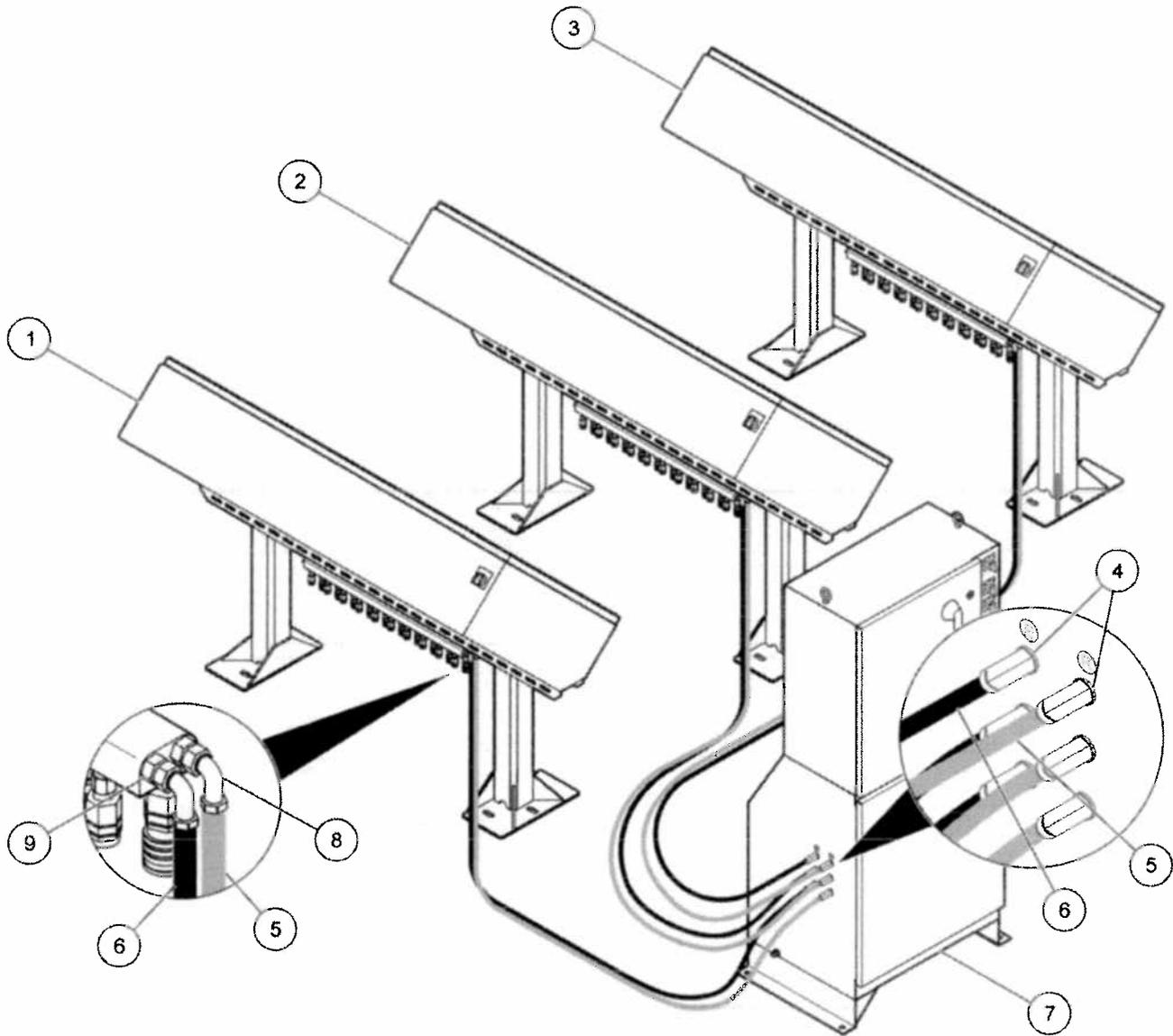


Figure 13 Hydraulic line connections, HSC Multibank

1	PDC 1	6	Hose, hydraulic, black Extend (E)
2	PDC 2	7	HSC Multibank
3	PDC 3	8	Barb, female, 90 degree
4	HSC connector, 90 degree	9	Connector, manifold
5	Hose, hydraulic, blue Retract (R)		

Section 7 Level control device

▲ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

▲ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

NOTICE

The channel must be free of water upstream and downstream during installation.

7.1 Motorized weir or slide gate installation

If a motorized weir gate or slide gate is used, the manufacturer or a qualified representative will install the gate.

Section 8 Low level sensor installation

DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

DANGER



Electrocution hazard. Be aware that an electrical panel may be fed from multiple sources and may have stored energy. Make sure that all stored capacitance has been effectively drained. Obey all site-specific protocols.

DANGER



Electrocution hazard. Lock-out electrical power. Refer to Section 2 on page 9 for general lock-out and tag procedures.

8.1 Low level sensor

One low level sensor is located in each channel between the level controller and the bank that is farthest downstream. The sensing electrodes are mounted in the channel and are powered by 12 VDC from the PDC. The solid state control relay is located in the PDC enclosure. When the water level drops enough to expose both sensor rods, the bank will power down.

8.1.1 Low level sensor installation

Refer to the site plan, layout drawing and the instrumentation section of the submittal for installation details.

1. Put the level sensor top wall mounting bracket in the location and elevation specified in the layout and site plan drawings. Make sure that the bracket is plumb with the channel wall.
2. Use the bracket to mark the location of the holes in the center of each slot (two per bracket). Drill the holes in the channel wall.
3. Install M8 (1/4-inch) anchors. Attach the mounting bracket with customer-supplied stainless steel nuts and washers.
4. Mount the level sensor to the bracket with the hardware supplied in the level sensor kit.
5. Put the lower wall mounting bracket so that the bottom is 254 mm (10 inches) below the bottom of the top wall mounting bracket.
6. A Trojan Technologies-certified technician will cut the sensor rods to the correct length. Electrical connections are specified in the layout drawing. Make sure that all connections are watertight and weatherproof to NEMA 4X or IEC IP56 standards.

Low level sensor installation

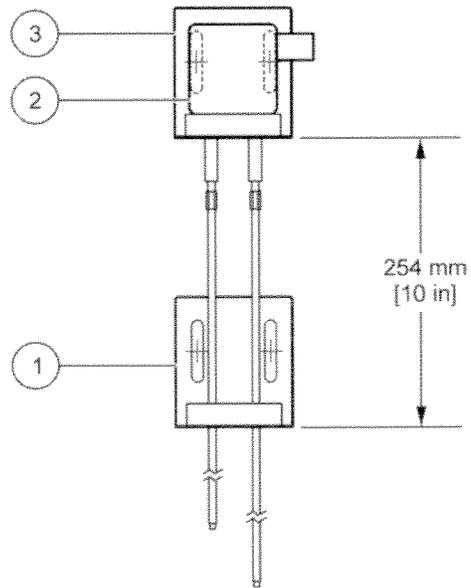


Figure 14

1	Lower mounting bracket	2	Low level sensor	3	Top mounting bracket
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Section 9 Additional equipment

▲ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

▲ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

NOTICE

The channel must be free of water upstream and downstream during installation.

9.1 UV Transmittance (UVT) controller and sensor installation

Refer to the layout drawing for the location of the UVT instrument location. Refer to the manufacturer's user manuals for installation instructions.

9.2 Lifting sling

▲ WARNING

Heavy object hazard. Wear protective clothing, such as safety glasses, a hard hat and steel-reinforced boots. Stay clear of the object during lifting and placement.

The lifting sling is used to remove modules from the channel for cleaning and maintenance (Figure 15). One end of the UV Module is heavier. At least one person must be present to keep the load level and balanced during moving and lifting.

1. Attach the ring to the crane.
2. Lower the lifting sling to the module.
3. Attach the end brackets to each end of module.
4. Raise the crane slowly to tension and carefully lift the module from the channel.

Additional equipment

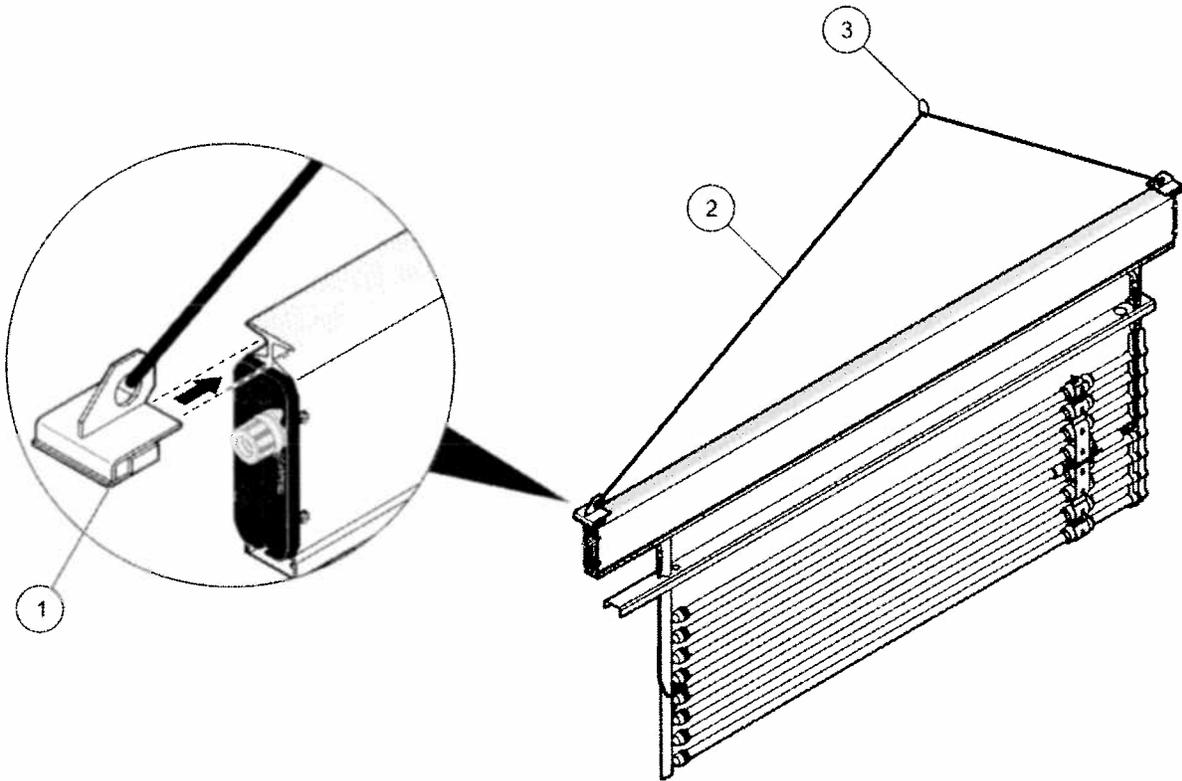


Figure 15 Lifting sling

1	End bracket	2	Sling	3	Ring
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NOTICE

To mix the cleaning solution, fill the tank with water, then add the acid to the water.

Section 10 System Control Center

⚠ DANGER

Only qualified personnel should conduct the tasks described in this section of the manual.

⚠ DANGER



Electrocution hazard. Be aware that an electrical panel may be fed from multiple sources and may have stored energy. Make sure that all stored capacitance has been effectively drained. Obey all site-specific protocols.

⚠ DANGER



Electrocution hazard. Lock-out and tag-out electrical power. Refer to Section 2 on page 9 for general lock-out and tag procedures.

⚠ CAUTION

Wear safety glasses, protective gloves and boots when working on equipment.

The SCC can be floor mounted with four expansion anchor bolts.

5. Install the SCC enclosure to the floor as required with 6-mm (1/4-inch) bolts.

