ADDENDUM #6

RFP Number: 23-016-3340	Title: Antioch Water Treatment Plant Phase 3A Expansion
	Date: June 12, 2023
Issuing Officer: Greg Bridges	Bid Initially Solicited: April 27, 2023
Email Address: gebridges@forsythco.com	Telephone: 770-888-8872

This addendum supersedes and supplements all portions of the bidding documents and becomes part of the contract documents for the above-referenced project. Where any item called for in the specifications or indicated on the drawings is supplemented hereby, the original requirements shall remain in effect. Where any original item is amended, voided, or superseded hereby, the provision of such item not so specifically amended, voided, or superseded shall remain in effect.

#	Addition/Change	Drawings or Specification	Details
1.	**Date Change**	**00 11 13** **00 11 19**	**The Bid Opening Date has been extended to June 29, 2023 at 2:00 pm.**
2.	Paragraph 1-1.02.e.	44 43 00	Replace the first sentence with: "Three Adjustable Frequency Drives for the Process Pumps (P-3500-9, P-3500-10, P-3500-11) and one Adjustable Frequency Drive for the membrane air scour blower (B-8500C)."
3.	Paragraph 3-1.0.c.4)	44 43 00	Replace the last two sentences with: "The glycerin coating shall be removed from the membranes by rinsing with finished water. Refer to the glycerin flushing procedure provided by SUEZ." A glycerin procedure is attached.
4.	Paragraph 3-1.0.c.5)	44 43 00	Replace the first sentence with: "The glycerin removal procedure shall follow the procedure provided by

#	Addition/Change	Drawings or Specification	Details
			SUEZ." A glycerin procedure is attached.
5.	Updated version of Suez Proposal	Suez Proposal	The Suez Proposal begins on page 1188 of the Bid Set Documents. Replace this Revision 2 with the attached Revision 3. File is attached under Miscellaneous on Forsyth County Procurement website
6.	Two sets of Suez P&IDs are included in the Bid Documents	Suez P&IDs	There are two sets of Suez P&IDs in the Bid Set Documents – beginning on PDF page 1233 of the Suez Proposal (now replaced with Revision 3) and those beginning on PDF page 1890 from the approved submittal. The approved submittal drawings are to be followed.
7.	Glycerin flushing instructions	Glycerin Flush and Module Sanitization Procedure	The Suez Glycerin Flush and Module Sanitization Procedure is attached.
8.	Suez uncrating instructions	ZeeWeed 1000 40-60 element uncrating and installation instructions	The Suez element uncrating and installation instructions are attached.
9.	Addition to Note 5	I-01-602-3A	At the end of Note 5, add the following: "Veolia is providing Ethernet modules for all Membrane Control Panels. Removal of ControlNet modules, wiring new Ethernet modules and Ethernet cable installation will be by the Contractor."
10.	Moisture switch and temperature switch	E-20-101-3A	Delete MSH-8500C and TSH 8500C from Membrane Blower B-8500C.
11.	Moisture switch and temperature switch	E-90-605-3A	Delete MSH-8500C and TSH 8500C from Membrane Blower B-8500C.

Glycerin Flush and Module Sanitization Procedure

VEOLIA WTS CONTROLLED DOCUMENT

1.0 Purpose

The purpose of this document is to outline the steps required to carry out a glycerin flush on ZeeWeed* Cassettes and to carry out sanitization on ZeeWeed membrane modules removed from and re-installed at site.

ZeeWeed membrane modules are shipped in a preservation solution and must be rinsed prior to their initial use and subsequent startup of the system to remove the preservative. The preservative is a food grade glycerin solution that when flushed in water results in a high strength flush water in terms of Chemical Oxygen Demand (COD). It is not appropriate for this solution to be discharged directly to the environment without first treatment through a wastewater treatment plant. For estimation of plant specific water flush water volumes, please contact your Veolia Representative.

Follow proper safety procedures to prevent injury when carrying out this procedure. Proper crane training is required along with a certified and inspected crane. Adhere to all confirmed Fall Arrest Procedures as per Veolia's Health and Safety Policy & Procedures Manual.

2.0 Applicability and Revisions

This document covers the ZeeWeed product line.

3.0 Manpower Requirement

This procedure can be carried out by one Field Service Representative (FSR) or operator.

READ THIS PROCEDURE COMPLETELY BEFORE PROCEEDING

4.0 Preparation Work

Glycerin flushing procedures vary from plant to plant. This is dependent on the membrane application (wastewater or drinking water) and the local capability to dispose of the resulting glycerin solution. Prior to commissioning, discussions should be held on the best method to dispose of the glycerin and a detailed plan developed with responsibilities and timelines clearly established.

Glycerin Flush and Module Sanitization Procedure

4.1 Considerations

- What is the disposal method – discharge to local sanitary sewer or offsite trucking?
- Can the receiving WWTP accommodate the glycerin solution on the current generation timeline?
- What local regulations are in effect to confirm glycerin removal (TOC, COD, etc.)?
- What is the background TOC/COD in the flush water?
- Confirm with customer the acceptable TOC/COD level for discharge of treated water to its destination.
- What equipment will be required at site to provide this onsite lab analysis?
- How will the glycerin containing solution be handled (removed from the tank) and how will fresh water be added to the tank?
- How will the system piping be arranged to return the permeate back to the membrane tank or bioreactor?

5.0 Glycerin Removal – Wastewater Applications

A comprehensive glycerin flush procedure is usually not needed in wastewater applications. On a new installation, glycerin removal will be accomplished during Veolia standard clean water control testing of the system.

The simplest way to remove glycerin in wastewater applications is to recirculate the permeate in a closed loop within the bioreactor. The glycerin will come out into solution through the bioreactor and act as a food for the biology during process startup. The load of the glycerin can be evaluated into the F:M loading during seeding or regular operations of the system.

Permeating at 20-40 LMH (12-24 GFD) for a duration of 15 hours is sufficient for glycerin removal from the membranes.

A COD or TOC test of the permeate can be performed, if required, to confirm the glycerin has been removed from membranes (compared against a background COD/TOC sample of the starting flush water).

Glycerin Flush and Module Sanitization Procedure

5.1 Glycerin Removal – Drinking Water and other UF Applications

There are four general methods to remove glycerin from the membranes:

a. Permeate to waste
b. Backpulse to waste
c. Permeate in a closed loop, drain, fill and repeat
d. Priming and purge – *not recommended if any of options a. to c. are possible*

The permeate and backpulse to waste methods are simpler but may consume more water. These methods may require frequent operation of rotating equipment and evaluating plant flows.

The closed loop method consumes less water but is more time intensive. This method may utilize plant common equipment and requires effective draining of the closed loop between flushes.

The priming and purge method consumes the least amount of water but is generally not recommended due to time and labour requirements. Only use this approach if necessary. This method does not use any plant common equipment and may be suitable for flushing membranes that are being installed in a plant that is already in operation.

Permeate to waste procedure:

1. Install the membranes and fill with raw water. The quality of this raw water used for flushing should be equal to or better than the design requirements for the system including, but not limited to, adherence to UF membrane upstream screening requirements.

2. Commence permeating from the membranes at 20 LMH (12 GFD) to waste. Take a sample of the raw water upstream of the membranes and measure COD or TOC to be used as a baseline. Permeate for a period of 45 minutes.

3. Execute a backwash / backpulse sequence manually as per the system design. Ensure the tank / modules are deconcentrated (drained), and a backpulse and aeration take place according to the design. Ensure the tank / modules are refilled.

4. Permeate from the membranes at 20 LMH (12 GFD) to waste. Permeate for a period of 15 minutes.

5. Increase the permeate flow rate to the maximum instantaneous permeate flow rate. Permeate for a period of 15 minutes.

6. Collect permeate sample for COD/TOC analysis.

Glycerin Flush and Module Sanitization Procedure

7. Repeat step 3.

8. If COD/TOC result is acceptable the flush is complete. If not, repeat steps 5-8.

Backpulse to waste procedure:

1. Install the membranes and fill the tank / modules with raw water. The quality of this raw water used for flushing should be equal to or better than the design requirements for the system including, but not limited to, adherence to UF membrane upstream screening requirements.

2. Verify a backpulse water source that is of UF permeate quality, potable / drinking water quality, or better. Fill the backpulse tank. This can be done manually from an external source, or using permeate from existing, flushed trains.

3. Commence backpulsing the membranes / modules at 20 LMH (12 GFD) to waste or into the membrane tank. Take a sample of the raw water upstream of the membranes and measure COD or TOC to be used as a baseline. Backpulse for a period of 45 minutes to drain.

If the waste cannot be continuously discharged for 45 minutes (for example, it will be batch transferred to a truck for disposal) backpulse in batches until the equivalent amount of water has been discharged. For immersed systems, this should be a minimum of 3 tank volumes. Leave the membrane tank full after the last backpulse step.

4. Execute a full backwash / backpulse sequence manually as per the system design. Ensure the tank / modules are deconcentrated (drained), and a backpulse and aeration take place according to the design. Ensure the tank / modules are refilled.

5. Backpulse from the membranes at 20 LMH (12 GFD) to waste. Backpulse for a period of 15 minutes to drain.

If the waste cannot be continuously discharged for 15 minutes (for example, it will be batch transferred to a truck for disposal) backpulse in batches until the equivalent amount of water has been discharged. For immersed systems, this should be a minimum of 1 tank volumes. Leave the membrane tank full after the last backpulse step.

6. Execute a full backwash / backpulse sequence manually as per the system design. Ensure the tank / modules are deconcentrated (drained), and a backpulse and aeration take place according to the design. Ensure the tank / modules are refilled.

7. After the backwash, collect a sample from the top of the tank using a dip cup for COD/TOC analysis.

Glycerin Flush and Module Sanitization Procedure

8. If COD/TOC result is acceptable the flush is complete. If not, repeat steps 5-8. If COD/TOC result is acceptable, perform a modified Chlorine Maintenance Clean on the train that has been flushed, increasing the typical chlorine dose from 100 mg/L to 150-200 mg/L. Once the Chlorine Maintenance Clean has been completed, leave the membranes to sit in permeate water, awaiting further train commissioning.

Closed loop procedure:

1. Install the membranes / modules and fill with raw water. The quality of this raw water used for flushing should be equal to or better than the design requirements for the system including, but not limited to, adherence to UF membrane upstream screening requirements. Take a sample of the raw water and measure COD or TOC to be used as a baseline.

> **NOTE:** For submerged ZW500 and ZW1000 systems, plan the membrane tank fill such that the water level reaches just to the top of the membrane fibers to limit extraneous volumes of glycerin solution that will need to be disposed of. It may help to fill the membrane tank after the membranes are installed in the tank to more easily determine how much water to fill.

2. Commence permeating from the membranes at 20-40 LMH (12-24 GFD), recycling the permeate from the permeate pump discharge to the membrane tank for submerged membranes (ZW500 & ZW1000) or through the CIP tank for pressurized membranes (ZW1500 & ZW700B). Permeate for a period of 30 minutes for the first flush.

3. Drain the tank contents to sanitary sewer drain, tanker truck for transport to a local WWTP, or other identified destination. It is important that all water containing glycerin is drained completely from all tanks, membranes, pipes, pumps etc. If not, the number of required flushes to achieve glycerin removal will increase. As an approximation, this water will have on the order of 10,000 mg/L COD (contact Veolia for a more precise estimate)

4. Backpulse clean water into the membrane tank for submerged membranes (ZW500 & ZW1000) or into the CIP tank for pressurized membranes (ZW1500 & ZW700B) for at least 3 pipe/membrane volumes at design backpulse flow. Ensure this water is drained from the tank. It is important that all water containing glycerin is drained completely from all tanks, membranes, pipes, pumps, etc. If not, the number of required flushes to achieve glycerin removal will increase.

5. Ensure the inside of the membranes / modules are completely drained by opening the permeate side to atmosphere or purging with MIT air. Ensure this purged water is drained from the tank / modules. It is important that all water containing glycerin is drained completely from all tanks, membranes, pipes, pumps etc. If not, the number of required flushes to achieve glycerin removal will increase.

Glycerin Flush and Module Sanitization Procedure

6. Refill the tank / modules with raw water.

7. Repeat steps 2-6 with a recycle time of 2 hours. As an approximation, the water drained in this step will have on the order of 1,000 mg/L COD (contact Veolia for a more precise estimate.)

8. Repeat steps 2-6 with a recycle time of 4 hours. As an approximation, the water drained in this step will have on the order of 100 mg/L COD (contact Veolia for a more precise estimate).

9. Refill the tank or train with raw water, permeate for 15 minutes and collect final sample for TOC/COD analysis.

10. Proceed to clean water controls testing if required for the system.

11. Proceed to sanitization if required.

12. Repeat Step 9.

13. Conduct final effluent COD/TOC test post sanitization. If COD/TOC result is acceptable the flush is complete. If value has not reach acceptable levels, repeat steps 8 and 9.

Priming and purge procedure:

1. Install the membranes /modules and fill with raw water. The quality of this raw water used for flushing should be equal to or better than the design requirements for the system including, but not limited to, adherence to UF membrane upstream screening requirements.

2. Prime the membrane permeate header by running the vacuum ejector or vacuum pump until water is continuously observed at the ejector or pump discharge. This should take approximately 5 minutes.

3. Apply compressed air to the permeate header by opening the MIT air supply valve. Pressurize the membranes for 10 minutes.

> **NOTE:** Take care when applying pressurized air to the membranes. Ensure the compressed air supply has been properly filtered and regulated to not exceed the MIT test pressure for the installed membrane product.

4. Repeat steps 2 and 3 for at least 5 hours. Aerate the membrane tank /modules periodically to ensure even mixing of the glycerin into the water. Monitor for foam generated by the aeration. If unacceptable foaming occurs during aeration, lower the aeration duration or frequency, or use low pressure water supply (ex. service water) to spray for control.

Glycerin Flush and Module Sanitization Procedure

.

5. Drain the membrane tank / modules to waste.

6. Refill the membrane tank / modules.

7. Repeat steps 2 and 3 for at least 2 hours. Aerate the membrane tank / modules periodically to ensure even mixing of the glycerin in the water. Monitor for foam generated by the aeration.

8. Drain the membrane tank / modules to waste.

9. Refill the membrane tank / modules.

10. Repeat steps 2 and 3 for at least 1 hours. Aerate the membrane tank / modules periodically to ensure even missing of the glycerin in the water. Monitor for foam generated by the aeration.

11. Drain the membrane tank / modules to waste.

12. Refill the membrane tank / modules.

13. Permeate for a period of 30 minutes.

14. Collect permeate sample for COD/TOC analysis.

15. If COD/TOC result is acceptable the flush is complete. If not, repeat steps 13-15.

Notes

Sampling:

- Collect a COD/TOC sample(s) of the recycle water during draining to create your COD/TOC decay curve to understand the reduction in COD/TOC for each flush iteration. This can help plan future flushes on other trains.
- It is important to collect baseline COD/TOC samples throughout the flushing process to establish a reliable baseline and ensure it does not change during the flushing time frame.
- If no guidance has been provided by the customer/consultant, it is recommended to achieve a value < 3 mg/L TOC (or <10 mg/l COD) above the baseline to consider the glycerin flush is complete.

Reuse of flush water:

Glycerin Flush and Module Sanitization Procedure

- Flush water from later flush steps from one train can be reused for earlier flush steps on another train. For example, flush 3 water can be used as flush water for flush 1 of another train. This is also known as cascade flushing and can help reduce waste volumes.
- First flush water should not be reused.
- Flush water for the final flush step should not be recycled flush water from another train. Fresh, clean water that does not contain any glycerin MUST be used.

Draining water between steps

- It is critical that all membranes, modules, pipes, tanks and pumps used in the glycerin flushing recirculation loop (if applicable) are completely drained between flushes. This is very critical for the later flushes to achieve the low TOC/COD residual levels required. If this is not followed, additional flushes will be required.

Filing tanks, trains, or modules between flushes:

- Filing the membrane tank or modules via backpulse can help to reduce the number of flushes required.

Soaking between steps:

- Time is an important parameter for later flush steps. Soaking the membranes can help accelerate glycerin removal (for example, soak overnight before 3rd or 4th flushes).

6.0 Sanitization (For Drinking Water Plants)

6.1 Sanitization of Cassettes

Please utilize this as guidelines for sanitization of the piping system in conjunction with your local applicable regulations. **This section is not intended to be a complete procedure**, however: it is provided to give key discussion points on this activity. Water should not be sent to distribution prior to having proper laboratory analysis of the treated water completed by a certified lab.

The purpose of sanitization is to clean the treated water side of the membranes as well as any associated piping prior to the clearwell in drinking water plants. The clearwell and distribution piping sanitization is not covered in this documentation package. Sanitization is a concentration and time-based event – refer to the AWWA document on sanitization practices for reference.

Depending on the level of automation that exists for the membrane Clean-In- Place (CIP) equipment, some of these steps can be performed by manually operating equipment from the HMI. For example,

Glycerin Flush and Module Sanitization Procedure

a system with automated Maintenance Cleans could initiate a semi-auto chlorine Maintenance Clean to introduce a chlorine solution to the membranes

For manual steps:

1. Drain the concentrated raw water in the membrane tank to waste and then fill the tank or rack with potable low TOC/COD water.
2. Chlorination is typically required on all the ZeeWeed equipment and associated instrumentation touching the potable water including the membrane tank and backpulse tank.
3. Chlorinate the membrane tank by adding sodium hypochlorite directly to the membrane tank, measuring to achieve 100 mg/L as Cl_2. Provide mixing to the tank by briefly turning on the membrane blower.
4. Ensure that the backpulse tank is filled with potable water. Chlorinate the backpulse tank by adding sodium hypochlorite directly to the top hatch to achieve 250 mg/L.
5. Chlorinate the permeate piping by manually back pulsing water from the backpulse tank directly to the membrane tank followed by permeating water back to the backpulse tank. The residual sodium hypochlorite from steps a. and b. above should effectively sanitize the piping. Once filled and mixed, the measured free chlorine in the system should not be less than 100 mg/L.
6. Purge 2 litres of chlorinated water from each sample port and 10 litres through the drain lines of the membrane (if relevant) and backpulse tank. “Bottle up” the system by ensuring all valves on the ZeeWeed skid are closed.
7. If required, chlorinate the particle counter or turbidimeter degassing column with 100 mg/L (as Cl_2) of sodium hypochlorite solution, then allow the column to partially drain through the sensor cell and on to the drain hole. Flush the column by filling it with non-chlorinated fresh water, then allowing it to drain through the sensor cell and on to drain.
8. Allow the system to soak in solution for a minimum of 3 hours. At no time during the first 3 hours should the free chlorine concentration in the system drop below 50 mg/L.
9. Obtain test duplicate samples, each no less than 30 minutes apart, for fecal and total coliforms as well as heterotrophic plate counts (HPC), using standard methods. Should the test results prove unsatisfactory per the project or regulatory requirements, repeat Steps 1 through 4.

6.2 Dechlorination and Neutralization of Spent Cleaning Solution - Cassettes

Depending on the level of automation that exists for the membrane Clean-In- Place (CIP) equipment, some of these steps can be performed by manually operating equipment from the HMI. For example, a system with automated Neutralization could initiate a semi-auto Neutralization after the chlorination is complete.

Glycerin Flush and Module Sanitization Procedure

For manual steps:

1. To dechlorinate the ZeeWeed equipment, use 1.40 grams of sodium bisulfite per gram of NaOCl (as Cl_2). Follow the procedure below in its exact sequence:
2. Dechlorinate the membrane tank by adding sodium bisulfite and mixing for a brief period by turning on the blower. Exercise caution not to pour the bisulfite directly onto the membranes. Ensure that running the blower too long does not create excess foam. Periodically grab a sample of the solution to test for total chlorine content. Add enough of the bisulfite to bring the total chlorine level to 0 mg/L.
3. Dechlorinate each backpulse tank by adding the sodium bisulfite directly to the top hatch.
4. Dechlorinate the permeate piping by manually permeating water in the membrane tank directly to the backpulse tank, then cycling the backpulse tank water back to the membrane tank. The residual sodium bisulfite from steps a. and b. above should eliminate any residual chlorine solution from the piping.
5. To neutralize the sodium bisulfite solution (pH between 3 and 4), add enough caustic (sodium hydroxide – NaOH) to the membrane tanks to bring the pH to between 6.5 and 8.0. Do this in small amounts, ensuring the membrane blowers are turned on for mixing. Use caution not to pour the caustic directly onto the membranes. Check the pH periodically until the desired pH is attained.
6. Drain the neutralized solution to sewer. Thoroughly rinse any residual foam from the membrane tank. With the tank drained, backpulse approximately 30 litres/module through the membrane lumens and remove this water from the tank.
7. Re-fill the membrane tank with fresh feedwater.

Note: Ensure that the train that is being sanitized is completely isolated and that all components of the system which have been exposed to glycerin be sanitized prior to sending permeate to distribution.

7.0 Sanitization of Modules Removed from and Returned to Site

ZeeWeed membrane modules are to be sanitized if they are removed from a cassette for off site cleaning or repair activities. This procedure is to be completed prior to the re-installation of these modules into the system.

Glycerin Flush and Module Sanitization Procedure

Note: The preferred method of module sanitization is to install the module into the cassette and initiate an online recovery clean sequence on that cassette. If this option is not available, then follow the steps below, describing the use of an offline repair tank.

Please utilize this as guidelines for sanitization of the module in conjunction with your local applicable regulations. This section is not intended to be a complete procedure, however: it is provided to give key discussion points on this activity.

The purpose of sanitization is to clean the treated water side of the membranes. Sanitization is a concentration and time-based event – refer to the AWWA document on sanitization practices for reference.

1. Ensure any membrane repair tank that is being utilized as a repair pool is designed for potable water use and has not been utilized for any other purpose.
2. Fill the membrane repair tank with potable low TOC/COD water to fully cover the module.
3. Chlorination is required on all the ZeeWeed equipment and associated instrumentation touching the potable water.
4. Chlorinate the tank by adding sodium hypochlorite directly to the tank to achieve 250 mg/L as Cl_2.
5. Re-circulate the chlorine solution through the membrane by manually permeating using a pump through the membrane back to the repair tank.
6. Allow the system to soak in this solution for 3 hours.
7. Check the chlorine level in the repair tank. If there is at least 100 mg/L as Cl_2 at the end of the clean, proceed to step 8 if less than 100 mg/L as Cl_2 then repeat steps 4-6.
8. Remove the module from the repair tank and place it in a new mylar bag for transportation to the cassette.
9. Remove the module from the bag and place it in the cassette.
10. Neutralize the remaining chlorine solution as necessary prior to disposal.

Glycerin Flush and Module Sanitization Procedure

Veolia have made every effort to provide current information while preparing this procedure. Veolia maintains that depictions of methods and/or techniques and use of specific tools and/or apparatus shown within the situations portrayed are accurate at the time of printing. Veolia accepts no liability for any reliance placed on the information contained herein.

NOTES:

1. LINES/EQUIPMENT EXISTING.
   LINES/EQUIPMENT BY OTHERS.
   LINES/EQUIPMENT BY VEOLIA.
2. PIPE SPOOL FOR STRAINER MAINTENANCE/ REMOVAL AND ISOLATION VALVE ACTUATION.
3. ALL EQUIPMENT SHOWN IS EXISTING AND SUPPLIED DURING INITIAL PHASE.

PERMEATE
DS-113
FROM COMMON PERMEATE HEADER
6", SCH.40, CS
HV-8871 6"
FV-8870 6"

POTABLE WATER
FROM PLANT SERVICE WATER SOURCE
2", SCH.80 PVC
HV-8890 2"

SODIUM HYPOCHLORITE FOR BIOGROWTH PREVENTION
DS-111, SHT1
FROM P-5100
1/2", SCH.80, PVC
HV-5696 CV-5685 FV-5677 HV-5697 1/2"

VENT C/W AIR FILTER F-8800
8"
8", SCH.80,PVC
EXISTING TK-8800
BACKPULSE TANK
1,420 USGAL
WORKING VOLUME
CT = 2000
PE CONSTRUCTION
HH H L LL LL 8826 LI 8826
HH H L LL LA 8826 LY 8826
AI
RANGE: 0" TO 100"
LE 8826 LIT 8826
CV-8898
HV-8826 1½"
HV-8895 4"
STR-8800 12"
(SEE NOTE 2)
HV-8884 12"
12", SCH.10, 304L SS

BACKPULSE WATER DS-105 TO P-3500-1
BACKPULSE WATER DS-105 TO P-3500-2
BACKPULSE WATER DS-105 TO P-3500-3
BACKPULSE WATER DS-105 TO P-3500-4
BACKPULSE WATER DS-105 TO P-3500-5
BACKPULSE WATER DS-105 TO P-3500-6
BACKPULSE WATER DS-105 TO P-3500-7
BACKPULSE WATER DS-105 TO P-3500-8
BACKPULSE WATER DS-105 TO P-3500-9
BACKPULSE WATER DS-105 TO P-3500-10
BACKPULSE WATER DS-105 TO P-3500-11

Backpulse water source for flushing comes from the Backpulse Tank

VEOLIA WTS CONTROLLED DOCUMENT

HIS
YS
DO
EXHAUST
S
IAS

TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	AS	SA	WC	15 NOV 22

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

VEOLIA

CUSTOMER INFORMATION
THE FORSYTH COUNTY WTP
PHASE 3 EXPANSION

P&ID,
BACKPULSE & ASSOC.EQ

DRAWING NUMBER	REVISION
510283-WTS-PR-SYS-EN21-DS-107	A

REF.: -
DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510283	-	NTS	D	1 OF 1

LAST SAVED: Tuesday, November 15, 2022 12:01:45 AM

FILE LOCATION: C:_ADSKVault\NAM\510283 - THE FORSYTH COUNTY WTP PHASE 3 EXPANSION\1 PID and P&ID\510283-WTS-PR-SYS-EN21-DS-107.dwg

NOTES:

1. LINES/EQUIPMENT EXISTING.
   LINES/EQUIPMENT BY OTHERS.
   LINES/EQUIPMENT BY VEOLIA.
2. CONFIGURATION TYPICAL FOR ALL TRAINS (1 TO 11).
   TRAINS 1 TO 8 EXISTING. SCOPE SHOWN FOR TRAINS 9 TO 11.
   TAGS FOR TRAIN 9 SHOWN.
3. 5 PIPE DIAMETERS UPSTREAM, 3 PIPE DIAMETERS DOWNSTREAM, STRAIGHT PIPE RUN RECOMMENDED FOR MAXIMUM ACCURACY.
4. VFD BY OTHERS

Backpulse water to the Membrane Train being flushed.

S.P.= 11 PSIG INCREASING

PERMEATE/ BACKPULSE
DS-103
FROM/TO MEMBRANES

12", SCH.10, 304L SS

PLH 8807-9
PAH 8807-9
DI
PSH 8807-9

HH H L LL PL 3523-9 PI 3523-9
HH H L LL PA 3523-9 PY 3523-9
AI
PIT 3523-9
PE 3523-9
RANGE: -15 TO 15 PSIG
1/2"

FV-8860-9

FV-3561-9

PI 3541-9
HV-3541-9 1/2"
HV-3586-9 1"

FV-8861-9

BACKPULSE WATER
DS-107
FROM BACKPULSE TANK

12", SCH.10, 304L SS

10", SCH.10, 304L SS

HIS 3500-9 YL 3500-9 TLH 3500-9
YA 3500-9 YS 3500-9 SC 3500-9 SM 3500-9 HA 3500-9 TAH 3500-9
DI DO AO DI
KQI JS SC HS YL
HOA HOA
SEE NOTE 4
3500-9 3500-9 3500-9 3500-9 3500-9

I
JC 3500-9
TSH 3500-9
M-3500-9
10"
8"
P-3500-9

PROCESS PUMP
1871 GPM @ 41.2 FT
25 HP, 1180 RPM
480 V/ 3 PH/ 60 HZ

PI 3540-9
HV-3540-9 1/2"
FV-3562-9
HV-3587-9 1"

FQI 3520-9
HH H L LL FQI 3520-9
FQI 3520-9 FQI 3520-9
FQJI 8820-9 FQJI 8820-9
FQJI 8820-9 FQJI 8820-9 H L

FC 3520-9
HH H L LL FA 3520-9
FJ 3520-9 FFMY 3520-9 FQ 3520-9
AI
FIT 3520-9
FE 3520-9
RANGE: 0 TO 3000 GPM
MAG (SEE NOTE 3)
FC 8820-9
FA 8820-9 H L
FQJ 8820-9
FQJ 8820-9

FQM 3522-9
FC 3522-9
FQM 3522-9
FQ 3522-9
FY 3522-9 H L

FQJI 3522-9
FQI 3522-9
FQMI 3522-9
FQI 3522-9
FL 3522-9
H L

FV-3560-9

10", SCH.40, C.S.

PERMEATE
DS-113
TO COMMON PERMEATE HEADER

HV-3588-9

1/2", SCH.80, PVC

PERMEATE SAMPLE
DS-115

HIS
YS
DO EXHAUST
S
IAS

TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	AS	SA	WC	15 NOV 22

TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

VEOLIA

CUSTOMER INFORMATION
THE FORSYTH COUNTY WTP
PHASE 3 EXPANSION

P&ID,
PROCESS PUMP & ASSOC. EQ.

DRAWING NUMBER	REVISION
510283-WTS-PR-SYS-EN21-DS-105	A
REF.: -	DOC. OWNER: -

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
510283	-	NTS	D	1 OF 1

LAST SAVED: Tuesday, November 15, 2022 12:01:45 AM

FILE LOCATION: C:_ADSKVault\NAM\510283 - THE FORSYTH COUNTY WTP PHASE 3 EXPANSION\1. PFD and P&ID\510283-WTS-PR-SYS-EN21-DS-105.dwg

MIT AIR
DS-112
FROM AC-9100 A/B

HV-3466-9

FV-3467-9

1", SCH.10, 304L SS

Sampling:

- Collect a COD/TOC sample(s) of the recycle water during draining to create your COD/TOC decay curve to understand the reduction in COD/TOC for each flush iteration. This can help plan future flushes on other trains.
- It is important to collect baseline COD/TOC samples throughout the flushing process to establish a reliable baseline and ensure it does not change during the flushing time frame.
- If no guidance has been provided by the customer/consultant, it is recommended to achieve a value < 3 mg/L TOC (or <10 mg/l COD) above the baseline to consider the glycerin flush is complete.

Recommended Sampling, see full procedure for further details.

EJECTOR ASSEMBLY

FV-9268-9

3/8"(9mm)

1"(25mm)-SS150A

1"(25mm)

1/2"
HV-9292-9
(SEE NOTE 7)

1"
HV-9291-9

P-9200-9
VACUUM EJECTOR
(FOR PRIMING)

3/8"(9mm)

1/4"(6mm)

3/8"(9mm)

3/8"

3/8"

1"
(SEE NOTE 8)

DRAIN
DRAIN OR MEMBRANE TANK

AIR EJECTOR ASSEMBLY
REFER TO EQUIPMENT
ARRANGEMENT DRAWING:
1319244 (SS TUBING)

AIR SUPPLY ASSEMBLY

YS
9267-9

FV-
9267-9

1/4"(6mm)

F
F-9200-9

1/4"(6mm)-SS150A

HV-9290-9

1/2"

1" 304L SS

INSTRUMENT AIR
13.5 SCFM @ 80 PSIG
DS-112
FROM AC-9100 A/B

PDA 8823-9
PDC 8823-9
PDC 3423-9
PDA 3423-9
PDA 8123-9
PDIC 8823-9
PDIC 3423-9
PDL 3423-9
PDL 8823-9
PDL 8123-9

TMP

12", SCH.10, 304L SS

12", SCH.10, 304L SS

PERMEATE/BACKPULSE
DS-105
TO P-3500/FROM
BACKPULSE SYSTEM

LIC 3426-9
LI 3426-9
LL 3426-9
LC 3426-9
LY 3426-9
LA 3426-9

HV-3482A-9
10"

HV-3482B-9
10"

OVERFLOW TO
DISTRIBUTION
CHANNEL

HIS 3463-9
ZC 3463-9
AO

LIT 3426-9
LE 3426-9

RANGE:
0 TO 150 IN
(SEE NOTE 5)

I/P
IAS

FCV-3463-9

HV-3426-9
12"

CASSETTE A-1

CASSETTE B-1

Refer to Glycerin Flush and Module Sanitization Procedure
Section 5.1 - Backpulse to Waste procedure

Summary for each Train:
Step 3: BACKWASH AT 12 GFD (550 gpm) for 45 min = 24,750 gal
Backpulse Tank Volume = 1,420 gal
Each train Net Permeate Capacity = 2.4 MGD (1,666 gpm)

No issue with keeping up with Backpulse Water Demand for Glycerin flushing during step 3.

Step 4: Run a Backwash manually

Step 5: BACKWASH AT 12 GFD (550 gpm) for 15 min = 8,250 gal

Step 6: Run a Backwash manually

Step 7: Sample COD after this final Backwash to determine if COD level is low enough. If COD level is too high, repeat steps 5-7 until meeting the COD requirement.

Step 8: Once COD sample is confirmed, perform a Maintenance Clean.

Step 9: Operations will then confirm when the train is ready to put into service. This will be discussed during commissioning.

SCREENED CLARIFIED
WATER
DS-101, SHT 2
FROM DISTRIBUTION CHANNEL

18", SCH.40, CS

HV-3463-9

18", SCH.10, 304L SS

BAFFLE PLATE
(BY OTHERS)

TK-3400-9
MEMBRANE TANK
TRAINS 9 TO 11 WITH 2 ZW-1000 v3 CASSETTES OF 60/60
MODULES PER TRAIN (550 SQFT)
CONCRETE CONSTRUCTION

HV-3484A-9
2"

HV-3484B-9
2"

(SEE NOTE 4)

3", SCH.10, 304L SS

AIR SCOUR
DS-102
FROM B-8500 A/B

3", SCH.40, CS

FV-3473A-9

AIR SCOUR
DS-102
FROM B-8500 B/C

3", SCH.40, CS

HV-3473B-9
(SEE NOTE 6)

18", SCH.10, 304L SS

ZC XXXX-9
AO
HIS XXXX-9
I/P
IAS

FCV-3863-9

6", SCH.10, 304L SS

Drain using the CIP pumps, see CIP P&ID for further details.

FV-9761A-9

FV-9761B-9

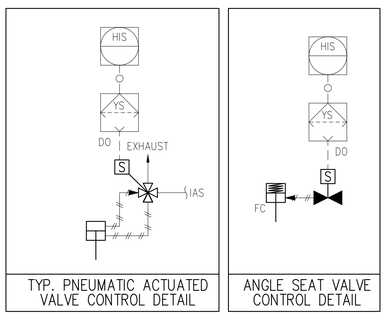
6", SCH.80, PVC

CIP / DRAIN
RECIRCULATION RETURN/
TANK DRAIN FOR CLEAN

FV-9761C-9
2"
F.O.

18", SCH.40, CS

BACKWASH WASTE
TO BACKWASH
RECOVERY BASINS



TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

ANGLE SEAT VALVE CONTROL DETAIL

NOTES:

1. LINES/EQUIPMENT EXISTING.
   LINES/EQUIPMENT BY OTHERS.
   LINES/EQUIPMENT BY VEOLIA.
2. CONFIGURATION SHOWN FOR TRAINS 9 TO 11.
   TRAINS 1 TO 8 ZW-1000 V3 CASSETTES OF 60/60 MODULES (550 SQFT).
   TRAINS 1 TO 8 EXISTING. SCOPE SHOWN FOR TRAINS 9 TO 11. TAGS FOR TRAIN 9 SHOWN.
3. EJECTORS TO BE LOCATED AT HIGH POINT IN PIPING
4. A PORTION OF THE AIR HEADER NEEDS TO BE LOCATED ABOVE THE HIGHEST WATER LEVEL IN THE MEMBRANE TANK.
5. LEVEL TRANSMITTER TO BE INSTALLED 6 INCHES BELOW TOP OF SUMP.
6. FV-3473B-9 ACTUATOR AND VALVES TO BE ADDED FOR THIS PROJECT. ONLY ACTUATOR FV-3473B TO BE ADDED FOR TRAINS 1 to 8
7. HV-9292-9 IS FOR MEMBRANE PRESSURE DECAY TESTING VALVE TO REMAINED CLOSED AND LOCKED AT ALL OTHER ITEMS.
8. AIR GAP IS REQUIRED ON EJECTOR DISCHARGE LINE EXHAUST TO MEMBRANE TANK OR DRAIN

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	AS	SA	WC	04 NOV 22

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X
.XX FRAC
.XXX

VEOLIA

CUSTOMER INFORMATION
THE FORSYTH COUNTY WTP
PHASE 3 EXPANSION

P&ID,
MEMBERANE & ASSOC.EQ

DRAWING NUMBER: 510283-WTS-PR-SYS-EN21-DS-103
REVISION: A
REF.: -
DOC. OWNER: -
PROJECT NO.: 510283
PART/MATERIAL NO.: -
SCALE: NTS
SIZE: D
SHEET: 1 OF 1

FILE LOCATION:C:_ADSKVault\NAM\S10283 - THE FORSYTH COUNTY WTP PHASE 3 EXPANSION\1_P&ID and P&ID\S10283-WTS-PR-SYS-EN21-DS-103.dwg
LAST SAVED: Wednesday, November 9, 2022 11:21:29 AM

NOTES:

1. LINES/EQUIPMENT EXISTING.
   LINES/EQUIPMENT BY OTHERS.
   LINES/EQUIPMENT BY VEOLIA.
2. PROVIDE AIR GAP.
3. 5 PIPE DIAMETERS UPSTREAM, 3 PIPE DIAMETERS DOWNSTREAM, STRAIGHT PIPE RUN RECOMMENDED FOR MAXIMUM ACCURACY.
4. ADD GOOSE NECK TO PREVENT DRYING OUT OF CELLS PROBE.
5. DO NOT INSTALL PROBES UNTIL COMMISSIONING BEGINS.
6. INJECTION LINES TO BE LOCATED ON UNDERSIDE OF PIPES.
7. ALL EQUIPMENT SHOWN IS EXISTING AND SUPPLIED DURING INITIAL PHASE.
8. BLOCK AND BLEED CONNECTION PIPE INSTALLED TO ALLOW CLEANING SOLUTION FROM BOTH CIP TANKS TO PUMP TO ALL TRAINS (1 TO 11). MAY BE ISOLATED TO ALLOW SIMULTANEOUS CLEANS.

Connect temporary hose here, to the camlock shown in the picture to the left, and run it to a temporary Frac Tank that is then trucked off site.

Need to coordinate with operations during glycerin flushing as no Membrane cleans can be run during this time. Need access to the CIP pumps

CIP / DRAIN
DS-103
TO/FROM TK-3400-1 TO 6

CIP / DRAIN
DS-103
TO/FROM TK-3400-7 TO 11

B DS-110 SHT.2

PERMEATE
DS-113
FROM COMMON PERMEATE HEADER

POTABLE WATER
FROM PLANT SERVICE WATER SOURCE

CIP SOLUTION
DS-110,SHT.2 A
FROM TK-9700-2

C DS-110, SHT.2

EXISTING P-9700A

EXISTING P-9700B
CIP/RECIRC./NEUTRALIZATION PUMPS
2 DUTY
306 GPM @ 22.5 FT
5 HP @ 1180 RPM
480 V / 3 PH / 60 Hz

RESIDUAL CHLORINE ANALYZER
RANGE: 0 TO 200 ppm

RANGE: 0 TO 1000 GPM

RANGE: 0 TO 14 pH

RANGE: 32 TO 122 °F

RANGE: 0 TO 120 IN

EXISTING TK-9700-1
CIP TANK
2900 USGAL
PE CONSTRUCTION
CT-2450

HX-9700-
ELECTRIC HEATER
81 KW

PANEL

SS PIPE PFTE LINED

SS PIPE PFTE LINED

?" PTFE TUBING

PTFE TUBING 316L SS

ALLOY 20 316L SS

½" DOUBLE CONTAINMENT

SULFURIC ACID SOLUTIONS FOR CLEANS
DS-111,SHT.3
FROM P-5000A/B

SODIUM HYPOCHLORITE SOLUTION FOR RECOVERY CLEANS
1", SCH.80, PVC
DS-111,SHT.1
FROM P-6600

SODIUM HYPOCHLORITE SOLUTION FOR MAINTENANCE CLEANS
1", SCH.80, PVC
DS-111,SHT.1
FROM P-5100

CITRIC ACID SOLUTION FOR CLEANS
?", SCH.80, PVC
DS-111,SHT.1
FROM P-6500

(SEE NOTE 6)

SODIUM BISULPHITE FOR NEUTRALIZATION
?", SCH.80, PVC
DS-111,SHT.2
FROM P-5300

SODIUM HYDROXIDE FOR NEUTRALIZATION
?", SCH.80, PVC
DS-111,SHT.2
FROM P-5500

NEUTRALIZED CHEMICAL WASTE
E DS-110,SHT. 2

NEUTRALIZED CHEMICAL WASTE
TO RESIDUALS HOLDING BASINS

D DS-110,SHT. 2
CIP DRAIN

TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

TYP. SOLENOID VALVE CONTROL DETAIL

SPRING TO CLOSE VALVE CONTROL DETAIL

VEOLIA WTS CONTROLLED DOCUMENT

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE	-	AS	SA	WC	15 NOV 22

TOLERANCES UNLESS NOTED
DECIMALS ANGLES
.X
.XX FRAC
.XXX

VEOLIA

CUSTOMER INFORMATION
THE FORSYTH COUNTY WTP
PHASE 3 EXPANSION

P&ID,
CLEANING SYSTEM TK-9700-1

DRAWING NUMBER: 510283-WTS-PR-SYS-EN21-DS-110
REVISION: A
REF.: -
DOC. OWNER: -
PROJECT NO.: 510283
PART/MATERIAL NO.: -
SCALE: NTS
SIZE: D
SHEET: 1 OF 2

FILE LOCATION: C:_ADSKVaultNAM\510283 - THE FORSYTH COUNTY WTP PHASE 3 EXPANSION\1_P&ID and P&ID\510283-WTS-PR-SYS-EN21-DS-110.dwg
LAST SAVED: Tuesday, November 15, 2022 12:01:45 AM

ZeeWeed 1000 40-60 element uncrating and installation instructions (V3.0.3 – V3.2.1)

1.0 PURPOSE

The purpose of this document is to outline the steps required to uncrate and install ZeeWeed* 1000 Version 3 cassettes populated with 40 and 60 modules. These instructions are specific to this model of cassette; contact Veolia for appropriate uncrating and installation instructions for other Veolia products, or for clarification as necessary.

⚠ WARNING	
	**Follow All LOTO Procedures** Follow proper safety procedures to prevent injury when carrying out this procedure. Adhere to all Lock Out Tag Out (LOTO) and safe lifting procedures in accordance with company, site and local health and safety policies and procedures.
	**Training and Certification Required** Proper crane training is required along with a certified and inspected crane.
	**Read Entire Procedure** Read this procedure completely before proceeding.

⚠ CAUTION	
	**Wear Appropriate PPE** This procedure requires that the operator wear Kevlar gloves, safety glasses, and protective clothing. Maintain baseline and task-specific PPE until task is completed.
	**Fall Protection Required** Fall protection is required if working around open tanks during membrane installation.
	**Environmental Exposure Hazard** Avoid breathing PVC glue fumes and work in a well-ventilated area.

⚠ CAUTION	
	**Overexertion Hazard** Use two people to uncrate the cassette, and be alert to pinch points. Use correct position and posture when lifting sides and during installation.
	**Sharp Edges** Be aware of sharp edges. There is a risk of being struck by, struck against, or caught on the cassette. Use care during inspection and be alert to pinch points.
	**Obstruction Hazard** Clear area of bystanders.
	**Overhead Hazard** Only lift cassette high enough to clear obstacles.

NOTICE	
	Every effort has been made by Veolia to provide current information while preparing this procedure. Veolia maintains that depictions of methods and/or techniques and use of specific tools and/or apparatus shown within the situations portrayed are accurate at the time of printing. Veolia accepts no liability for any reliance placed on the information contained herein.

2.0 APPLICABILITY AND REVISIONS

This document covers the ZW1000 V3 product line. Related procedures:

- *Membrane Pre-Installation Checklist (SERV-0007)*
- *ZW Membrane Map and Repair Log (SERV-0009)*
- *V3 Module Handling Procedure (SERV-0046)*
- *ZW1000 V3 Lifting Module Procedure (SERV-0048)*
- *Modified Straub Coupling Procedure (SERV-0055)*

3.0 MANPOWER REQUIREMENTS

The typical installation of a single cassette with modules installed requires approximately three (3) man-hours from opening of the crate to connection of permeate and aeration spools in the membrane tank. A minimum of two people are required for uncrating, cassette assembly, and tank installation.

The fully assembled populated cassettes are shipped on their sides and the 60-element cassettes need to be lifted to the upright position.

Figure 1 - ZeeWeed 1000 cassette

4.0 PREPARATION WORK

1. Complete the *Membrane Pre-Installation Checklist (SERV-0007)* before uncrating or and installing cassettes.

2. Locate all loose shipped parts required for cassette installation. Install all guide brackets, permeate piping and air piping as per Veolia-supplied installation documentation.

3. Thoroughly clean the membrane tanks and ensure they are free of debris. There must be enough water in the membrane tank to ensure that the fibers are completely submerged within water.

4. Locate and reserve an area for proper cassette assembly and unloading.

5.0 REQUIRED PARTS

- One Straub flexible coupling, which will be used to connect the permeate header to the permeate piping.

- One Straub flexible coupling, which will be used to connect air piping.

- Depending upon the version of cassette, the following slings are required to upright the cassette:
  - ZW1000 V3.0.3 has one top lifting point and will require one (1) sling rated for at least 2,300 kg (5,000 lbs) which is at least 1m (3 feet) long.
  - ZW1000 V3.0.4 through 3.1.2 versions have two top lifting points and will require two (2) slings each rated for 2,300 kg (5,000 lbs.) - both of equal length (1m (3 feet) recommended length).
  - ZW1000 V3.2 (current) has one top lifting point and will require one (1) sling rated for at least 2300 kg (5000 lbs.), which is at least 1 m (3 feet) long.

- As per above, depending upon cassette version, one (1) industrial rope at least 7 ft long is required for V3.0.3 and two (2) industrial ropes at least 7 ft long each are required for V3.0.4 and later versions (current).

- One (1) 2 x 4 block of wood– cut to cassette skid width and screws.
- Crane/Hoist rated for 2,300 kg (5,000 lbs.) required for uprighting operation for a new 60-module cassette.
- Crane/Hoist rated for 2,800 kg (6,000 lbs.) will be required to lift a 60-module cassette out of the tank post operation.
- **Labour required:** Approximately 3 man-hours using 2-3 people for uncrating, assembly, and tank installation. 2-3 people are required for uprighting of the cassette.
- Cordless drill, hand tools, NSF 61 approved anti-seize (i.e. White Knight for DW applications).
- Schedule 80 PVC spool pieces for air piping, PVC primer, glue, Teflon tape (either under Veolia scope of supply or contractor scope, depending on individual project).

6.0 MEMBRANE DIMENSIONS - V3.1.2 – V3.2

Cassette Specifications	40 Module		60 Module	
	Metric	**Imperial**	**Metric**	**Imperial**
Dimensions				
Maximum length (uncrated, does not include manifold overhang)	2,399 mm	94.4 in	2,399 mm	94.4 in
Maximum width (uncrated)	770 mm	30.3 in	770 mm	30.3 in
Maximum height (uncrated, header installed)	2,107 mm	83.0 in	2,756 mm	108.5 in
Crate shipping length	2,489 mm	98.0 in	2,953 mm	116.3 in
Crate shipping width	1,067 mm	42.0 in	927 mm	36.5 in

Note: *Cassette weights are job specific, dependent upon module version and number of blank modules installed. Contact your commissioning or Lifecycle team for specific cassette weights.*

7.0 UNCRATING AND UPRIGHTING PROCEDURE

To promote safety, uprighting a cassette must be done in a dedicated staging area.

1. Clear the staging area of any material and cordon it off to people who are not directly involved in this activity.
2. Clearly mark and isolate the area such that access of unauthorized personnel shall be prevented. Consider using a perimeter fence, rope/chain barriers, pylons, or other signaling and blocking means.
3. Ensure that the area for the uprighting operation is at least 7.5 m x 3 m (25 ft x 10 ft). This area does not include additional area required for a mobile crane.
4. Bring shipping crates into the staging area one at a time. Place the crate on level ground, directly underneath a hoist rated for 2,300 kg (5,000 lbs.)

   The use of an overhead hoist is recommended, however; if an appropriate overhead hoist is not available, then a mobile telescopic boom crane or equivalent lifting device should be used. (Figure 2).

Figure 2 - Lifting device

5. Ensure that the hoist/crane (Figure 3) is rated for at least 2300 kg (5000 lbs.) lifting capacity at the jib extension and angle required for the lift.

   If a crane is being used, it shall be located at an appropriate distance to prevent collision with the cassette during the lifting and uprighting.

6. Remove top and all four sides of the crate using a cordless drill with a Philips #2 screwdriver bit (Figure 4).

Figure 3 - Hoist or crane

Figure 4 - Removing a crate

7. Remove the wooden shipping braces secured to the bottom skid (Figure 5). Cut open the bag that seals the cassette and roll it down to the crate bottom.

NOTICE	
	Be careful not to cut or damage the cassette.

Figure 5 - Removing shipping braces (attached to base of crate)

8. Firmly screw the 2 x 4 block of wood to the cassette pallet at the aeration end of the cassette as shown (Figure 6).

Figure 6 - Screwing the wood to cassette pallet

7.1 Uprighting procedure – 60-module cassette

1. The crane shall be located along the long axis of the cassette at the top permeate pipe side (Figure 7). The area of travel of the crane needs to be along the long axis of the cassette.

   If a mobile crane is used, it shall be located at an appropriate distance to prevent collision with the cassette.

2. Prior to proceeding with the uprighting procedure, torque the four-bolt connection holding the top frame to the cassette frame to 85 nM (Figure 8).

Figure 7 - Crane should be located on this side of cassette

Figure 8 - Confirming torque connection

3. Attach the sling(s) to the upper lifting point on the top of the cassette (Figures 9 and 10). Refer to section 5.0 REQUIRED PARTS in this document to determine the number and type of sling(s) required.

Figure 9 - V 3.0.3 One lifting point

Figure 10 - V 3.0.4 Two lifting points

4. Fasten an industrial rope(s) to the bottom lifting point(s) on the top of the cassette to use as a guide rope (Figure 11).
5. Ensure that the surrounding area is clear of people. Slowly commence hoist lifting and gently lift the cassette (Figure 12). A signaling person, standing at a safe distance, should signal the crane operator. No person or body part is allowed to be under the cassette under any circumstances.

Figure 11 - Fastening guide rope

Figure 12 - Lifting cassette

NOTICE	
	Do not jog the crane when lifting.

6. Slowly continue lifting the cassette, using the guide rope to prevent rotation (Figure 13).
7. Slowly lower the cassette onto a clean level surface (Figure 14).

Figure 13 - Lifting cassette using guide rope

Figure 14 - Lowering cassette on a clean level surface

8. Once the cassette has been safely lowered, disengage the hoist(s) and remove the sling(s) (Figure 15).

Figure 15 - Disengaging hoist & sling

7.2 Installing the blank module retainer clip

If the cassette is populated with blank modules, the cassette will be delivered fully populated including the blank modules. A blank module clip must be installed on the back trays retaining the top module spigot of the blank module (Figure 17). This will replace the older blank module retainer (Figure 16) that was installed on the front of blank.

The retainers will be shipped in a plastic bag and can be found tied to the cassette. For 60M cassettes the bag will be located at the bottom near the open end of the manifold. For the 96M cassettes the bag(s) will be tied at the end of the cassette.

Figure 16 - Older style retainer

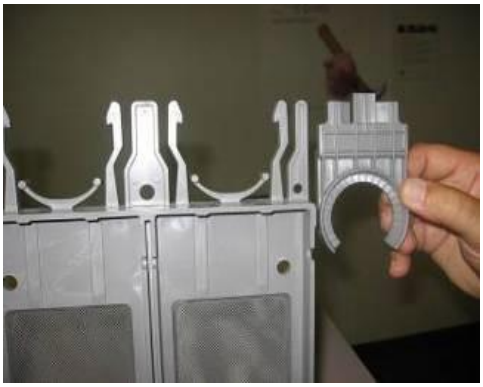


Figure 17 - ZeeWeed 1000 V3 tray and blank module retainer clip

1. The blank modules are fastened together with a tie wrap. Using scissors, clip the tie wrap and discard (Figure 18).

2. Starting at the top of the stack, remove the cap from the top of the blank module (Figure 19). Push the module back far enough into the cassette to allow enough room to insert the clip.

Figure 18 - Cutting the tie wrap

Figure 19 - Blank module cap removed

3. Insert the module retainer clip into the spacer tray with the outer legs going under the saddle and the center leg sliding in front as shown (Figure 20).

Figure 20 - Inserting module retainer clip into spacer tray

4. Pull the blank module into position through the blank module retainer clip (or push from the front). Continue for a balance of blanks within the cassette (Figure 21).

Figure 21 - Pulling blank module into position using retainer clip

7.3 Filling blank modules

Blank modules must be filled with potable water prior to installing the cassette into the cassette tank.

1. Prior to filling, ensure all blank module retainers are secure before proceeding.
2. With the bottom cap in place, loosen the top cap and using a hose, fill the module with potable water up to the bottom of the top hole (Figure 22).
3. Ensure the top cap and gasket are replaced and tightened.

Note that newer versions of the blank module have been manufactured with the bottom port molded closed. If it is necessary to drain such a blank module, remove the top cap, remove the bottom cap, and puncture the bottom port to allow water to drain. Take care to puncture the port in the center of the molded area (as seen in Figure 23) to allow for reuse.

If the port sides or threads or 1 cm of the port surface around the circumference are impaired in any way, the blank module will require replacing.

Figure 22 - Filling blank modules

Figure 23 - Puncturing hole to drain blank module

NOTICE	
	Blank module stacks must not be installed adjacent to another V3 blank module stack. Blank modules should never be removed from the cassette for filling.

Prior to lowering the cassette into the tank, inspect the cassette:

1. Check that all permeate pipe clips are in engaged on the permeate pipes (Figure 24). Remove any cardboard that may be wedged in between the side of the modules and the side of the cassette.

2. Ensure that the two small blue locking pins (top and bottom) are engaged and clicked into the space provided on the cassette tray (Figure 25).

Figure 24 - Permeate pipe clips engaged on the permeate pipes

To confirm the module is in the locked position, gently push the module from the back on the cassette. Position another person at the front of the cassette to ensure the module does not move out of the cassette.

Care must be taken not to rotate the handle, as this is also the slack adjustment for the module.

Figure 25 - Locking tabs are not locked (left) & locking tabs are locked (right)

NOTICE	
	Failure to confirm that the retractable locking pins are completely engaged once the element has been reinstalled could lead to the possibility of the element moving out/disengaging due to air pressure during the MIT, and to the disengagement of the O-ring seals.

8.0 LOWERING CASSETTE INTO THE MEMBRANE TANK

1. Apply NSF 61 approved anti-seize to the Straub bolts prior to installation.

2. Place the Straub fitting loosely on the incoming permeate line prior to lowering the cassette.

3. Using the crane and a signal person at the other end of the cassette, slowly lower the cassette into the tank (Figure 26).

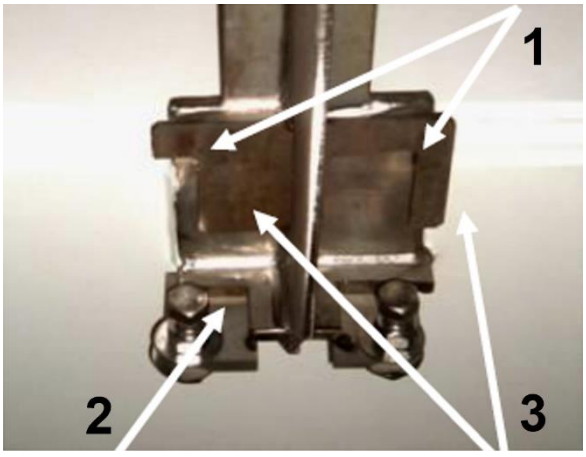
   As the cassette is being lowered, it will encounter the cassette support brackets at each corner. The brackets will guide the cassette at the four corners, and the cassette will eventually bottom out on the leveling bolt at the bottom of the supports.

   The cassette should sit evenly on all four support pads.

4. Use the leveling bolts, which are located on the cassette support bracket (Figure 27), to level the cassette within a tolerance of 1/8”.

Figure 26 - Lowering cassette into membrane tank

NOTICE	
⚠	The uprighting straps can be used for the first-time installation of the cassettes. However; for all subsequent removals and installations, the ZW1000 V3 lifting module MUST be used to meet Veolia safety requirements – straps must not be used. Refer to *SERV-0048 V3 Module Lifting Procedure.*



1: Retaining pads
2: Leveling bolt
3: Retaining plates

Figure 27 - Cassette supports

9.0 LOCKING DOWN THE CASSETTE

1. With the cassette sitting evenly on the support pads, release some slack in the hoist cables.

   The cassette is locked down at each of the four corners by rotating the bolt head using the supplied tool.

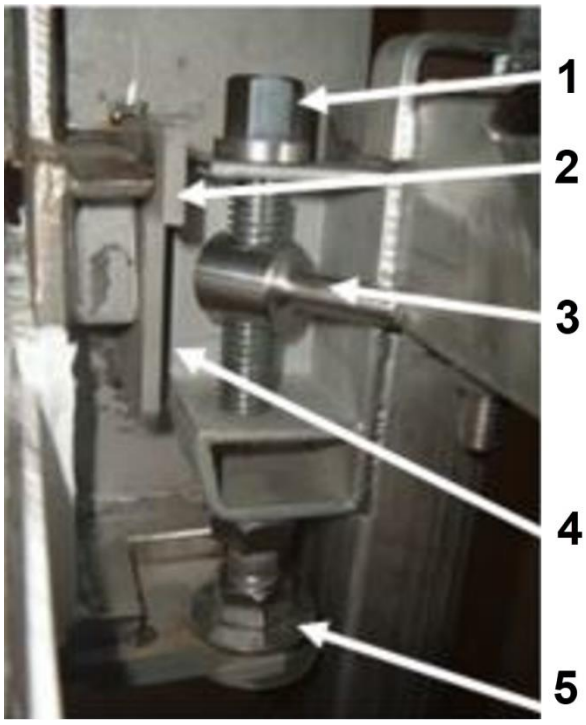
2. Turn the locking bolt clockwise to raise the pin to the locking position. The locking pin will swing around until its rotation is limited by a retaining plate.

3. Continue to turn the locking bolt until the pin has reached the top of the retaining pad on the cassette support. When the locking bolt is tight, the lockdown is fully engaged.

4. Perform this procedure for all four corners to fully lock down the cassette.

Reverse the procedure to prepare cassette for removal.

Prior to installing cassette, and at any time during plant operation before returning a cassette to a tank space, apply NSF 61 (i.e., White Knight) approved anti-seize to the lockdown mechanism.



1: Cassette locking bolt
2: Retaining pad
3: Cassette locking pin in fully disengaged position
4: Retaining plate
5: Leveling bolt

Figure 28 - Cassette locking bolt & pin

10.0 CONSTRUCTING & INSTALLING REQUIRED CONNECTIONS

Connect all piping per fabrication drawings and General Arrangement drawings specific to the project. This includes any gluing of PVC for the aeration as well as preparing and installing aeration hoses. The Contractor is responsible for exercising care and ensuring that the PVC primer and glue do not make contact with the membranes.

11.0 BLOWER AIR CONNECTION

Once the cassette is installed in the tank, the blower air flexible line must be installed. Follow these steps for a successful installation (Figure 29).

Figure 29 - Typical field installation of blower air line

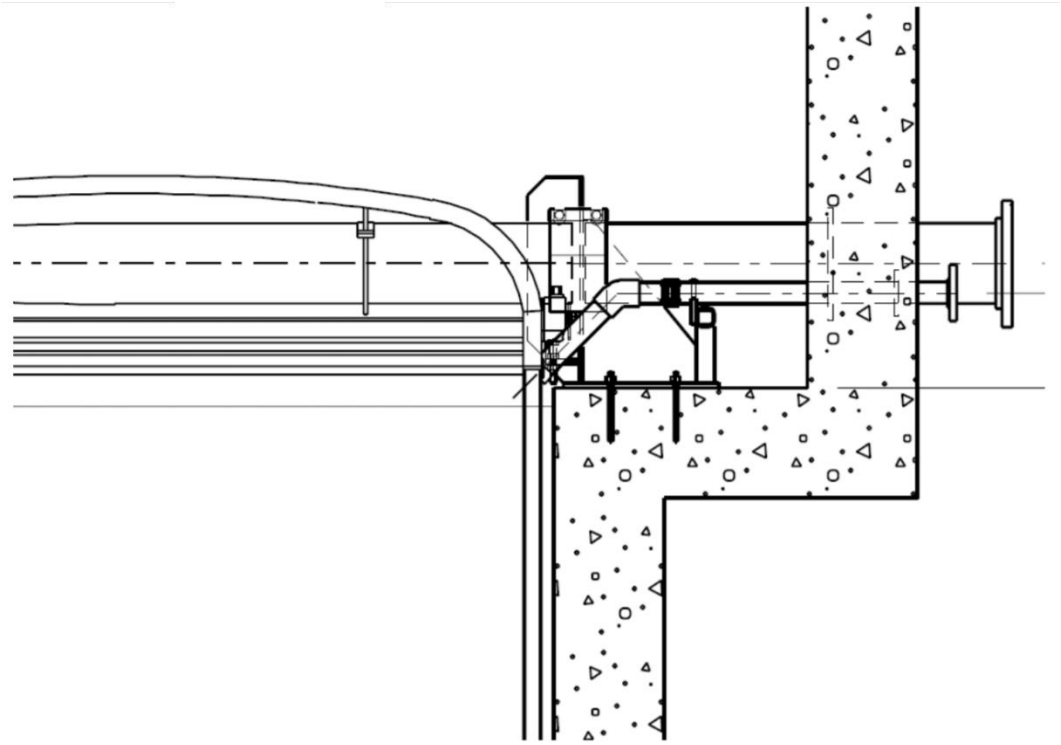


Figure 30 - Typical installation of air and permeate spool pieces for the ZW1000 cassette

11.1 Permeate connection

Figure 31 - Typical field installation of the permeate line

Once the cassette is installed in the tank, the permeate line must be connected to the permeate manifold. *SERV-0055 Modified Straub Coupling Procedure* should be followed for a successful installation. (Figure 31)

- The pipe coupling should be installed hand tight onto the permeate header pipe on the ZW1000 V3 cassette. Be sure to apply NSF 61 approved anti-seize to the tightening bolts prior to installation.
- The permeate header on the cassette must be aligned with the other header pipe so that the coupling will slide freely onto the cassette header.
- Loosen the pipe coupling, slide over the permeate header pipe protruding through the tank wall and tighten around the cassette header piping.

Note that there should be approximately a ½ inch gap between the spool piece and piping on the top and bottom of the spool.

12.0 MEMBRANE INSTALLATION DOCUMENTATION

F.S.R. is to record all serial number and membrane locations. This information is to be recorded in the membrane map form.