Notice of Award for Equipment

Date: 05/20/2022

Project: Central Wastewater Treatment Plant Expansion Project	
Owner: Town of Johnstown, Colorado	Owner's Contract No.:
Contract: MBR Equipment	Engineer's Project No.: 002004.C
Bidder: Suez WTS Systems USA, Inc.	
Bidder's Address: 3239 Dundas Street West Oakville, Ontario L6M 4B2	

You are notified that your Bid dated February 17, 2022 for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for BID ITEM #3 – MBR Equipment as described and provided for in your proposal. The Contract Price listed in this Notice of Award includes all equipment, submittals, O&M manuals, freight, spare parts, and field service design requirements as detailed in the RFP documents.

The Contract Price of your Contract is: **$1,766,929.00**

(Includes the following equipment - $1,406,700 "Bid Item A" base bid + $88,955 support beam adder + $78,844 fully populated cassettes adder)

and written: One million seven hundred sixty-six thousand nine hundred twenty-nine dollars and zero cents.

Per the Terms and Conditions outlined in the Request for Proposals (RFP), OWNER will provide payment as required for submittals for this equipment package in the amount of: **$156,300.00**

and written: One hundred fifty-six thousand three hundred dollars and zero cents.

Per the Terms and Conditions outlined in the RFP, OWNER will provide payment as required for recommended spare parts for this equipment package in the amount of: **$36,130.00**

and written: Thirty-six thousand one hundred thirty dollars and zero cents

The remainder of the contract will be assigned to the installation contractor, who is scheduled to be selected Fall 2022. The Town reserves the right to award the equipment contract to other vendors. Per the requirements in the RFP, please furnish submittals with 45 days or the number of days listed in your proposal (whichever is less) of the date you receive this Notice of Award.

One (1) electronic copy of the proposed Contract Documents accompany this Notice of Award. You must comply with the following conditions precedent within [15] days of the date you receive this Notice of Award.

1. Deliver to the Owner one (1) fully executed counterparts of the Contract Documents including acknowledged copies of this Notice of Award. Upon receipt of these Contract Documents, the Owner will sign the Contract Documents and return a fully executed copy for your records along with the Notice to Proceed.

Other Item Specific Terms:

1. Additional exceptions were noted on the EXCEPTIONS FORM and will be considered and finalized in the final form of the Agreement.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default and annul this Notice of Award. Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

Town of Johnstown – Ellen Hilbig – Utilities Director
Owner, Representative

Ellen Hilbig
Authorized Signature

Copy to AQUA Engineering

Proposal – Equipment for
Town of Johnstown –
Central Wastewater Treatment Plant Project

SUEZ proposal number: 490084

submitted to:
Town of Johnstown
450 S. Parish Ave.
Johnstown, Colorado 80534
attn : Ellen Hilbig, Utilities Director

submitted by:

SUEZ WTS Systems USA, Inc.

3239 Dundas Street West
Oakville, Ontario L6M 4B2

Grant MacInnis
Regional Manager

cell: (303) 396-9532
e-mail: grant.macinnis@suez.com

local representation by:

The Coombs-Hopkins Company

4380 S. Syracuse Street, Suite 450
Denver, Colorado 80237

Jason Morgan
Sales Manager

tel: (801) 691-4000
e-mail: jmorgan@coombshopkins.com

February 17h, 2022

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SUEZ Water Technologies & Solutions confidential and proprietary information

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The following are trademarks of SUEZ Water Technologies & Solutions and may be registered in one or more countries:

ZeeWeed and ZENON.

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Appendix A Equipment Technical Specifications

Water Technologies & Solutions
2913 Quitman St.
Denver, CO 80212
Tel: 303 396 9532

Attn:
Ellen Hilbig
Utilities Director
Town of Johnstown

Craig Matsuda
Project Manager
Aqua Engineering, Inc.

Date: February 17, 2022

Re: Town of Johnstown
Central Wastewater Treatment Plant Project – Membrane Biorector

Dear Ms. Hilbig and Mr. Matsuda:

SUEZ Water Technologies & Solutions is again pleased to present our proposal for the supply of a second ZeeWeed MBR system for the Town of Johnstown. We are again proud to present what we believe to be the greatest value MBR in the industry – the MBR that has proven to be the lowest maintenance, most reliable and most operator-friendly system available.

In the cover letter attached to the proposal for the Low Point MBR, we highlighted several benefits. Each of these benefits is still applicable. In the interest of brevity, we won't detail them in full here, but they did include each of these points:

- **CONFIDENCE IN THE PRODUCT**
    - The ZW-500 MBR system is the most robust, evolved and time-proven membrane on the market and has become the industry standard.
- **FLEXIBLE MEMBRANE REPLACEMENT**
    - As the leading supplier and industry standard, several vendors have launched "copies" of SUEZ MBR membranes. This ensures the greatest flexibility for future membrane replacements.
- **MEMBRANE CLEANING IN-SITU**
    - Cleans will be limited to twice per year and are fully automated. Membranes never need to be moved to be cleaned.
- **FLEXIBLE FIBERS MEANS IMPROVED AIR SCOUR**
    - Moveable fibers ensure the best possible solids removal.
- **ULTRAFILTRATION MEMBRANES**

- UF membranes mean that you get the best permeability, best pathogen removal and you don't need to develop a secondary biolayer for proper filtration, unlike MF membranes.

- **LONGEST-LASTING MEMBRANE**
  - The proven, longest lasting membrane backed up by the longest and most complete warranty.
- **HELP IF YOU EVER NEED IT**
  - Local support in central Colorado if you ever need it, with extra site trips included.

In addition to these benefits described in greater detail previously, we are pleased to be able to provide a design that maximizes continuity and minimizes any changes for the Town's maintenance and operations staff.

- Our proposal follows the exact same format as our previous proposal, which should greatly expedite review. You will notice that most of the material is identical to the material sent last year. This was done consciously to minimize labor required for review, but please feel free to reach out if any additional information would be helpful.
- The Low Point MBR design is based on trains that contain 4 cassettes. This Central Plant design maintains this very same train design with 4 cassettes per train. (A fourth, identical train has been added to account for the higher flows at the Central Plant compared to Low Point.)
- Using the same membrane train design will aid in operations and maintenance familiarity and minimize requirement for spare parts.
- Through our submittal process with Aqua, we have refined some details of the design (for instance, equipment tags). All of that design effort will be a direct benefit to the mechanical, civil, electrical and controls design of the Central Plant.

We are excited and eager to continue our relationship with the Town of Johnstown. I hope that this proposal is reasonably clear and complete, but please do not hesitate to contact us if you have any questions or concerns at all.

Yours Truly,

Grant MacInnis, P.Eng.
Water Technologies & Solutions
2913 Quitman Street, Denver, CO 80212
grant.macinnis@suez.com
303-396-9532

1 Contract Manager

1.1 Project Approach

SUEZ believes that successful projects are built on quality teams and communication. Our proven approach is to provide a dedicated engineering and project management team with extensive wastewater treatment plant design experience for each project. The goal of the team is to ensure on-time delivery and overall project success through:

- a Contract Manager who will be responsible for the performance of SUEZ work and be the primary contact
- frequent communication which allows SUEZ to better understand the needs of the owner
- comprehensive technical and commercial understanding and knowledge of the project including budget, schedule, as well as regulatory, technical and political issues – ensuring milestones are met
- partnerships and communication protocols that will remain in place for the duration of the project

This clear and defined project approach guarantees that the Town of Johnstown, AQUA Engineering, and the construction contractor will receive the best possible support from SUEZ and therefore the best value for all stakeholders.

SUEZ Primary Contact :	Grant MacInnis, P.Eng.
Title	Regional Business Leader
Office Address :	2913 Quitman Street Denver, CO 80212
Office Phone Number :	720-855-7296
Mobile Phone Number :	303-396-9532
E-Mail Address :	grant.macinnis@suez.com
SUEZ Contract Manager/Project/Execution Manager	Tom Macnaught
Title	Manager Project Management
Office Address:	3239 Dundas Street West Oakville, ON L6M 4B2
Office Phone Number:	905-465-3030 ext.3125
Mobile Phone Number:	289-981-0530
E-Mail Address:	tom.macnaught@suez.com

1.2 SUEZ Operations and Manufacturing

From modest beginnings in 1980, ZENON Environmental Inc. grew to become the global leader of low pressure membrane filtration technology. Spurred by the vision that membranes are the world's answer to water shortages, overuse, and pollution, the company has always focused on a single goal—to make superior membrane systems a cost-effective solution for everyone who needs them.

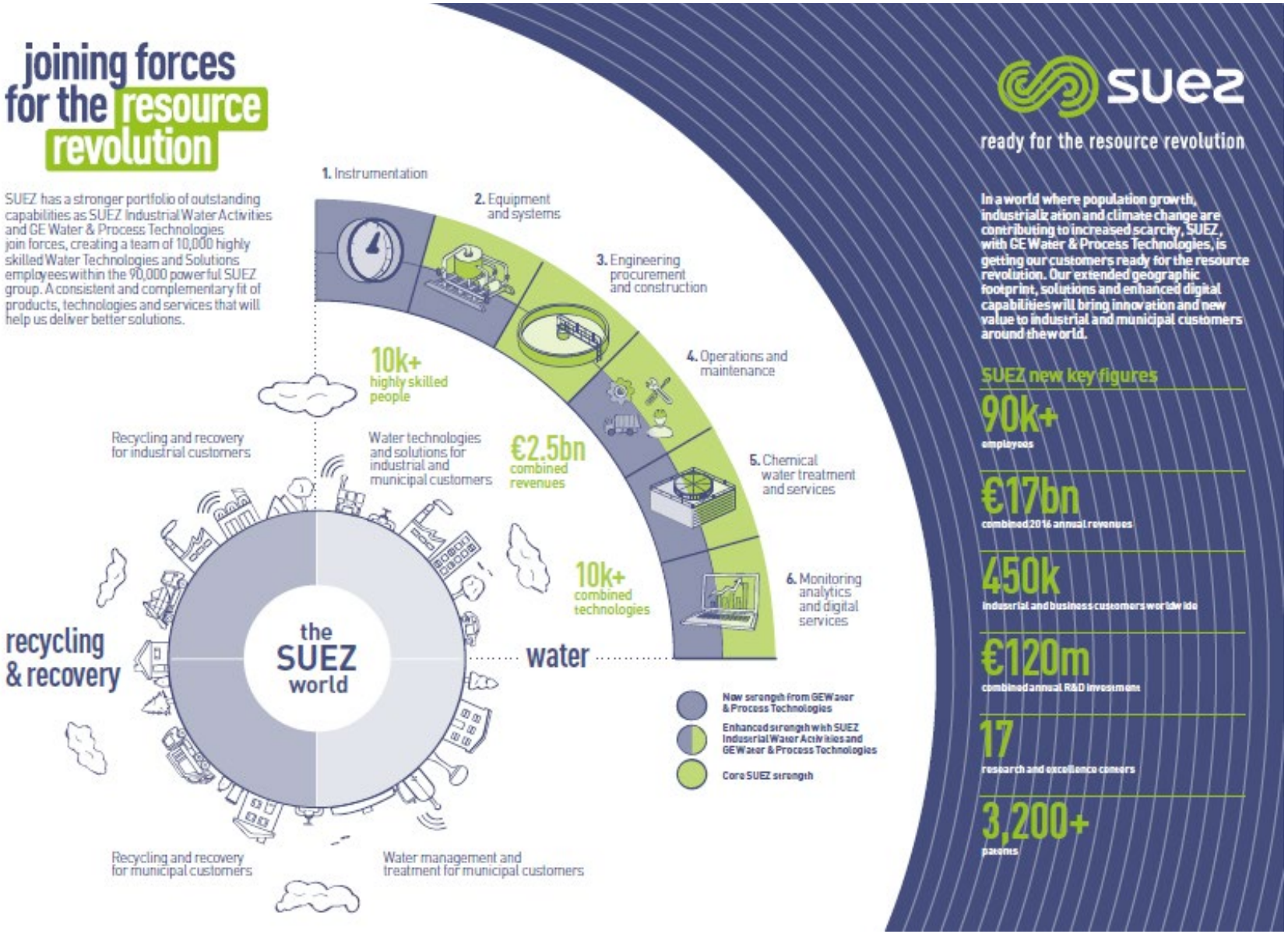
The ZeeWeed ultrafiltration membrane, developed in 1990, was a paradigm shift in membrane technology. At that time, membrane systems were primarily using pressurized cartridges with many components and high energy requirements. ZENON transformed the industry with the introduction of membranes that are immersed directly into process tanks and need only a slight vacuum to filter water.

GE Water & Process Technologies acquired ZENON Environmental Inc. on June 1, 2006, uniting patented ZENON technologies with GE's corporate leadership and financial depth to provide unparalleled performance and the best overall water treatment solutions. GE Water & Process Technologies became a worldwide leading systems and services provider for municipal and industrial customers, supplying state-of-the-art water, wastewater and process system solutions. GE Water & Process Technologies generated ~$2.1 billion USD in revenues in 2016 with 7,500 highly skilled salesmen and engineers with strong digital capabilities.

On October 1, 2017, SUEZ purchased GE Water & Process Technologies. GE Water & Process Technologies now joins forces with SUEZ's Industrial Water activities to create the **Water Technologies & Solutions** business unit within the SUEZ Group. With a solid financial position and a wide breadth of portfolios, this business unit aims to be a worldwide leader in water and treatment solutions for the industrial and municipal markets.

ready for the resource revolution

SUEZ Water Technologies & Solutions now operates with over 10,000 employees and addresses the needs of over 50,000 customers worldwide. Additionally, relying on 650 R&D and expert staff as well as 17 Research & Excellence Centers of SUEZ, the business unit is committed to expanding its water treatment offerings and digital capabilities to deliver best-in-class solutions.


joining forces for the resource revolution
SUEZ has a stronger portfolio of outstanding capabilities as SUEZ Industrial Water Activities and GE Water & Process Technologies join forces, creating a team of 10,000 highly skilled Water Technologies and Solutions employees within the 90,000 powerful SUEZ group. A consistent and complementary fit of products, technologies and services that will help us deliver better solutions.
1. Instrumentation
2. Equipment and systems
3. Engineering procurement and construction
4. Operations and maintenance
5. Chemical water treatment and services
6. Monitoring analytics and digital services
10k+ highly skilled people
€2.5bn combined revenues
10k+ combined technologies
Recycling and recovery for industrial customers
Water technologies and solutions for industrial and municipal customers
recycling & recovery
the SUEZ world
water
Recycling and recovery for municipal customers
Water management and treatment for municipal customers
New strength from GE Water & Process Technologies
Enhanced strength with SUEZ Industrial Water Activities and GE Water & Process Technologies
Core SUEZ strength
SUEZ
ready for the resource revolution
In a world where population growth, industrialization and climate change are contributing to increased scarcity, SUEZ, with GE Water & Process Technologies, is getting our customers ready for the resource revolution. Our extended geographic footprint, solutions and enhanced digital capabilities will bring innovation and new value to industrial and municipal customers around the world.
SUEZ new key figures
90k+ employees
€17bn combined 2016 annual revenues
450k industrial and business customers worldwide
€120m combined annual R&D investment
17 research and excellence centers
3,200+ patents

1.2.1 UF/MBR operations

From its inception 39-years ago, the company had endeavored to listen to customers and anticipate the needs of the market in order to respond with practical solutions for drinking water, wastewater treatment, and water reuse. Today, SUEZ carries on with a complete family of UF/MBR membrane products which provide large-, medium- and small-scale solutions for municipalities, industries, land development and emergency applications.

ZeeWeed ultrafiltration membranes are utilized for drinking water, wastewater, tertiary and water reuse applications, as well as industrial feedwater and reverse osmosis (RO) pretreatment. The advanced technology is operational in thousands of municipal, industrial and commercial applications worldwide:

ZeeWeed 500: immersed membrane designed to handle challenging wastewater, with a greater tolerance of solids and high turbidity. It is the core of our LEAPmbr technology – an advanced, low energy MBR designed for wastewater treatment and reuse.

ZeeWeed 1000: immersed membrane designed for retrofits and larger plants, making it ideal for tertiary, drinking water, brackish, and seawater pretreatment applications.

ZeeWeed 1500: a pressurized membrane ideal for drinking water treatment, tertiary filtration, and pretreatment applications for brackish and seawater desalination in small to medium sized plants.

ZeeWeed 700B: an “inside-out” ultrafiltration membrane ideal for lower solids feedwater like pretreatment for reverse osmosis, high quality industrial processes, high pressure offshore EOR and membrane upgrades. Also appropriate for non-water applications like juice, wine and beer clarification.

SUEZ’s global UF/MBR center of excellence in Oakville Ontario, Canada, is the focal point of SUEZ’s ultrafiltration (UF) membrane research and development, as well as the design and delivery of UF-based water and wastewater treatment systems. The UF membrane division is 100% focused on developing, manufacturing, and supporting leading-edge, hollow fiber water and wastewater treatment solutions. **All design and engineering for the Town of Johnstown Central WWTP will be directed out of the Oakville, Ontario UF/MBR center of excellence.**

SUEZ’s global UF/MBR center of excellence located in Oakville, Ontario, Canada

1.2.2 membrane manufacturing

With a world-class manufacturing facility located in Oroszlány, Hungary (the plant where the ZeeWeed 500 membrane modules proposed for the Town of Johnstown Central WWTP project would be produced), SUEZ leads the membrane industry with the world’s largest capacity for membrane manufacturing. By leveraging the capabilities of this manufacturing hub, SUEZ can assure customers of on-time and on-budget product delivery no matter where treatment plants are located.

A dedicated team of individuals monitor incoming project orders that incorporate ZeeWeed membranes, and are responsible for planning the production at the Oroszlány factory to ensure that all projects are delivered on time. As our backlog of orders increases, production capacity is continually reviewed to ensure that it is adequate. Several plant expansions have been implemented to ensure sufficient capacity to meet the demands of all pending and anticipated orders.

membrane manufacturing plant located in Oroszlány, Hungary

Built on a solid foundation of dedication and excellence, the SUEZ membrane manufacturing division is committed to delivering high quality membrane products to global customers. SUEZ owns and operates all of its manufacturing resources to ensure strict controls over the manufacturing process and rigid quality standards for every membrane module that leaves the plants.

SUEZ employs the industry's most advanced manufacturing techniques, which enables the production of top quality membranes with maximum efficiency. The manufacturing process is almost completely automated, which minimizes quality issues and maximizes product consistency. Over the past several years, our manufacturing infrastructure has easily accommodated the rapid increases in demand for SUEZ products – increasing production by more than 500 percent during this period.

While the manufacturing facilities maintain an inventory of products, we constantly monitor bidding activity to confirm that sufficient manufacturing capacity is available to meet customer demand and that adequate product supplies are available to avoid project delays.

Prior to shipping, all of our products undergo a rigorous inspection to verify that all system components meet the quality and performance standards that SUEZ customers have come to expect.

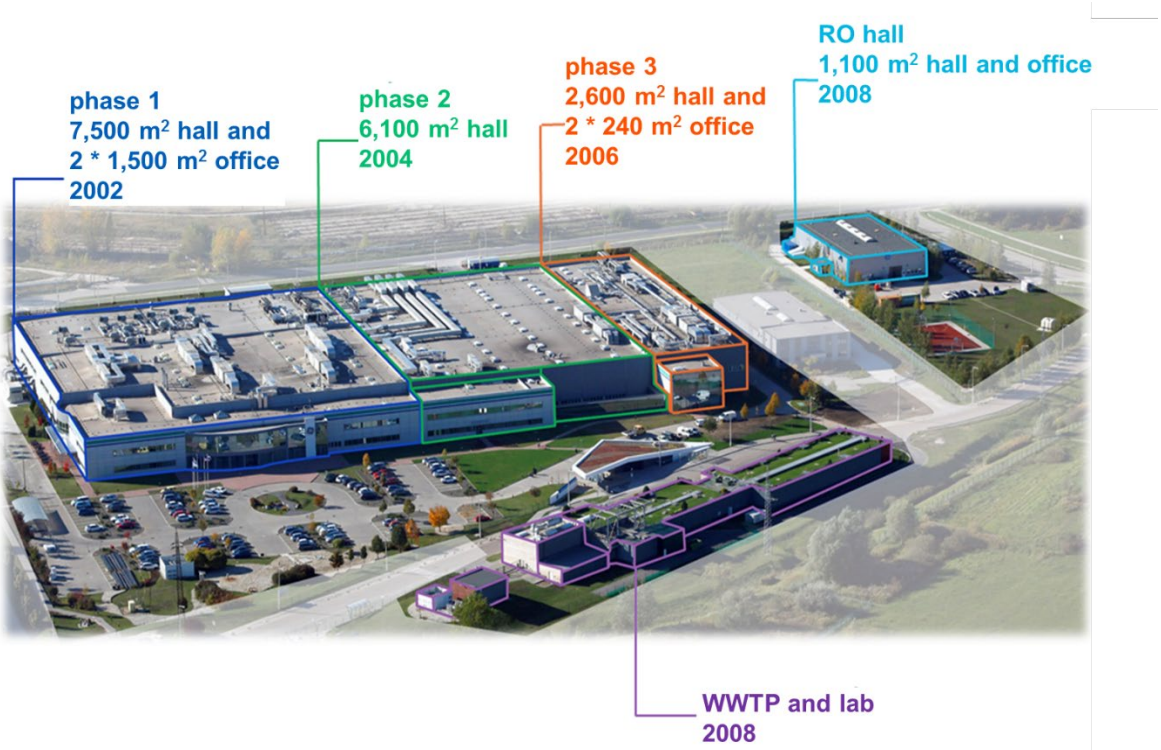
Over the next several years, membranes are expected to comprise more than 20 percent of the global market for water and wastewater treatment equipment. Our proactive manufacturing plan has accounted for this growth, and SUEZ is well positioned to increase manufacturing capacity over this period.

Our production increases, coupled with continued efficiencies in manufacturing, will enable our manufacturing teams to quickly and efficiently deliver high quality membrane products while constantly improving system performance and value. Through these streamlining efforts, SUEZ also strives to improve on a key success metric shared by both the company and its customers—reducing the cost of each gallon of water treated.

Globally, SUEZ currently has over 300,000 square feet of manufacturing and production area at its disposal. Over 660 employees are utilized in the manufacturing of the ZeeWeed membranes and assembling of process equipment.

production expansion

The Oroszlány manufacturing plant has undergone three plant expansions since opening in 2002. Most recently some of our production lines have been expanded for further capacity in 2013.



physical size

- ❑ total area: 80 000 m²
- ❑ constructed area: 19 300 m²
- ❑ total manufacturing area: 11 700 m²
- ❑ total warehouse area: 5 000 m²

general facts

- ❑ initial building built: 2002
- ❑ activities:
  - UF/MBR manufacturing center of excellence
  - RO manufacturing
  - European distribution center

product mix

- ❑ ZeeWeed 500, 1000, 1500 manufacturing
- ❑ RO element manufacturing

certifications

- ISO 9001 / ISO14001 / OHSAS 18001
- NSF 61
- KTW-TZW (Ger) / DWA (GB) / Gost (Rus)
- ÁNTSZ (Hun) / PZH (Pol) / KWWA (Kor)
- MOH (China)

annual transactions

- number of shipments: 3500
- number of inbound deliveries: 660

2.1 Completed Bid Forms

BIDDING SHEET #3 – MEMBRANE BIOREACTOR (MBR) SYSTEM

The undersigned hereby proposed to furnish and deliver the following items of equipment to OWNER, all in strict accordance with the attached and/or incorporated Special Requirements, Technical Specifications, and Drawings, for the following Bid prices:

Bid Item A - Furnish one MBR System complete with Auxiliary Equipment and Appurtenances as specified in Technical Specifications:

$ 1,406,700 *
(Figures)

$ One Million, Four Hundred and Six Thousand, Seven Hundred *
(Written)

Bid Item B - Firm Price for the supply of submittals and manufacturer's shop drawings (**This price is *not* to be included in the equipment price above**):

$ 156,300 *
(Figures)

$ One Hundred Fifty-Six Thousand, Three Hundred *
(Written)

Bid Item C - Firm Price for the supply of the manufacturer's recommended spare parts not included in the price above (attach list showing individual components and costs): (**This price is *not* to be included in the equipment price above**):

$ 36,130 *
(Figures)

$ Thirty-Six Thousand, One Hundred Thirty *
(Written)

Bid Item D - Firm Price for taxes for equipment and spare parts (not submittals): (**This price is *not* to be included in the equipment price above**):

$ 0 *
(Figures)

$ Zero *
(Written)

*** Owner is exempt from Colorado State Sales and Use Taxes on materials and equipment to be incorporated in the Work (Exemption No. 09803492). Said taxes shall not be included in the Bid. All other applicable taxes by reason of this contract shall be provided in Bid Item D.**

2.2 Completed Exceptions Form

X. EXCEPTIONS

Please state below any and all exceptions that you are taking to any portion of this Request for Proposals. If not addressed below, OWNER then assumes that the vendor will adhere to all terms and conditions as contained in the proposal document. Vendor is responsible to reconcile, at vendor cost, any exceptions not listed in this section. Please provide additional lines or sheets as required.

1. Page 38, & 1/8 Actuators for Process Valves and 1/4 Butterfly Valves: AWWA:

SUEZ standard valves do not typically comply with AWWA regulations. SUEZ standard butterfly valves are Bray Series 31/32. These butterfly valves are demonstrated to be robust and compact in SUEZ's MBR experience for decades. SUEZ has designed around our standard and trusted design

2.3 Completed Signature Form

SIGNATURE SHEET

I hereby certify that I am authorized to sign as a Representative for the Firm:

Name of Firm: SUEZ WTS SYSTEMS USA,

Address: 3239 Dundas Street West, Oakville, Ontario, Canada L6M 4B2

Fed ID No.: 04-2068530

Name: David Bingham

Title: Commercial Director

Telephone (905) 465-3030 Ext 3234

Fax No. (_____) NA

Email: david.bingham@suez.com

Date: February 17th, 2022

My signature certifies that the proposal as submitted complies with all Terms and conditions as set forth in RFP.

Representative Signature

My signature also certifies that this firm has no business or personal relationships with any other companies or persons that could be considered a conflict of interest or potential conflict of interest to OWNER, pertaining to any and all work or services to be performed as a result of this request and any resulting contract with OWNER.

To receive consideration for award, this signature sheet must be included with the bid form for each item.

DELEGATION OF SIGNATURE AUTHORITY BY OFFICER

BY THIS DELEGATION OF SIGNATURE AUTHORITY, I, as Vice President - Engineered Systems, of SUEZ WTS USA, Inc.; SUEZ WTS International USA, Inc.; SUEZ WTS Analytical Instruments, Inc.; SUEZ WTS Systems USA, Inc.; SUEZ WTS Services USA, Inc.; SUEZ WTS Solutions USA, Inc.; and Zenon Environmental Corporation (hereinafter collectively referred to as "SUEZ WTS") with the delegable authority granted by the Board of Directors to sign contracts in the name of SUEZ WTS as set forth in the Annual Actions Resolutions of SUEZ WTS, hereby revoke any previously granted delegations issued by me and delegate to the below named individuals, effective January 1, 2021:

Anthony AMENDOLA
Michael BENSON
David BINGHAM
Greg BRICKETT
Joseph BRUCE
Michael CONE
Thomas COSGRAVE
Pedro DACRUZ
Edana ESSA
Andrea FORSTER
Branden GARRETT
William GILL
Richard GRAY
James HARWOOD
Miloud HASSENE
William HEINS
Ryan HESS
Paul HOWLAND
Michael HRIBLJAN
Christopher JANSEN
Paul JOSEPHSON
Diane KUN
Debora LOUNSBERRY
Chris LOW
Melanie MAILLY-DEMONT
Jason MONGRAIN
Dewey PINNOCK
Louise RAYMOND
David ROSSER
Eric SAVAGE
Dhaval SHAH
Stephanie SNYDER
Michael SYLSTRA
Eric TATE
Joseph TIETJENS
Frank TROCINO
Nishith VORA
Graeme YOUNG

A. the authority to exercise my approval authority with regard to commercial operations under the Annual Actions Board Resolutions and SUEZ Water Technologies & Solutions Global Operating Policy, subject to the prior approvals obtained via the SUEZ Delegation of Authority Policy;

B. the authority to sign on behalf of SUEZ WTS those certain agreements within my authority as Vice President, subject to the prior approvals obtained via the SUEZ Delegation of Authority Policy; and

C. the authority to sell goods and/or services to SUEZ WTS customers on standard terms and conditions.

Such delegation includes but is not limited to the delegated authority to sign all contractual instruments, certificates, documents, acknowledgments, consents, and other agreements as may be necessary or convenient in order to carry out the intent and purpose of the foregoing authority.

EXCEPT THAT THIS DELEGATION DOES NOT INCLUDE THE AUTHORITY TO:

1. Modify corporate insurance policies
2. Transfer intellectual property to a customer
3. Enter into joint ventures or partnerships
4. Provide advance payments to customers
5. Provide commissions to agents other than approved distributors
6. Provide deferred revenue
7. Buy back inventory
8. Engage in a Tiering arrangement

Nothing in this Delegation of Signature Authority alters any applicable Corporation review and approval requirements for the above-listed documents, including but not limited the SUEZ Water Technologies & Solutions Global Operating Policy. The Delegation of Signature Authority conferred hereby shall NOT be further delegable.

This Delegation of Signature Authority is valid until 31 December 2021.

IN WITNESS, WHEREOF, I, as Vice President of SUEZ WTS, have caused my signature to be hereunto placed the day and year first above written.

Name: Kevin Cassidy
Title: Vice President - Engineered Systems

Acknowledged by Legal Dept.:

Kelley A. Tarricone

Date: □□□□□□0□0

Acknowledged by Delegee:

Date: □□0□□□0□□

2.4 Completed References Form

2.4 References

This section will outline that Suez is experienced, reputable and highly qualified in the manufacture and design of membrane ultrafiltration systems. The following project references included are of comparable size and complexity as the Town of Johnstown Central WWTP within the United States and Canada. These particular references are just a few among the thousands of SUEZ MBRs worldwide. In addition to similar size ranges, these were chosen because of their very cold feed water. Please feel free to request further reference information from any of the projects listed in the larger list below. Please see the required Completed Reference Form and table below for the installation list, followed by a more detailed summary each referenced project in the following pages.

table 2-1. North American project reference installation list

plant name	location	MMF (MGD)	design temperature	years in operation
Goose Creek	Alaska	0.3	4°C	8
Port Rowan	Ontario	0.3	5°C	8
Wolf Creek	Utah	0.4	8 °C	12
City of Duvall	Washington	0.9	11°C	14
North Lake	Idaho	1.0	5°C	12
Hutchinson	Minnesota	1.0	10°C	12
Borough of Mansfield	Pennsylvania	1.3	7°C	9
Lagoon Lake	Ontario	2.8	4°C	8

table 2-2. Partial Worldwide SUEZ MBR reference installation list

country	system name	average daily flow (MGD)	commissioned date
Canada	Ganges Pollution Control Centre	0.26	Dec-96
India	Infosys Trivandrum MBR	0.26	Sep-14
India	Sahibabad	0.26	Jul-11
South Africa	SASOL Landlord Extension	0.26	Mar-10
Spain	Ultracongelados del Duero WWTP	0.26	Sep-08
Spain	Firgas WWTP	0.26	Jun-04
United Arab Emirates	JAFZA 1000	0.26	Jun-08
United States	Goose Creek Correctional Facility	0.27	Sep-11

China	Xiangrikui	0.28	Mar-12
United States	Cape Charles	0.28	Mar-11
Australia	Moura	0.29	Mar-09
Canada	Port Rowan WPCP	0.29	Dec-11
India	Pepsi Sangareddy	0.29	May-14
United States	Walter Panas	0.29	Apr-14
Colombia	Frito Lay Colombia	0.3	Jun-09
United States	Spring Valley Ranch	0.3	Sep-06
United States	Greenwood Lakes Townhomes	0.3	Aug-04
United States	City of Filer WWTP	0.3	Jun-11
United States	Far West Del Oro WWTP	0.3	Oct-10
United States	Oyster Landing	0.3	Mar-07
United States	Randolph Township	0.3	Oct-06
China	Chang An Ford Mazda	0.32	Aug-07
India	NESTLE Moga	0.32	Apr-11
Spain	Marchena WWTP	0.32	Nov-12
Canada	Ghost Mountain Bus Link	0.33	May-99
Ireland	IDL Middelton WWTP	0.33	Aug-03
Qatar	Qatargas Operating Company	0.33	Dec-13
Switzerland	Uerikon WWTP	0.33	Dec-05
United States	Mona WWTP	0.33	Jan-12
Canada	Kilworth Retrofit MBR	0.34	Nov-08
France	Grasse La Paoute WWTP	0.34	Mar-10
France	Veules Les Roses WWTP	0.34	Nov-09
Taiwan	Chungwa Picture Tube (CPT)	0.34	Jul-00
United Arab Emirates	Tecom - Dubai Studio City	0.34	Jul-10
United Kingdom	St. Agnes STW	0.34	Mar-07
United Kingdom	Shap WWTP	0.34	Aug-11
United States	Key Colony WWTP	0.34	Jan-99
Mexico	Sabritas Vallejo	0.35	Feb-11
United States	Cache Creek Casino WWTP	0.35	Dec-02
United States	Bellevue	0.35	Apr-10
France	Cooperle WWTP	0.36	Jun-03
United States	Harrison Hot Springs WWTP	0.36	Jan-12
United States	Gerdau Ameristeel	0.36	Nov-06

United States	Clear Lake / Clearwater WWTF	0.36	Mar-08
Germany	Roche Pharmaceutical NN WWTP	0.37	Nov-05
Hungary	Tolnatej Rt. Szekszard WWTP	0.37	Aug-05
United States	Coolfont WWTP	0.37	Jan-13
France	Perthes En Gatinais WWTP	0.38	Jan-99
United Kingdom	Aqueduct Unilever Durban-Durban WWTP	0.39	Mar-12
United States	Carnation WWTP	0.39	Apr-08
Canada	Springhill Farms	0.4	Sep-10
France	Ploudalmezeau WWTP	0.4	Apr-09
France	Plouescat WWTP	0.4	Jul-07
Hungary	TEVA Debrecen WWTP	0.4	Aug-06
India	Cubbon Park	0.4	Sep-05
Ireland	Pfizer Ringaskiddy WWTP	0.4	Mar-01
Oman	Marmul	0.4	Jan-09
Poland	Jonkowo WWTP	0.4	Oct-10
Puerto Rico	Lilly del Caribe WWTP	0.4	Jan-14
United Arab Emirates	Global Environmental Services, Palestine	0.4	Mar-14
United Arab Emirates	Masdar City	0.4	Sep-09
United States	Lake Lanier Islands	0.4	Feb-10
United States	Wolf Creek WRF	0.4	May-08
United States	Wyndgate MBR	0.4	Mar-07
Netherlands	Rendac Son WWTP	0.42	Mar-03
United Kingdom	Princes Foods Long Sutton WWTP	0.42	Sep-07
United States	City of Odell Wastewater Treatment Plant	0.42	Jan-08
United States	City of Coburg	0.44	Jul-13
United States	Cohasset WWTP	0.45	Aug-08
United States	Skillman Village	0.45	Apr-11
United States	Mystic Harbour WWTP	0.45	Mar-10
Canada	CNRL Horizon Oil Sands Sanitary System	0.48	Nov-06
Germany	Monheim WWTP	0.48	Jul-03
United States	Rohm & Haas	0.48	Sep-06
Canada	Evan Thomas	0.49	Jan-14
Spain	Calasparra WWTP	0.5	May-06

United States	IDI WWTP	0.5	Jan-11
United States	City of Galena	0.5	Aug-12
United States	Epping Wastewater Treatment Facility	0.5	Feb-02
United States	Fripp Island	0.5	May-06
United States	Laguna County Sanitation District Wastewater	0.5	Dec-02
United States	Mariposa Water Reclamation Facility	0.5	May-05
United States	Pojoaque Pueblo	0.5	Jun-09
United States	The Manor	0.5	Mar-05
Canada	Port McNicoll WWTP	0.51	May-01
France	Guethary WWTP	0.51	Jan-03
United States	Mount Holly Club WWTP	0.52	Feb-14
India	Infosys Pune	0.53	Aug-09
India	Adani	0.53	Aug-10
Taiwan	CMO Fab 5	0.53	Nov-07
United Arab Emirates	Temcom	0.53	Dec-10
United Arab Emirates	Tecom - DuBiotech	0.53	Jul-09
United Arab Emirates	Tecom - IMPZ	0.53	Mar-10
Canada	Nexen Long Lake	0.55	Apr-07
Germany	Markranstädt Erweiterung WWTP	0.57	Nov-08
Germany	Waldmossingen WWTP	0.57	Aug-04
France	Binic WWTP	0.6	Sep-13
France	Great Lakes Chemical Co. WWTP	0.6	Jan-00
France	Ile d'Yeu WWTP	0.6	Jan-00
United States	Churchill County	0.6	Sep-08
United Arab Emirates	Alnbar	0.62	Jul-08
Belgium	Louvain la Neuve WWTP	0.63	Aug-07
France	Boulari New Caledonia WWTP	0.63	Jan-10
United States	Santaquin Water Reclamation Facility	0.65	Mar-12
Egypt	El Obour Market	0.66	Jan-01
France	Fitou WWTP	0.66	Jun-08
India	Infosys Bangalore	0.66	Dec-13
Oman	Qaboos	0.66	Feb-08
Spain	Morro Jable WWTP	0.66	Apr-06

Taiwan	Nantze WWRS with Orzone	0.67	Oct-10
United States	Village of Baltimore	0.67	May-09
Mexico	Tijuana	0.68	Nov-07
United Kingdom	Vivergo Hull WWTP	0.7	Jan-13
United States	Pike Brook	0.7	Apr-11
Australia	Branxton WWTP	0.71	Feb-11
Israel	Bromine Compunds WWTP	0.71	Mar-07
United Kingdom	Swineshead STW	0.72	Sep-12
United States	Hutchinson	0.72	Dec-07
Israel	Jerusalem Har Homa WWTP	0.74	Sep-13
United States	Onancock	0.75	Oct-10
India	NTPC Badarpur	0.79	Nov-13
Taiwan	Quanta Display QDI Small	0.79	Mar-06
United Kingdom	Heineken Ledbury WWTP	0.82	Aug-09
Germany	Rodingen WWTP	0.84	Jun-99
Spain	La Bisbal WWTP	0.85	Jul-03
France	Perros Guirec WWTP	0.87	Nov-10
Hungary	Richter Dorog WWTP	0.9	Nov-11
United States	Borough of Mansfield WWTP	0.9	Jun-10
Canada	Westview WWTP	0.92	Aug-98
France	La Canourgue WWTP	0.92	Aug-08
Germany	Bayer Schering Pharma AG WWTP	0.92	Feb-04
Italy	Alto Lario WWTP	0.92	Oct-08
France	Sarzeau WWTP	0.95	May-09
Canada	Steel Technologies	1	Jan-90
Canada	Cam-Main Remote Radar Camp	1	Oct-95
Israel	Tel Aviv Airport WWTP	1	Sep-06
Japan	Tokyo International Airport 2nd Oil Supply Center	1	Aug-03
United States	Canyon at Wild Basin	1	Apr-98
United States	Jefferson Village Square Mall	1	Jul-94
United States	Tioxide Paints	1	Nov-90
United States	Hennepin County Public Works	1	Apr-98
United States	Tci Of Northern	1	Nov-92
United States	US Army / Watervliet Arsenal	1	Nov-90

United States	Berryville WWTP	1	Nov-11
United States	Cabezon WWTP	1	Jun-05
United States	Corona WWTP	1	Dec-01
United States	Duvall WWTP	1	May-05
United States	Fowler WRF	1	Feb-04
United States	Jordanelle WWTP	1	Jul-09
United States	Lancaster Water Reclamation Facility	1	Aug-07
United States	North Lake	1	Aug-07
United States	Rio Vista	1	Jul-06
United States	US GYPSUM	1	Apr-14
Morocco	Mediouna	1.01	Jan-12
France	Grasse Roumiguieres WWTP	1.06	Aug-05
Hungary	Karcag City MWWTP	1.06	Oct-05
Saudi Arabia	Dallah Real Estate & Tourism	1.06	Dec-97
Germany	Markranstadt Kommunale Wasserwerke WWTP	1.14	Jan-00
Mexico	Minera Mexico	1.14	May-10
United Kingdom	West Burton Power Station WWTP	1.14	Nov-00
United States	Woodstock	1.2	Aug-09
United States	Dodge City WRF	1.25	Sep-11
Belgium	Friesland Campina WWTP	1.27	Apr-14
China	Petrochina Changqing	1.27	Sep-08
China	Jushi Group	1.27	Oct-08
Italy	AQP Noci WWTP	1.27	Dec-08
United States	Far West - Section 14	1.3	Jul-11
United States	Basic American Foods (Blackfoot) WWTP	1.3	Dec-02
France	Nantes La Mountagne WWTP	1.32	Jan-10
Hungary	Oroszlany City MWWTP	1.32	Nov-04
Hungary	Veresegyhaz City MWWTP	1.32	Dec-12
Netherlands	Varsseveld WWTP	1.32	Dec-04
United States	Gold'n Plump Poultry	1.4	Jun-11
Mexico	Ternium MBR Monterrey	1.43	Jun-13
France	Castel WWTP	1.44	Dec-08
Belgium	Aquafin Schilde WWTP	1.45	Mar-04
Switzerland	Rietliau Wädenswil WWTP	1.45	Nov-05
France	Limay WWTP	1.46	Jul-11

United Arab Emirates	Mina Al Arab	1.57	Mar-10
Italy	SEA Viareggio WWTP	1.59	Oct-04
Korea	Uiwang	1.59	Oct-13
Oman	Ministry of Regional Municipalities	1.59	Mar-13
Saudi Arabia	Wasit	1.59	Oct-11
Spain	Jinamar WWTP	1.59	Jun-04
United Kingdom	Tandragee WWTP	1.61	Feb-07
United Kingdom	Campbeltown WWTP	1.64	Oct-01
United States	North Liberty	1.69	Apr-08
United States	Tate & Lyle Fort Dodge	1.7	Mar-09
United States	South Kitsap Water Reclamation Facility	1.7	Mar-06
Italy	Sciacca WWTP	1.72	Jun-10
Canada	CCRL	1.73	May-10
United Kingdom	Ballyclare WTW	1.79	Aug-05
United States	Fillmore WWTP	1.8	Aug-09
Germany	Glessen WWTP	1.84	Jul-07
India	Hindalco Mahan	1.9	Feb-14
Israel	Agan Chemicals WWTP	1.9	Sep-12
New Zealand	Rotorua WWTP	1.93	Aug-11
Egypt	Kaha - Mubarak Youth City WWTP	1.98	Jul-98
France	Claye Souilly WWTP	1.98	Jun-10
Oman	Madinat Qurum	1.98	Nov-08
United Arab Emirates	Al Quoz MBR	1.98	May-10
Brazil	Petrobras/Replan	2	Feb-11
United States	City of Surprise	2	Dec-10
United States	City of West Wendover	2	Mar-12
United States	Jackson WWTP	2	Oct-09
United States	Lewes WWTP	2	Sep-07
United States	Nantuckett	2	Nov-09
United States	Rotonda WRF	2	Dec-08
United States	Town of Taos	2	Jan-11
Canada	Lagoon Lane WWTP	2.11	Nov-11
Indonesia	Pertamina RU II Dumai	2.11	Oct-10

United Arab Emirates	Dubai Motor City WWTP	2.11	Sep-08
United Arab Emirates	JAFZA 8000	2.11	Jun-09
Slovenia	Novo mesto MWWTP	2.14	Apr-13
United States	J.R Simplot	2.2	Jul-12
United States	SCLA MBR	2.23	Aug-10
Spain	San Pedro del Pinatar WWTP	2.24	Jul-07
Israel	Intel Kiryat Gat WWTP	2.25	Dec-08
Switzerland	Zermatt WWTP	2.25	Nov-11
United States	Buchanan Mine	2.3	Nov-10
United States	Modesto WWTP	2.3	Jul-10
India	BINA Refinery	2.38	Jan-11
France	CPCU La Grenelle WWTP	2.47	Sep-09
United States	Tate & Lyle Loudon	2.5	Dec-08
United States	Rubes Creek WWTF	2.5	Dec-03
Italy	ASM Montichiari WWTP	2.54	Feb-11
Italy	Trento Nord WWTP	2.64	Feb-09
France	Ollainville WWTP	2.77	Sep-09
United States	Tate & Lyle Sagamore	2.85	Oct-06
United States	LeClair Ryan	2.88	Apr-07
United States	American Canyon WWTP	3	Aug-02
United States	Mid-Continent WRF	3	Jun-10
United States	Randolph Park	3	Dec-03
Belgium	Rosieres WWTP	3.04	Jun-09
United States	Blaine WWTP	3.1	Aug-10
United Kingdom	Buxton WWTP	3.13	Mar-04
United States	Pooler WWTP	3.34	Dec-04
China	Pucheng Power Plant	3.44	Dec-08
Taiwan	AUO L7B WWT MBR System	3.49	Mar-10
United States	North Regional WWTP	3.5	Sep-07
United States	Lake Stevens Sewer District	3.56	Jan-12
Canada	Oxford Pollution Control Plant	3.6	Oct-08
Cyprus	Anthoupolis	3.7	Jan-08
Italy	Genova Quinto WWTP	3.8	Oct-09
France	Bonifacio WWTP	3.96	Jun-10
Spain	Terrassa WWTP	3.96	Jun-09

China	Kunshan Lujia WWTP	3.97	Dec-10
United States	Anthem WWTP Village Water Campus	4	Feb-99
United States	Hollister Water Reclamation Facility	4	Jun-08
United States	Tri-City WPCP	4	Dec-10
United States	Bonita Springs Utilities East WRF	4.1	Mar-07
United States	Schofield Barracks WWTP	4.2	Nov-06
Denmark	Lundtofte WWTP	4.34	Dec-12
Germany	Nordkanal WWTP	4.41	Mar-04
Korea	Y City	4.58	Nov-09
United States	Linwood WRF	4.6	Aug-07
France	Carpentras WWTP	4.63	May-10
South Africa	Zandvliet	4.76	May-08
United States	Marco Island WWTP	5	Mar-07
Bahrain	BAPCO WWTP	5.02	Jan-14
Australia	Cairns Cleaner Seas - Northern Plant	5.13	Sep-09
Australia	Cairns Cleaner Seas - Southern Plant	5.13	Oct-09
United States	Ironhouse SD WWTP	5.39	Jun-11
India	HPCL-Mittal Energy Limited (HMEL)	5.41	Oct-11
France	Ile D'Arrault Orleans WWTP	5.55	Oct-11
Italy	Rozzano WWTP	5.68	Dec-10
Taiwan	Quanta Display	5.71	Mar-06
United States	Beaver Creek	6	Dec-09
United States	North Kent Sewer Authority	6	Oct-08
Singapore	Ulu Pandan	6.08	Dec-06
United Arab Emirates	Dubai Sports City WWTP	6.61	Jun-09
Korea	Seoul	6.68	Jul-12
United States	Traverse City WWTP	7.1	Jul-04
Australia	Christies Beach	7.13	May-12
Italy	Borghetto Santo Spirito WWTP	7.13	Jun-10
United States	Redlands WWTP	7.2	Jun-04
Italy	Punta Gradelle WWTP	7.4	Dec-14
Australia	Cleveland Bay WWTP	7.74	Apr-08
China	Wuxi Meicun WWTP	7.94	Dec-08
Spain	Avila WWTP	7.94	Oct-12
United States	Henderson South Waste Water Reclamation Facility	8	Dec-11

United States	Spokane County RWRF	8	Aug-11
Canada	Brandon	8.03	Oct-09
Spain	Gava MBR WWTP	8.45	Jun-10
United States	Butler Drive WRF	10	Jun-08
UITED Staes	Broad Run WRF	10.1	Feb-08
Italy	Syndial Porto Marghera WWTP	10.57	Nov-05
United States	Irvine Ranch Water District	10.9	Dec-13
United States	Johns Creek Environmental Campus (JCEC)	10.91	Aug-09
Italy	Brescia MWWTP	11	Oct-02
China	Zhuhai Founder Technology Multilayer PCB	12.17	Mar-13
Russian Federation	Taneco IWWTP	13.31	Jun-12
United States	Jordan Basin WRF	13.9	Jun-12
Qatar	Pearl GTI Qatar	14.9	Jun-11
United States	Ballenger-McKinney WWTP	15	Dec-13
France	Cannes Aquaviva WWTP	15.67	Dec-11
France	La Morèe WWTP	15.67	Jan-13
Qatar	Lusail WWTP	16.19	Oct-10
United States	Yellow River WRF	18.31	Nov-11
Turkemenistan	Turkmenbashi MWWTP	18.49	Aug-12
United States	City of North Las Vegas WRF	25	Aug-11
Korea	Busan City MBR	26.42	Jul-12
United States	Brightwater WTF	31	Sep-11

XI. REFERENCES

Please list below name of business, address, telephone number, and contact person.

Stonegate Village Metropolitan District WWTP
10252 Stonegate Pkwy, Parker, CO 80134
Ger Whelan, Colorado Water Systems (303) 912-1126
GerW@coloradowatersystems.com

City of Duvall Wastewater Treatment Plant
14525 Main Street NE, Duvall, WA 98019
Mike Marty, City of Duvall (425) 788-0257
mike.marty@duvallwa.gov

North Lake Wastewater Treatment Plant
435 Eld Lane, Donnelly, Idaho 83615
Chris Schneider, Operations Manager (208) 325-3718
chris@northlakesewerwater.com

Hutchinson Wastewater Treatment Facility
111 Hassan Street SE, Hutchinson MN 55350-2522
Tim Gratke, City of Hutchinson (320) 234-4231, (320) 583-6088
tgratke@ci.hutchinson.mn.us

Wolf Creek Water Reclamation Facility
3632 N Wolf Creek Drive, Eden, Utah 84310

Larry Hall, Operations Manager (801) 299-1327

larryH@aquaenviron.com

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plant name	**Stonegate Village Metropolitan District WWTP**
owner (*location*):	Colorado Water Systems (*Parker, Colorado*)
installation type:	retrofit
project method:	Design bid build
commissioned:	September 2015
contact information	
owner/operator contact:	Ger Whelan – Colorado Water Systems Tel: 303-912-1126 Email: *GerW@coloradowatersystems.com*
design engineer contact:	Brian Diekej – Water Technology Group Tel: 636-524-6934 Cell: 303-886-8265 Email: *Dieke@wtrgroup.com*
description of facility	
system type:	ZeeWeed MBR
feed source:	municipal wastewater (12-20°C)
process:	biological nutrient removal
process configuration:	MLE – Pre Anoxic and Aerobic
membrane configuration:	3 trains 3 cassettes/train (2x48) + (1x34) modules/cassette
membrane type:	ZW500D modules manufactured by SUEZ
membrane life:	5 years to date
membrane replacement history:	No membranes replaced to date.
additional services provided:	InSight, 24/7

design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L) TSS (mg/L) TKN (mg/L) NH_3-N(mg/L) TP (mg/L) turbidity (NTU)	350 360 52 32 7.5 -	< 25 < 25 < 7 (annual median), < 14 (95% percentile) < 1.5 < 0.05 < 3

flow & net flux:		**flow (mgd)**
		design
	MMF	1.1
	PHF	3.5

MLSS:	design: 10,000-12,000 mg/L in mem tank	operating: 10,000-12,000 mg/L in membrane tank
plant performance:	no issues	
power consumption:	power consumption not available	

cleaning information	frequency	volume (gal/clean)
maintenance clean:	**actual**	**actual**
NaOCl (200 mg/L)	2/week	13
citric acid (2000 mg/L)	2/week	12
recovery clean:	**Actual**	**actual**
NaOCl (1000 mg/L)	2/year	553
citric acid (2000 mg/L)	2/year	214

plant name	**Duvall Wastewater Treatment Plant**
owner (*location*):	City of Duvall, Duvall, King County, Washington
commissioned:	May 2005
contact information	
owner/operator contact:	Mike Marty, Wastewater Operations Manager, City of Duvall Tel: 425-788-0257 Email: mike.marty@duvallwa.gov
description of facility	
system type:	ZeeWeed MBR
feed source:	municipal wastewater
process:	Nitrification/Denitrification
membrane type:	ZeeWeed 500

design & operational information	**parameter**	**effluent**
influent & effluent design criteria:	BOD (mg/L) TSS (mg/L) TN(mg/L) NH_3-N(mg/L) TP (mg/L) turbidity (NTU)	< 15 < 20 - < 1.8 - < 2

flow & net flux:		**design flow (mgd)**
		phase 1
	ADF	0.90
	MMF	1.31
	MDF	2.48
	PHF	2.00
		phase 2
	ADF	1.20
	MMF	1.75
	MDF	3.30
	PHF	4.00

Project Description:

The City of Duvall is located approximately 25 miles northeast of Seattle. The city's wastewater treatment plant, discharging to the Snoqualmie River, was originally constructed in 1976 using an oxidation ditch treatment system. In 1992, the plant was expanded by adding a second oxidation ditch, two new clarifiers, and additional equipment. Later, with population growing rapidly in the area, the plant was reaching its treatment capacity, and effluent from the plant frequently exceeded permit limits. In order to address these concerns, and to provide a source of high-quality reclaimed water for future reuse, the City of Duvall and Parametrix engineering consultants selected GE membrane bioreactor (MBR) technology to meet the community's wastewater treatment needs.

As part of the MBR expansion and upgrade, the existing oxidation ditches were converted to contain flow equalization volume and both anoxic and aerobic biological treatment. In addition, new concrete tanks were constructed to contain additional aeration volume, as well as four parallel membrane trains. A new building, designed to architecturally blend into the plant's downtown location, was constructed to contain the process equipment related to the MBR. Finally, the two old clarifiers were converted into aerobic digesters. Reusing the plant's existing tanks allowed the city to expand the treatment capacity without increasing the plant's footprint.

The initial MBR phase of the upgraded plant was brought into operation in May 2005, using three membrane trains. The future Phase 2 expansion will be achieved by installing additional membranes into the fourth train.

The expansion and upgrade of the plant enabled the city to end a building moratorium that had been in place since 1999. The Duvall Wastewater Treatment Plant was selected as one of the American Public Works Association's Public Works Projects of the Year for 2006.

plant name	North Lake Wastewater Treatment Plant
owner (*location*):	North Lake Recreational Sewer and Water District *(Donnelly, Idaho)*
commissioned:	April 2008

contact information	
owner/operator contact:	Chris Schneider, Operations Manager Tel: 208-325-3718 Email: chris@northlakesewerwater.com

description of facility	
system type:	ZeeWeed MBR
feed source:	municipal wastewater (10°C)
membrane configuration:	4 tains 3 cassettes per train 2 filled cassettes per train
membrane type:	ZeeWeed 500D
aeration type:	Cyclic

design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L)	235	≤ 10
	TSS (mg/L)	155	≤ 2.5
	TN(mg/L)	46 (TKN)	≤ 10
	NH_3-N(mg/L)	-	-
	TP (mg/L)	7.5	≤ 0.07
	turbidity (NTU)	-	≤ 0.5

flow & net flux:		flow (mgd) design	flux (gfd) design
	ADF	0.8	-
	MMF	1.0	7.99
	MDF	2.0	15.98
	PHF	-	-

cleaning information	frequency	
Maintenance clean:	design	Actual
NaOCl (500 mg/L)	1/week	1-2/month
citric acid (2000 mg/L)	0.5/week	1 x every 2 months (both MCs are high strength cleans)

plant name	North Lake Wastewater Treatment Plant
Recovery clean:	design
NaOCl (1000 mg/L)	2/year
citric acid (2000 mg/L)	1/year

plant name	Hutchinson Waste Water Treatment Facility
owner (*location*):	City of Hutchinson (*Hutchinson, Minnesota*)
project method:	design, bid, build
commissioned:	December 2007, upgrade to LEAPmbr July 2012

contact information	
owner/operator contact:	Tim Gratke - *City of Minnesota* Tel: 320-234-4231 Email: tgratke@ci.hutchinson.mn.us

description of facility	
system type:	ZeeWeed MBR
feed source:	municipal wastewater (10 to 18°C)
effluent use:	surface water discharge to Crow River
unit operations:	influent pumping, equalization, rotating drum screens, grit removal, membrane filtration, sludge storage, dewatering, bio-solids drying, UV post treatment disinfection
process configuration:	nitrification/denitrification, chemical phosphorus removal
membrane configuration:	2 membrane trains 4 cassettes per train in a single row (6 cassette spaces) 192 modules per train in 48 module cassettes, 348 modules total
membrane type:	ZeeWeed 500D 340 ft^2 conversion to ZeeWeed 500D 370 ft^2 in February 2010
aeration type:	LEAPmbr aeration 80/160 dcfm per cassette in LEAP-Lo & LEAP-Hi respectively
cassette access:	aluminum grating on membrane tanks, lifting bracket for cassette removal, cassette laydown beside the membrane tanks

design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L) TSS (mg/L) TKN(mg/L) NH_3 (mg/L) turbidity (NTU)	330 350 42 32 ?	≤5 ≤5 ≤1 (summer) ≤12 (winter) ≤1 ≤0.2
flow & net flux:	**flow (mgd)**	**flux (gfd)**	

plant name	Hutchinson Waste Water Treatment Facility					
		design	operating	design	operating	@20°C
	ADF	1.46	1.73	7.26	16.9	15.7
	MDF	3.2	2.0	13.7	26.1	28.1
TMP range	design: 0 to 8 psi					
MLSS:	design: 8,000-12,000 mg/L in mem tank					
plant performance:	plant meeting design objectives by performance test					

plant name	**Wolf Creek Water Reclamation Facility**
owner (*location*):	Wolf Creek Sewer District (*Eden, Utah*)
installation type:	Greenfield
commissioned:	2008
contact information	
owner/operator contact:	Larry Hall – Operations Manager Tel: 801-299-1327 Email: larryH@aquaenviron.com
description of facility	
system type:	ZeeWeed MBR
feed source:	municipal wastewater
effluent:	golf course irrigation (summer), man-made lake storage (winter)—zero surface water discharge
process:	fine screening, process and biological treatment systems, ultrafiltration, UV disinfection
membrane configuration:	2 trains 2 cassettes/train 44 modules/cassette filled (currently fully filled membranes trains)
membrane type:	ZW 500D
membrane life:	12 years
membrane replacement history:	None
additional services provided:	24/7, ZenoTrac, Site visits

design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L) TSS (mg/L) TKN (mg/L) turbidity (NTU)	250 237 45 -	< 5 < 5 < 10 (TN) < 2

flow & net flux:		design flow (mgd)	design flux (gfd)
	ADF	0.4	6.68
	MDF	0.8	13.37
	PHF	1.0	16.71

MLSS:	design: 10,000-12,000 mg/L in mem tank
cleaning information	**frequency**
recovery clean:	**design**
NaOCl (1000 mg/L)	2/year
citric acid (2000 mg/L)	1/year

2.5 Completed Contract Completion Schedule

Contract Completion Schedule

Item of Work	Calendar Days for Completion: Contract Completion Time (days)	Calendar Days for Completion: Bidder's Completion Time (days)
1. Price Guarantee (Hold proposal prices following RFP due-date).	288*	288
2. Receipt by Owner of complete Submittal Package	45**	45
3. Delivery of equipment to the project site: (Complete and Operable Equipment Ready for Installation)	180***	180

* Owner will issue a Notice of Award to the selected Supplier. Selected suppliers will be required to honor their submitted Proposal pricing for equipment delivery, installation, and warranty for the required period from the proposal due date for this RFP. If the "Price Guarantee" time is exceeded before agreement with Contractor, price escalation shall be allowed as follows: Price adjustment will be based on the net change of the Consumer Price Index for Urban Consumers (CPI-U) occurring in the period from 288 consecutive calendar days from the proposal due date to the date when the Purchase Order is issued by the Contractor, plus 1%.

** Commencing on Date of "Notice to Proceed" issued by Owner during the design phase of the project. Owner will transmit a "Notice to Proceed" to Equipment Supplier upon receipt by Owner of an executed Agreement, including insurance. Thereafter, the Equipment Supplier shall commence with the preparation of the Submittal Package. Payment will be provided by OWNER upon review and approval of submittals. Submittals will be reviewed during the 60% design phase and used to inform the 60% design. Approved submittals will be returned to Supplier following the 60% design phase.

***Commencing on Date of "Notice to Proceed" issued by the Contractor during the construction phase of the project. "Notice to Proceed" by Contractor is estimated to be issued in November 2022.

Work shall be completed per the Contract Completion Time, unless Alternate Completion Times, herein references as "Bidder's Completion Time", is proposed by Bidder, as set forth herein, and is approved by Owner.

2.6 Addendum

This is to acknowledge receipt of Addendum labelled “Town of Johnstown Central Wastewater Treatment Plant Project Equipment Procurement – Request for Proposals Addendum No. 1 January 19, 2022” and “Town of Johnstown Central Wastewater Treatment Plant Project Equipment Procurement – Request for Proposals Addendum No. 2 February 14, 2022”.

3 Technical Literature and Information

3.1 System Description

The proposed ZeeWeed Membrane filtration system for the Town of Johnstown Central WWTP is designed to ensure reliable long-term performance and to maximize operational flexibility. At the core of the MBR process is the ZeeWeed 500 series reinforced hollow fiber membrane. The ZeeWeed 500 series membrane is a bold reinforced hollow fiber ultrafiltration membrane that was designed specifically for high solids applications. The membrane fiber has a nominal pore size of 0.04 µm, a tensile strength of 100 lbs and is highly resistant to chemicals, including acids, bases and chlorine, allowing for flexible cleaning regimes.

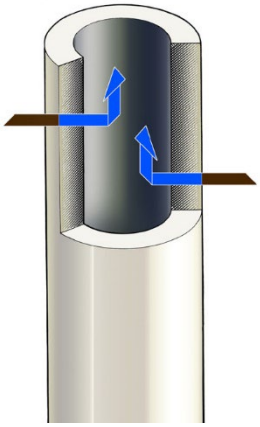


figure 3-1. The ZeeWeed 500 series membrane is a reinforced hollow fiber ultrafiltration membrane with a nominal pore size of 0.04 µm

The membrane is manufactured and assembled into discrete units called “modules” or small membrane subunits. These are the basic building blocks of the membrane system that are manifolded together to create a “cassette” or large membrane subunit. The ZeeWeed 500D cassette (figure 3-2), proposed for the Town of Johnstown Central WWTP, will contain 52 modules. Each module has 430 ft^2 of membrane area, for a total available installed membrane area of 22,360 ft^2 per ZeeWeed 500D cassette.

In the ZeeWeed membrane filtration process, the membrane cassettes are immersed directly in the mixed liquor in separate membrane compartments. A series of cassettes connected to a common permeate header is called a “membrane train” (see figure 3-3). Mixed liquor is pumped into a common membrane channel, then flows into each membrane train. RAS overflows by gravity to a common channel back to the head of the bioreactor where it is blended with the incoming wastewater. To take advantage of the increased mixed liquor solids concentration, waste activated sludge is typically taken from the RAS channel. The membrane train utilizes a process pump to draw treated water through the reinforced hollow fiber membranes, leaving the mixed liquor solids on the outside of the membrane.

figure 3-2. ZeeWeed 500D cassette

LEAPmbr aeration

LEAPmbr aeration is a specially designed and highly efficient aeration system used to scour the outside surface of the membranes and move mixed liquor solids away from the membrane fibers. The patented LEAPmbr aeration system uses factory installed LEAP aerators which are integrated into the base of each ZeeWeed 500D cassette.

LEAPmbr aeration devices release large air bubbles which create higher scouring forces along the surface of the membrane fiber and therefore have more effective solid removal capability than smaller bubbles.

Because the large mushroom-cap bubbles generated by LEAPmbr aeration devices are so effective, 30% less air is required to achieve the same solids removal performance than previous designs.

figure 5-3. Simple construction – one permeate pipe, one air pipe per train ZW500D LEAPmbr membrane trains (City of Riverside, CA – 26 MGD)

3.2 System Design

3.2.1 Influent Flow Data

The proposed ZeeWeed membrane filtration system for Town of Johnstown Central WWTP is offered based on using the design parameters summarized in the following sections.

The influent design flows are summarized in the table below.

influent design flows

flow conditions	value	units
maximum month flow (MMF)	2.50	mgd
maximum day flow (MDF)	3.11	mgd
peak hour flow (PHF)[2]	3.11	mgd
maximum flow with one train offline for maintenance or cleaning (for less than 24 hours)	3.11	mgd
maximum flow with one train offline (for less than 30 days)	2.50	mgd

note 1: any flow conditions that exceed the above-noted flow limits must be equalized prior to treatment in the ZeeWeed membrane filtration system. The Town of Johnstown Central WWTP RFP stated any flows will be equalized above 2.10 mgd.

note 2: upstream flow equalization will be provided (by Others) to ensure PHF to the membranes no more than 3.11 MGD as per RFP Section 002004.C.

MMF – the average flow rate occurring over a 24-hour period during the 30-day period with the highest flow based on annual flow rate data.

MDF – the maximum flow rate averaged over a 24-hour period occurring within annual flow rate data.

PHF – the maximum flow rate sustained over a 1-hour period based on annual flow rate data.

3.2.2 Influent Quality

The design solution proposed is based on the wastewater characteristics detailed below.

influent design parameters

influent design parameters	value	unit
design influent temperature	12	ºC
BOD_5	304	mg/L
TSS	474	mg/L
inert solids fraction[1]	20	%
NH_3-N	60	mg/L
TKN	74	mg/L
TP	8	mg/L
alkalinity	Note 2	mg/L as $CaCO_3$

note 1: Parameter value assumed.
note 2: Chemical addition has been specified for alkalinity adjustment as per RFP.

Below are the ultrafiltration system influent characteristics that were used for this design; any deviation from the values below may impact the membrane system design.

acceptable mixed liquor properties entering into membrane tanks

temperature range (°C)	12-28
MLSS concentration (mg/L) [1]	≤ 10,000
pH (SU)	6.5 – 7.5
soluble $cBOD_5$ concentration (mg/L)	≤ 5
NH_3-N concentration (mg/L)	≤ 1.0
colloidal TOC (cTOC) concentration (mg/L) [2]	≤ 10
soluble alkalinity (mg/L as $CaCO_3$)	50 – 150
time to filter (TTF) (seconds) [3]	≤ 200
material greater than 2 mm in size (mg/L) [4]	≤ 1

note 1: Membrane tank MLSS concentration of up to 12,000 mg/L is permissible during MDF and PHF events only. Membrane tanks MLSS concentration to be ≤10,000 mg/L during all other flow conditions.

note 2: Colloidal TOC (cTOC) is the difference between the TOC measured in the filtrate passing through a 1.5-µm filter paper and the TOC measured in the ZeeWeed membrane permeate.

note 3: Per seller's standard time to filter (TTF) procedure (available upon request).

note 4: Per seller's standard sieve test procedure (available upon request).

note 5: Chemicals that are not compatible with the ZeeWeed PVDF membrane are not permitted in the membrane tanks.

3.2.3 Effluent Quality

The following performance parameters are expected upon equipment startup and once the biological system has stabilized based on the data listed in sections 1.1 and 1.2.

effluent design parameters

effluent design parameters	value	unit
TSS	≤ 10	mg/L
turbidity	≤ 0.2	NTU

3.2.4 Membrane Design

The proposed ZeeWeed membrane filtration system for the Town of Johnstown Central WWTP has four (4) identical membrane trains. Each train consists of four (4) cassette spaces. The membrane system is designed to achieve max month flows with only three (3) trains in operation and to meet flux limit of 10 gfd as specified in the RFP. Table 3-1 summarizes the configuration and design flux data for the proposed membrane filtration system.

table 3-1. membrane system design

parameter	value	unit
type of membrane	ZeeWeed 500D	n/a
type of aeration	LEAPmbr aeration	n/a
total number of membrane trains	4	no.
number of membrane cassettes installed per train	4	no.
number of membrane cassettes spaces per train	4	no.
number of partially populated membrane cassettes per train	1	no.
number of fully populated membrane cassettes per train	3	no.
maximum number of membrane modules per cassette	52	no.
number of membrane modules installed per train	196	no.
number of membrane cassettes installed per plant	16	no.
total membrane area installed per train	84,280	ft^2
total membrane area installed per plant	337,120	ft^2
cassette spare space available	5.8	%

3.2.5 Technical Specifications

See Appendix A for SUEZ Equipment Specifications.

3.3 Scope of Supply

3.3.1 scope of supply by SUEZ

The main equipment included in SUEZ's scope of supply for the Town of Johnstown Central WWTP project is listed in the tables below. These tables should be read in conjunction with the Piping and Instrumentation Diagrams (P&IDs) found in Section 3.6. A general scope of supply table, including items not listed on the P&IDs, follows the detailed scope tables.

The P&IDs and scope of supply tables define SUEZ's scope of supply and that provided by the Contractor or Owner (by others). In case of conflict, the P&IDs take precedence for SUEZ supplied equipment and devices. On the P&IDs, items within SUEZ's scope of supply are shown as solid, and items not included in SUEZ's scope of supply are shown dotted.

Pipes shown as dotted are to be furnished by the Contractor (by others). The sizes of all pipes are depicted on the P&IDs. Valves are typically the same size as the pipe on which they are located.

Equipment sizing, max rating, and motor horsepower for equipment supplied by SUEZ is shown on the P&IDs. Materials of construction and additional equipment detail can be found in the equipment cut sheets in Section 3.5.

Equipment has been specified considering seismic zone considerations as outlined in the RFP.

The P&ID package in Section 3.6 includes:

490084-AA-01:	title page (sheet 1 of 1)
490084 -AA-02:	legends & symbols (sheet 1 of 2)
490084 -AA-02:	legends & symbols (sheet 2 of 2)
490084 -AP-02:	membrane blowers (sheet 1 of 1)
490084 -AP-04:	membrane tank (sheet 1 of 1)
490084 -AP-05:	process pump (sheet 1 of 1)
490084 -AP-07:	backpulse tank (sheet 1 of 1)
490084 -AP-11:	cleaning chemical systems (sheet 1 of 1)
490084 -AP-12:	air compressor (sheet 1 of 1)

membrane tank 490084-AP-04 sheet 1 of 1			supply by	
equipment	**tag #**	**qty**	**SUEZ**	**others**
ZeeWeed® Membrane Cassette Frames	ZW500d	16	√	
ZeeWeed® 500d Membrane Modules	N/A	784	√	
Cassette Brackets (end & middle wall)	N/A	40	√	
Permeate Collection Headers	N/A	4	√	
Permeate Header Cassette Isolation Valve	HV-212X3A HV-212X4A HV-212X5A HV-212X6A	16	√	
Cassette – Permeate Header Connection Hardware: camlock connectors, hoses & clamps	N/A	16 Sets	√	
Membrane Air Scour Header Pipes	N/A	4	√	
Air Header Cassette Isolation Valve	FV-214X1 HV-212X3B HV-212X4B HV-212X5B HV-212X6B	4 16	√ √	
Cassette – Air Header Connection Hardware incl. camlock connectors, hoses, hose clamps	N/A	16 Sets	√	
316SS Fasteners for SUEZ supplied header piping (excludes fasteners at points where piping connects to piping that will be supplied By Others)	N/A	Lot	√	
Membrane Tank Influent Deflector Plate	N/A	4		√
Membrane Tank Inlet Sluice Gate	G-211X1	4		√
Membrane Tank Outlet Drain Valve	HV-212X7	4		√
Membrane Tank Level Switch High	LSHH-216X3	4	√	
Membrane Tank Level Switch Low	LSSL-216X3	4	√	
Membrane Tank Level Transmitter	LIT-216X3	4	√	
Membrane Tank (concrete design)	20-TK-201-1 to 4	4		√
Permeate Header Pressure Indicator	PIT-216X1	4	√	
Air Supply Assembly Isolation Valve-manual Filter Valve-automatic	 HV-216X1 ME-216X1 SV-216X1	 4 4 4	 √ √ √	

membrane tank 490084-AP-04 sheet 1 of 1			supply by	
equipment	**tag #**	**qty**	**SUEZ**	**others**
Ejector Assembly Flow Control Valve Isolation Valve-manual Vacuum Ejector	FV-216X3 HV-216X3 HV-216X4 ME-216X3	4 4 4 4	√ √ √ √	
Other valves and items generally as noted on DWG: 490084-D-004 (1 of 1)	Various	Lot		√

permeate pump: 490084-AP-05 sheet 1 of 1			supply by	
equipment	**tag #**	**qty**	**SUEZ**	**others**
Citric Acid Solution Injection Valves	FV-212X2A CV-212X2 HV-212X2B	4 4 4	√ √ √	
Sodium Hypochlorite Solution Injection Valves	FV-212X1A CV-212X1 HV-212X1B	4 4 4	√ √ √	
Flow Control Valve	FV-213X1	4	√	
Permeate Pump Suction Pressure Gauge w/ hand isolation valve Permeate Pump Suction Pressure Switch High	PI-213X4A HV-213X4A PSH-213X4A	4 4 4	√ √ √	
Permeate Pump Suction Drain Valve Permeate Pump Discharge Drain Valve	HV-213X2 HV-213X3	4 4	√ √	
Permeate Pump	P-213X1	4	√	
Permeate Pump Discharge Pressure Gauge w/hand isolation valve Permeate Pump Discharge Pressure Switch High	PI-213X4B HV-213X4B PSH-213X4B	4 4 4	√ √ √	
Turbidimeter Isolation Valve Permeate Pump Discharge Turbidimeter Hand Control Valve Flow Control Valve Hand Control Valve Flow Control Valve Degassing Tank	HV-213X7 AE-213X7 AIT-213X7 SV-213X9 HV-213X9A ME-213X9 HV-213X9B SV-213X7 HV-213X7A	4 4 4 4 4 4 4 4	√ √ √ √ √ √ √ √ √	
Permeate Flow Transmitter	FIT-213X5	4	√	
Permeate Discharge Isolation Valve	HV-213X6	4	√	

Other valves and items generally as denoted on DWG: 490084-D-005 (1 of 1)	Various	Lot		√

backpulse pumps: 490084-AP-07 sheet 1 of 1			**supply by**	
equipment	**tag #**	**qty**	**SUEZ**	**others**
Backpulse Temperature Transmitter	TT-21338/TW-21338	1	√	
Other valves and items generally as denoted on DWG: 490084-D-007 (1 of 1)	Various	Lot		√

chemical system: 490084-AP-011 sheet 1 of 1			**supply by**	
equipment	**tag #**	**qty**	**SUEZ**	**others**
Sodium Hypochlorite Isolation Valve	HV-23511A	1	√	
Sodium Hypochlorite Strainer Isolation Valve	HV-23512 HV-23521A	1 1	√ √	
Sodium Hypochlorite Pressure Indicator Sodium Hypochlorite Pressure Indicator Isolation Valve	PI-23521C HV-23521C	1 1	√ √	
Sodium Hypochlorite Pump Suction Drain Valve	HV-23521E	1	√	
Sodium Hypochlorite Pump	P-23521	1	√	
Sodium Hypochlorite Pump Discharge Drain Valve	HV-23521F	1	√	
Sodium Hypochlorite Pump Discharge Pressure Indicator Sodium Hypochlorite Pump Discharge Pressure Indicator Valve	PI-23521D HV-23521D	1 1	√ √	
Sodium Hypochlorite Pump Discharge Check Valve	CV-23521	1	√	
Sodium Hypochlorite Pump Isolation Valve	HV-23521B	1	√	
Sodium Hypochlorite Pump Flowmeter	M-23521	1	√	
Hand Control Valve-Sodium Hypochlorite line	HV-23523 FV-23522	1 1	√ √	
Flow Valve-Sodium Hypochlorite line	HV-23524	1	√	
Pressure Relief Valve-Sodium Hypochlorite line	MFV-23525	1	√	
Citric Acid Isolation Valve	HV-23551A	1	√	
Citric Acid Strainer Isolation Valve	HV-23552 HV-23561A	1 1	√ √	
Citric Acid Pressure Indicator	PI-23561C HV-23561C	1 1	√ √	

Citric Acid Pressure Indicator Isolation Valve				
Citric Acid Pump Suction Drain Valve	HV-23561E	1	√	
Citric Acid Pump	P-23561	1	√	
Citric Acid Pump Discharge Drain Valve	HV-23521F	1	√	
Citric Acid Pump Discharge Pressure Indicator Citric Acid Pump Discharge Pressure Indicator Valve	PI-23561D HV-23561D	1 1	√ √	
Citric Acid Pump Discharge Check Valve	CV-23561	1	√	
Citric Acid Pump Isolation Valve	HV-23561B	1	√	
Citric Acid Pump Flowmeter	M-23561	1	√	
Hand Control Valve- Citric Acid line	FV-23562 HV-23563	1 1	√ √	
Flow Valve- Citric Acid line	HV-23564	1	√	
Pressure Relief Valve- Citric Acid line	MFV-23565	1	√	
Other valves and items generally as denoted on DWG: 490084-D-011 (1 of 1)	Various	Lot		√

air compressors & associated equipment: 490084-AP-12 sheet 1 of 1			**supply by**	
equipment	**tag #**	**qty**	**SUEZ**	**others**
air compressor & air filter	ME-23601/2 ME-23601A/2A	2 2	√ √	
pressure switch	PSL-23601A/B	2	√	
receiver tank	ME-23603	1	√	
receiver tank pressure relief valve	PRV-23603	1	√	
receiver tank pressure gauge	PI-23601	1	√	
receiver tank automatic drain valve	FV-23603B	1	√	
compressor isolation valve	HV-23603A	1	√	
refrigerated air drier	ME-23621	1	√	
air drier outlet isolation valve	HV-23621A HV-23621B	1 1	√ √	
coalescing filter inlet isolation valves	HV-23611A	1	√	
coalescing filter	ME-23611	1	√	
coalescing filter differential pressure indicator	90-DPI-001	1	√	
coalescing filter drain valve	HV-23611	1	√	
coalescing filter isolation valve	HV-23611B	1	√	
coalescing filter pressure switches	PSL-23612A	1	√	

air compressors & associated equipment: 490084-AP-12 sheet 1 of 1			supply by	
equipment	**tag #**	**qty**	**SUEZ**	**others**
	PSL-23612B	1	√	
coalescing filter pressure regulator	MFV-23612	1	√	
other valves & items generally as denoted on DWG: 490084-AP-12 (1 of 1)	various	lot		√

general	supply by	
	SUEZ	**others**
preparation of design submittals and shop drawings - see section 2.5 for details	√	
equipment general arrangement and layout drawings	√	
operating & maintenance manuals	√	
spare parts – see section 3.9 for details		√
on-site field services – see section 3.10 for details	√	
aftermarket site services – see section 4.4 for details	√	
warranty - mechanical and membrane – see section 4 for details	√	

3.1.1 scope of supply by Others

SUEZ has provided a detailed list of the equipment and services to be provided. All equipment or services not specified in the scope of supply by SUEZ and as designated on the P&IDs are to be provided by others. Supply by installation contractor or others includes all items as specified in the RFP and includes but is not limited to:

mechanical

- ❑ Overall plant and biological design.
- ❑ Review of all submittals and equipment cutsheets.
- ❑ Headworks and pretreatment equipment and facilities including grit removal, and fine screening and associated equipment (collection/disposal of screenings) and instrumentation
- ❑ Equalization tank facilities and systems including associated equipment and instrumentation
- ❑ Influent flow measurement to the membrane filtration system (4-20 mA signal to be sent to SUEZ PLC).
- ❑ Biological tanks and equipment including but not limited to: process chemical pumps, diffusers, mixers, raw sewage feed pumps, waste pumps valves and meters, process blowers, and associated instrumentation and valves.
- ❑ Finished water disinfection, post-aeration tank, and pumping equipment and associated instrumentation.
- ❑ Design, supply and installation of anchor bolts, brackets and fasteners for SUEZ supplied equipment. Seismic structural analysis and anchor bolt sizing.
- ❑ Design, supply and installation of bulk chemical storage facilities, containment, transfer pumps and associated controls.
- ❑ Any spacer rings that may be required for valves.
- ❑ Energy/power measurement and equipment for startup, acceptance and confirmation testing.
- ❑ All required permits and permissions including but not limited to: civil works, mechanical and electrical works, environmental permits or other permits to allow operation.
- ❑ Weather protection as required for all SUEZ supplied equipment. Skids and electrical panels are designed for indoor operation and will need shelter from the elements. Includes heat tracing, insulation, sunshades, etc., of equipment and instrumentation
- ❑ alignment of rotating equipment
- ❑ Membrane tank drain pumps and valves
- ❑ Membrane tank blowers

- ❑ Sludge wasting pumps
- ❑ Sludge wasting valves and flow meters
- ❑ Mechanical support labor for commissioning activities

electrical

- ❑ Supply of SUEZ equipment controls including remote panels
- ❑ Supply and installation of panel boards, transformers, and other equipment as necessary to provide power distribution and control for all membrane system equipment.
- ❑ Design, supply and installation of motor control center's complete with motor starters and variable frequency drives for SUEZ supplied equipment.
- ❑ Design, supply and integration of plant PLC or DCS, including SCADA configuration, testing and interfacing with the SUEZ supplied control system.
- ❑ Design, supply and installation of all power distribution and instrumentation interconnecting wiring, optical fibers, conduit and appurtenances, as follows.
  - Power connections as needed from the electrical power source to the SUEZ control panels, owner supplied MCC and from the MCC to SUEZ supplied equipment.
  - Connections as needed between the various field-mounted instruments and valve actuators to the SUEZ control panels.

  The electrical installation should meet the requirements of best practice guidelines which include standards for facility grounding, lightning protection, transient control, single-point grounding, load-balancing and management of harmonics.
- ❑ Control of equipment and systems not supplied by SUEZ.
- ❑ MCC , VFD or Starters for 3-ph motors, including loose ship SUEZ supplied equipment
- ❑ electrical support labor for commissioning activity
- ❑ UPS, Power Conditioner, Emergency power supply and specification (where applicable)

commissioning

- ❑ Equipment installation, including;
  - All SUEZ supplied equipment and membranes.
- ❑ Unloading of delivered equipment and membranes at the defined point of destination including receiving, sign-off and safe storage of equipment at site until ready for installation.
- ❑ Storage of membrane cassettes, if required. SUEZ will provide storage specifications.

- ❑ Provide trailers/offices and washroom facilities for the SUEZ site personnel and its representatives.
- ❑ Installation & removal of suitable temporary screens (if required) on all process lines entering the membrane basins to prevent foreign construction related debris from coming in contact with the membranes.
- ❑ Raw materials, chemicals, seeding sludge and utilities during equipment start-up and operation including a supply of raw water feed that meets all design parameters for the successful commissioning of the membrane equipment.
- ❑ Supply and installation of all required oil and lubricants for equipment start-up and initial operation per the manufacturer's specifications.
- ❑ Replacement of lubricants in all drives and intermediate drives of mechanical equipment after initial break-in of the equipment
- ❑ Flushing of all piping and membrane tanks and verification of removal of all residual debris from construction.
- ❑ Laboratory services, operating and maintenance personnel during equipment checkout, start-up and operation.
- ❑ All required permits and approvals to run the plant.
- ❑ Temporary piping/hosing may be required for the commissioning of the plant before effluent distribution is authorized.
- ❑ Contractor checklists are required complete prior to commissioning.
- ❑ Supply and installation of a suitable secure remote internet connection for 24/7 emergency telephone technical service.
- ❑ Disposal of initial start-up wastewater and associated chemicals

civil

- ❑ Provision of main plant structures, existing tank modifications, buildings, equipment foundation pads, concrete work, etc.
- ❑ equipment access platforms, walkways, stairs, safety tie off points, handrails, grating, ladders, full floor coverage equipment contact pads, etc.
- ❑ Membrane tank covers, walkways, stairs, safety tie off points, handrails, grating, ladders, as required, etc.
- ❑ Isolation gates between membrane tanks and mixed liquor channel to deoxygenation tank and/between membrane tanks and common influent channel
- ❑ Any on-site touch-up primer or painting of equipment supplied by SUEZ.
- ❑ Overhead traveling beam crane above the membrane tanks for installation and removal of the membrane cassettes (10,000 lbs capacity)
- ❑ Treated water storage tank – as required
- ❑ HVAC equipment design, specifications and installation (where applicable)

- ❑ Bioreactor tank – complete with pre-anoxic, aerobic and post anoxic zones

piping interfaces

- ❑ Installation of supplied air header pipes that run the length of the membrane tanks, to the end of the membrane gallery. Supply and installation of pipe supports and hangers for this piping. Pipe supports under the SUEZ-supplied air headers on each train are to be provided by others.
- ❑ Installation of supplied permeate header pipes that run the length of the membrane tanks, through the deoxygenation tanks to the permeate collector. Supply and installation of pipe supports and hangers for this piping. Pipe supports under the SUEZ-supplied permeate headers on each train are to be provided by others.
- ❑ Design, supply and installation of process and utilities piping, pipe supports, hangers, valves, etc., to and from SUEZ supplied equipment including but not limited to:
  - Piping from the blowers to the SUEZ supplied process air pipes at the membrane gallery.
  - Piping from permeate collector to disinfection to discharge
  - Temporary piping systems required for the start-up and commissioning of the SUEZ equipment. Typically, the provision of a re-circulation loop between the permeate header and the tank inlet channel/pipe is required for the start-up of the SUEZ system to allow for testing prior delivery of water the distribution system.
  - Any heat tracing, insulation and cladding on any piping systems as required.
- ❑ Process tank aeration system air piping, equalization tank system piping, etc.
- ❑ Piping, pipe supports and valves between SUEZ-supplied equipment and other plant process equipment

hazardous area classification

- ❑ Unless stated otherwise, the equipment & instrumentation quoted is to be installed in a NFPA 820 non-classified area.

miscellaneous

- ❑ stamping, signing or sealing of general drawings as per Federal, Provincial or local regulations or codes, where required

3.4 Equipment Cut Sheets

See attached for SUEZ Equipment Cut Sheets.

3.5 Drawings

See attached for SUEZ Equipment Layout and P&IDs.

3.6 Controls and Operating Strategies

SUEZ's Electrical Engineering group will interface with the Town of Johnstown Central WWTP team and the selected Contractor to provide the necessary controls information, system network architecture, and integrated component design that is robust and reliably enables full automation of the plant.

major control system components include:

a) Programmable Logic Controller (by Others)
b) Microprocessor and ETHERNET network responsible for controlling plant (by Others)
c) Human Machine Interface (by Others)
d) System Control and Data Acquisition, allowing data to be collected, stored, trended and viewed (by Others)
e) Field Devices (by SUEZ & Others)

automatic control

This plant is designed to operate with minimal operator intervention. Any pump or valve that requires frequent use has been made fully automatic to reduce work required by the operator. The PLC network monitors many inputs and responds through many outputs; These can be simple digital signals (level switch - high for example) or can be analog signals for detailed input or control (pH, pressure, valve position, motor speed). Alarms (described below) are in place to prevent equipment damage and may initiate shutdown of certain or all devices.

setpoints

Calculated or derived setpoints require no operator intervention. The PLC performs "behind the scenes" calculations optimizing target setpoints for permeate flows, tank levels and aeration. The Operator can also adjust manual setpoints at the HMI when need arises based on a tiered authorization level.

system triggers

To effect automatic operations, the PLC uses 'triggers' to initiate changes in equipment status i.e. start/open, stop/close, change speed etc.

digital control instruments

The simplest type of control, it handles the easy tasks such as opening a valve, or simple instruments such as switches and floats. Some digital instrumentation provides redundancy for an analog device, e.g., an LSL/LSH may be used to alarm based on tank level. While the software LSL/LSH alarms are calculated by the PLC based on level from an LIT.

analog control instruments

The ongoing pinpoint control of the system is handled with analog inputs/outputs. Rather than a simple on or off, analog signals also communicate a magnitude.

integrity monitoring & control

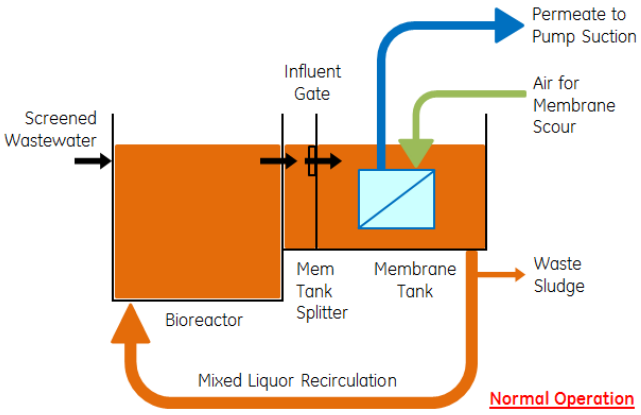
Integrity of each train is monitored with on-line turbidimeters.

permeation

During permeation or normal operation, the membrane system functions as presented in the table and diagram below.

Filtration, or permeation, consists of drawing clean water from the mixed liquor through the membrane fibers via the filtrate pump and discharging into the common header. Water is produced from each train for **a cycle time (10-15 minutes) followed by relaxation (30-60 seconds)**, during which time permeation is stopped but air scouring of the fibers continues. During normal operation, the membrane filtration system is operated with a repeated filtration cycle, which consists of a production period (permeation) followed by a relaxation or backpulse period. **ZeeWeed membrane filtration systems have the unique capability to operate in either relaxation or backpulse mode.** Under normal conditions the system is operated in relaxation mode. During start-up or under conditions of poor sludge filterability, the system can be operated in backpulse mode if required

function	status
permeation	✓
aeration	✓
sludge recirculation	✓
sludge wasting	✓
permeate addition	–
chemical addition	–
tank drain	–

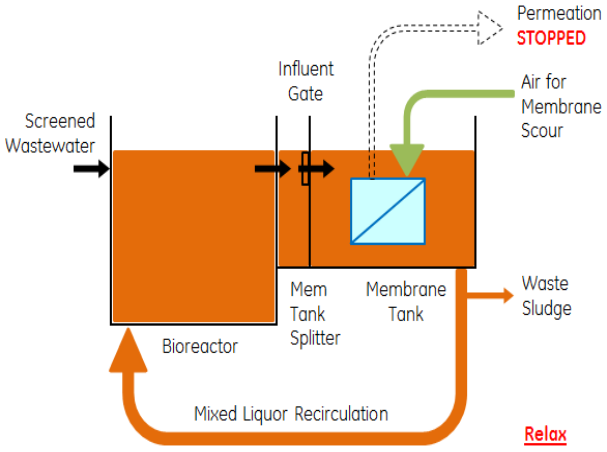


relaxation

In relaxation mode, permeation for each train is stopped, one train at a time, **for a short period (30-60 sec) every 10-15 minutes** to allow air scouring of the membrane without permeation. No chemical or permeate is used during relaxation period. This is the normal operating mode of ZeeWeed MBR systems. Relaxation mode is fully automated.

The relaxation sequence is summarized in the table and depicted in the figure below.

function	status
permeation	–
aeration	✓
sludge recirculation	✓
sludge wasting	✓
permeate addition	–
chemical addition	–
tank drain	–



standby

During periods where filtration is not required from all trains in order to meet capacity requirements, some or all trains remain idle in standby. During this time the standby trains aerate and recirculate for 2 min every 30 min to keep the tank contents mixed and minimize energy consumption.

LEAPmbr aeration

LEAPmbr is a specially designed and highly efficient aeration system used to scour the outside surface of the membranes and move mixed liquor solids away from the membrane fibers. The patented LEAPmbr aeration system uses factory installed LEAPmbr aerators which are integrated into the base of each ZeeWeed 500D cassette and are removed with the cassette for any maintenance (tank drain not required for that).

LEAPmbr aeration devices release large air bubbles which create higher scouring forces along the surface of the membrane fiber and therefore have more effective solid removal capability than smaller bubbles. Because the large mushroom-cap bubbles generated by LEAPmbr aeration devices are so effective, 30% less air is required to achieve the same solids removal performance, as compared with the previous generation of membrane aeration.

With LEAPmbr, aeration to the train is either on (during production) or off (during stand-by). When a train is in operation, air is continuously supplied to the cassette aeration device from the membrane blowers. When sufficient air volume has built up in the aeration device to overcome the static head above it, the air releases through the multi-stage coarse-bubble diffuser built into the bottom of the cassette, underneath membrane modules.

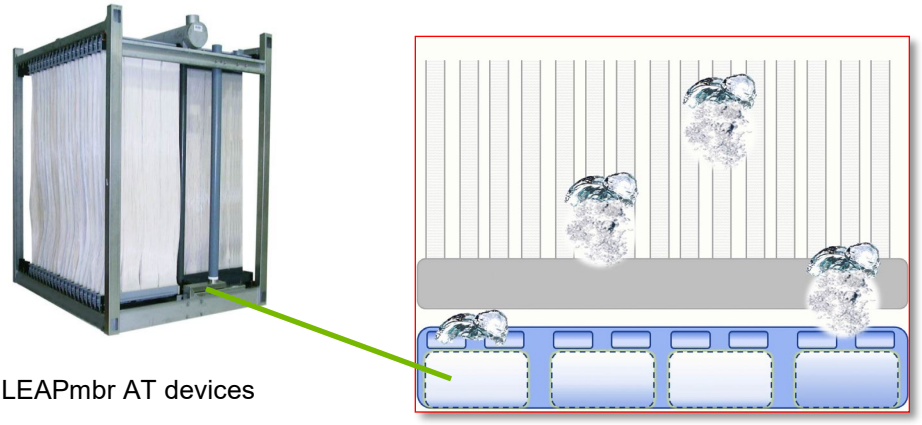


figure 1. LEAPmbr AT devices

3.7 Spare Parts and Special Tools

A list of spare parts and special tools included for year 1 through year 5 is outlined in the table below. The price for these items is provided as a separate line item in the Bid Forms found in Section 2.1.

Membrane System	
	Spare Parts Included (year 1 to 5)
	Permeate Pumps: axial wear plates (casing & cover), mechanical seals, rotor tips, wear plate)
	Compressor: pressure switches, belts, air intake element, piston ring kit, gasket kit, oil filters, food grade oil
	Chemical Cleaning Pumps: wet end assembly

3.8 Field Testing and Operations and Maintenance

3.8.1 Commissioning Services

With over 700 full scale membrane based wastewater and water treatment plants commissioned and in operation, the commissioning group has developed a powerful infrastructure that provides timely support and management of all commissioning activities.

Throughout commissioning, testing and start-up, we will assign an internal field service supervisor that will support the field service representative to ensure rapid response to any on-site issues that may arise.

During the commissioning phase of the project, regular updates will be provided to document site progress. Potential delay issues, site issues and planning for future activities will be highlighted within these reports.

3.8.2 Construction and Commissioning Phase

During the construction phase of the project, communication will occur between SUEZ, the construction contractor, owner, and design engineer in the following ways:

- ❑ our project manager will continue to be the prime contact for all communication and will coordinate all activities to ensure all appropriate team members are available as required. Telephone, e-mail, video conferencing and participation in site meetings will be the prime modes of interaction during this period.
- ❑ our field service representative will come to site to review, with the construction contractor, the installation of the SUEZ supplied equipment

In addition, the contractor will complete “installation checklists” provided by SUEZ to ensure that all equipment has been installed properly for commissioning of the membrane system to begin. Following the initial inspection by SUEZ, the contractor will make any necessary field adjustments to installed equipment to ensure the system complies with the design specifications.

During the later stages of equipment installation, SUEZ will provide the services of a factory trained field service representative. Upon arrival at site, the SUEZ field service representative will advise the general contractor on equipment readiness, confirm that all field installed piping systems and connections to and from the membrane treatment system have been made correctly and will verify that all field installed instrumentation is wired correctly to the PLC system. The field service representative will work closely with the project and process engineers to confirm that all components meet the design specifications.

3.8.3 Summary of Installation, Commissioning and Training Services

SUEZ will provide the owner and contractor with:

- ❑ assistance with SUEZ equipment acceptance
- ❑ supervision of SUEZ membrane installation
- ❑ assistance with commissioning and start-up of the membrane system
- ❑ operator training and
- ❑ assistance with the performance testing of the system

The following is a summary of the onsite technical support services provided by SUEZ for the Town of Johnstown Central WWTP. Services will be provided by trained SUEZ field service representatives or manufacturer's representative.

task	**no. of person days** note 1	**no. of trips**
Equipment acceptance, installation, plant commissioning and start-up assistance including membrane installation assistance and operator training (as per page 4 of 5 MBR System)	7	2
Inspection at 6 month mark (as per page 38 of the RFP)	2	1
Additional equipment inspection (as per page 7 of 8 Valves)	2	1
total	**11 total**	**4**

note 1: No. of person days is based on a not-to-exceed 10-hour workday.

note 2: Additional man-hours will be billed separately from the proposed system capital cost at a rate of $1,750 per day plus living and traveling expenses. Detailed SUEZ service rates are available upon request.

3.8.4 Equipment Acceptance and Installation Visit

A SUEZ representative will visit site to assist the owner and contractor in the following ways:

- ❑ attend the pre-delivery site meeting with the construction contractor
- ❑ identification of all SUEZ supplied equipment

- ensuring all SUEZ supplied equipment has been delivered in good order and that no damage has occurred during delivery
- identification of any discrepancies between the shipping lists and the equipment received
- inspection of all SUEZ supplied equipment
- inspection of equipment by others (providing it is necessary for the correct operation of the SUEZ system)

3.8.5 Plant Commissioning

After the contractor has completed the installation of the membrane filtration system equipment and provided completed installation checklist to SUEZ, but prior to the installation of the membranes, equipment wet testing and start-up of the system, a SUEZ field service representative will again visit the site. This visit is to ensure the installation work has been carried out correctly and has reached a degree of completion adequate to allow installation of the membranes and plant start-up to proceed smoothly and without delays. The items to be completed include:

- inspection of all wiring to SUEZ supplied equipment (I/O checks)
- rotation checks on all SUEZ supplied equipment
- witness flushing of all piping using potable water for SUEZ supplied equipment
- witness correct operation of prescreening equipment
- setup of SUEZ supplied instrumentation; verify ranges and calibration
- stroking SUEZ supplied valves
- verify operation of SUEZ supplied pumps, blowers and air compressors

Upon completion of this work, ZeeWeed membrane installation may commence.

3.8.6 Membrane Installation Assistance

ZeeWeed membranes are installed just prior to wet testing/commissioning and after a field service representative has checked that equipment has been installed correctly.

The SUEZ field service representative will be present during membrane installation to advise and provide direction to the installation contractor on the assembly of the ZeeWeed membrane cassettes and their installation into the membrane tanks. SUEZ has prepared detailed instructions on ZeeWeed membrane installation which will be given to the construction contractor prior to the beginning of this work.

Once the membranes are installed, the SUEZ field service representative will perform tests to ensure membrane quality. The SUEZ system is then ready for wet commissioning.

3.8.7 Start-up Assistance

Following the completion of the equipment installation, the field service representative will assist with the process of starting up the SUEZ system. The field service representative will be onsite for guidance and technical support during the system start-

up. The field service representative will work directly with the project engineer, process engineer and project manager to ensure that a reliable and fully functional system is transferred to the owner.

Once the SUEZ system has been fully commissioned and the control system verified, the process engineer will oversee the process start-up with actual feed wastewater.

The project and process engineer's primary roles during the start-up phase will be to ensure that the system design is correctly represented, and translated from the drawings into the "real world". A key component of this work will be to ensure that control functionality bridges the gap between the desired wastewater process outputs of the system and the need to have a reliable, controllable and user-friendly system.

Commissioning and start-up assistance includes:

- ❑ flushing glycerin solution from the membranes
- ❑ testing the SUEZ system operation on clean water
- ❑ running chemical and cleaning systems
- ❑ tuning SUEZ system operation
- ❑ functional testing of the entire system
- ❑ assistance with the planning for seeding the SUEZ system

Once the plant is operating on wastewater and meets the design treated water quality, the treated water is suitable for discharge. This effectively completes the installation and commissioning of the equipment.

Throughout this process, the project engineer will review functionality with the engineer to ensure the facility meets the design requirements.

3.8.8 operator training

SUEZ has developed numerous operator training courses, each catered to the individual needs of its client. The training included by SUEZ will **empower the staff to operate the membrane system proficiently and confidently.**

Client training packages are developed, maintained, and delivered by the commissioning group.

SUEZ has full-time training experts responsible for training methodologies and curriculum development.

shadowing: During the commissioning and start-up of the system and for membrane installation, SUEZ recommends that an operator representative shadows the field service representative. Shadowing provides superior operator understanding and confidence in all aspects of membrane system operation. Our partner-focused field service representatives will instruct a "shadow" operator over the course of start-up and commissioning.

classroom: SUEZ will conduct classroom training at the facility. It is recommended that this section of training is conducted prior to the completion of commissioning, but after the installation of membranes, so that the information learned is quickly put into practice and reinforced through actual application on the system.

One of our training specialists will deliver the classroom training, covering the theory and practice required to operate a SUEZ system. Group sizes of five (5) to ten (10) are optimal for classroom training, but up to twenty (20) people can be accommodated in one session. Material to be covered includes:

- membrane application theory
- performance monitoring
- membrane cleaning theory
- system controls theory
- the reasoning method of troubleshooting

SUEZ requires that there be a suitable classroom with associated teaching materials such as blackboards, overhead projectors, pens, pencils, writing pads etc. be available for the duration of the course. It is preferred that, where possible, training be carried out at the plant where the equipment supplied is located.

hands-on: Immediately following the classroom training, the training specialist will further train the owner's personnel through hands-on operation of the membrane system. The material to be covered includes:

- use of the computer operator interface
- plant maintenance
- instrumentation and equipment maintenance
- membrane cleaning
- troubleshooting

SUEZ's experience in training shows that groups for hands-on training should be kept to five (5) or less.

learning outcomes

Upon successful completion of this learning program the learner will be able to:

- understand the terminology used in membrane filtration
- understand the primary flows and equipment functions

- navigate the P&IDs (Piping & Instrumentation Drawings) to locate components and understand their function
- navigate the Operating Manual and controls documentation
- use and navigate within the HMI (Human Machine Interface)
- understand the concept of PID controllers, set-points, the mechanism of adjusting set-points and where to find the default listing of standardized set-points within the SUEZ documentation supplied
- understand the primary mechanical components and know the preventive maintenance steps which can improve system reliability
- understand the electrical systems required for continued operation
- develop a basic capability with the reasoning technique of troubleshooting of both electrical and mechanical issues

3.8.9 Reliability Acceptance Testing (RAT)

Following the commissioning of the membrane filtration system, SUEZ will assist the Town of Johnstown's operations team with the performance testing phase to ensure that treated water meets the design quantity and quality. The Town's operations staff will be responsible for the full operation of the treatment system during the performance test.

During the performance test, SUEZ will monitor system performance by collecting data using InSight or the client's SCADA system. 24/7 emergency telephone technical support will be initiated during this time to ensure that round-the-clock support is available.

3.8.10 additional commissioning services

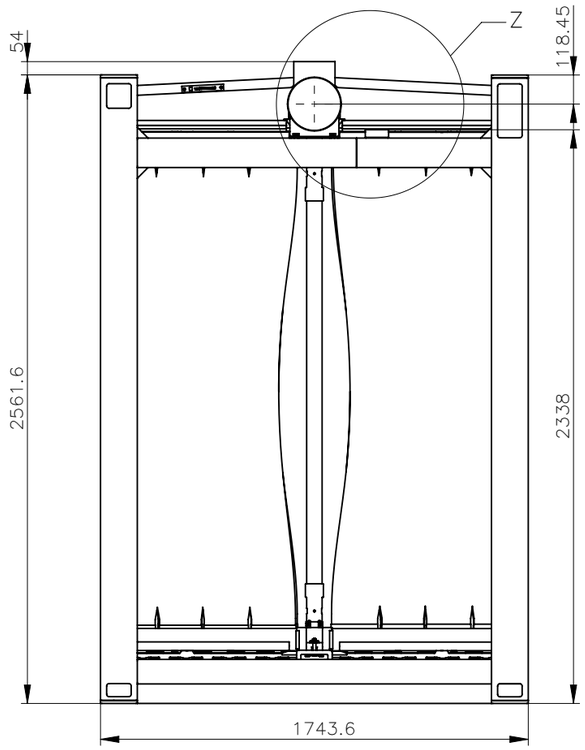
Additional services required, beyond what has been included in the commissioning proposal above, are chargeable at the rates indicated in SUEZ's prevailing field service labor rates sheet. These rates are effective as of January 1st this year, and are subject to adjustment at yearly intervals on December 31st.

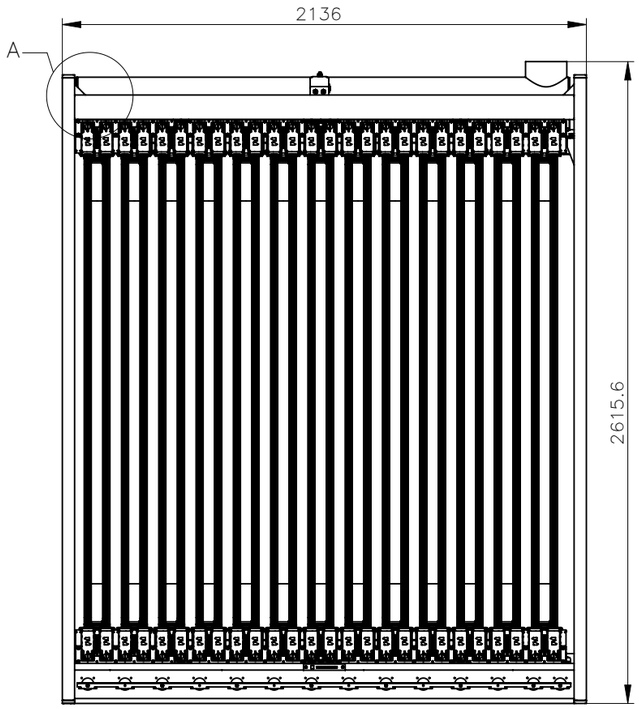
For after market services, please refer to section 4 of this proposal.

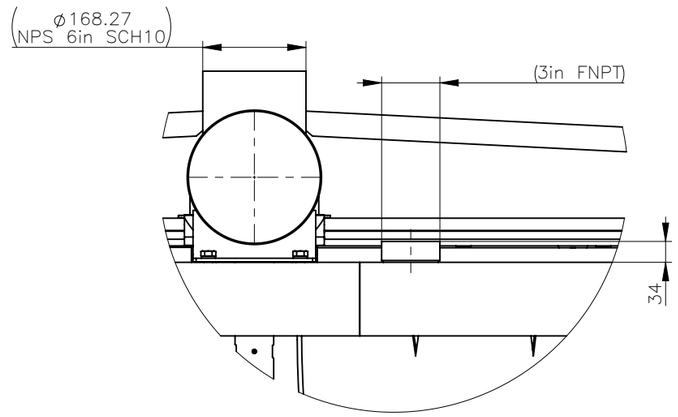
As a company, and as individuals, we strive to meet our corporate values. These values include working as a team to provide our clients with the best possible service and support and **'delivering what we promise'**.

3.9 Additional Information

See attached Information Tables for additional information.







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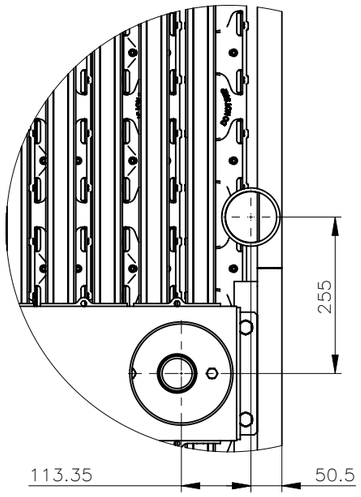

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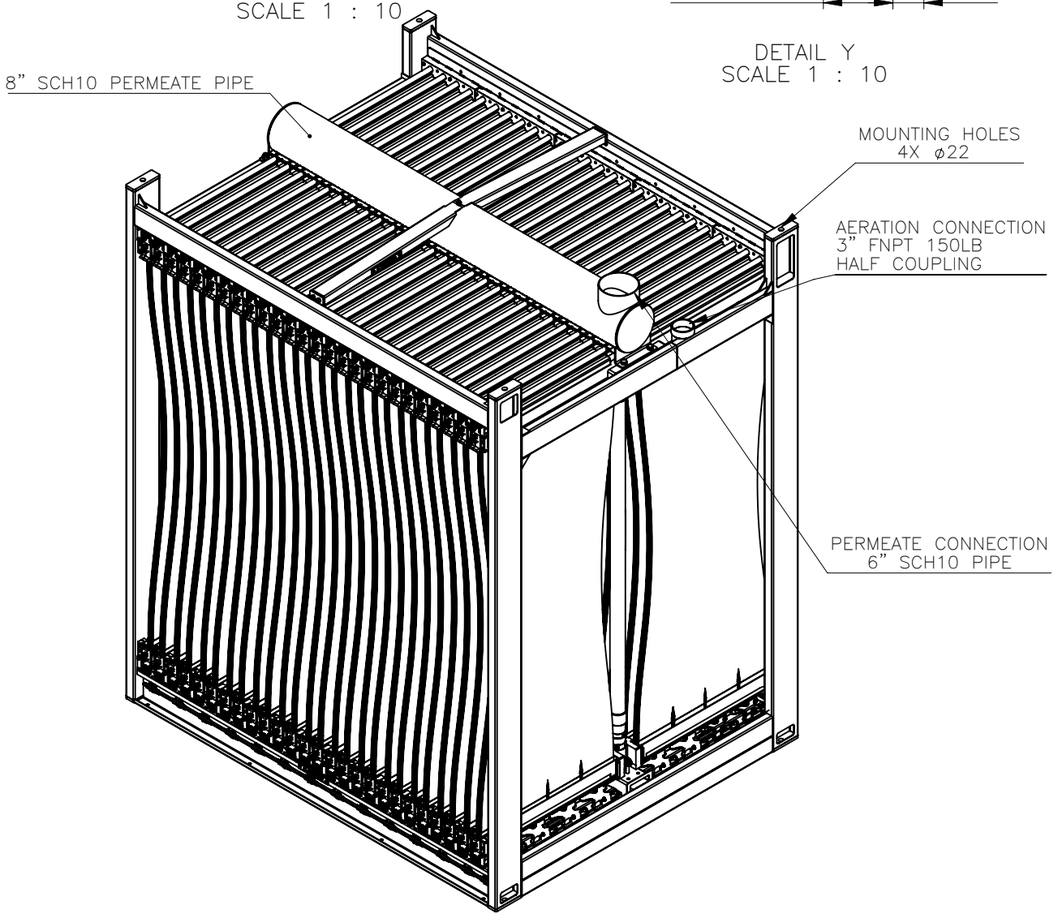

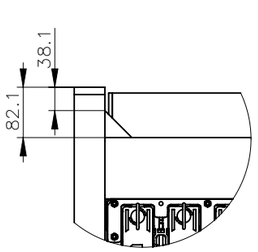

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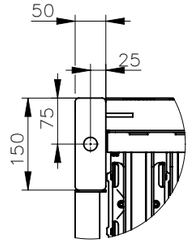

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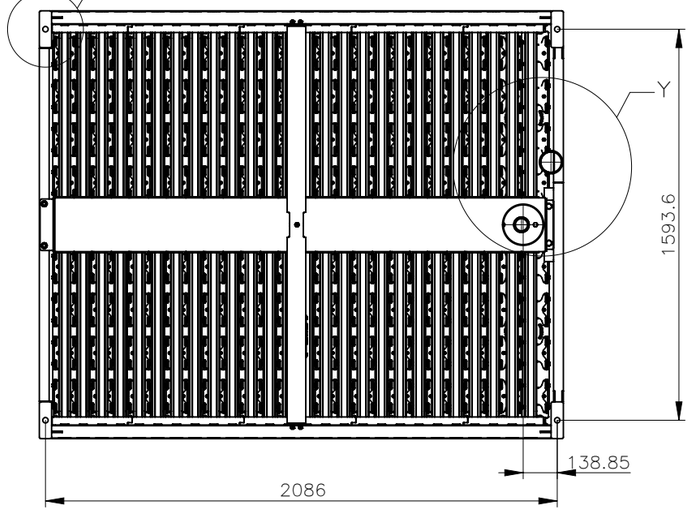

REV.	REVISION DESCRIPTION	ECO	DRWN	CHKD	APVD	DATE (YYMMDD)
1	SHEET FORMAT UPDATED	–	IC	SK	RB	191216

suez Water Technologies & Solutions

GLOBAL HEADQUARTERS: TREVOSE, PA USA +1-215-355-3300 SUEZWATERTECHNOLOGIES.COM

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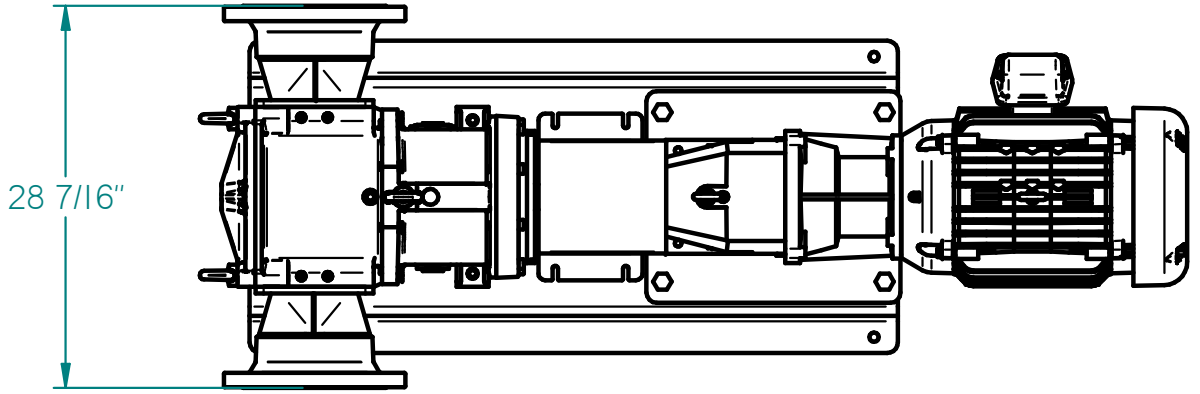
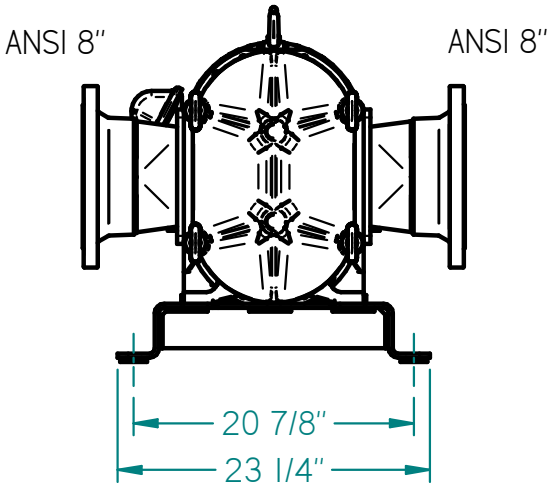
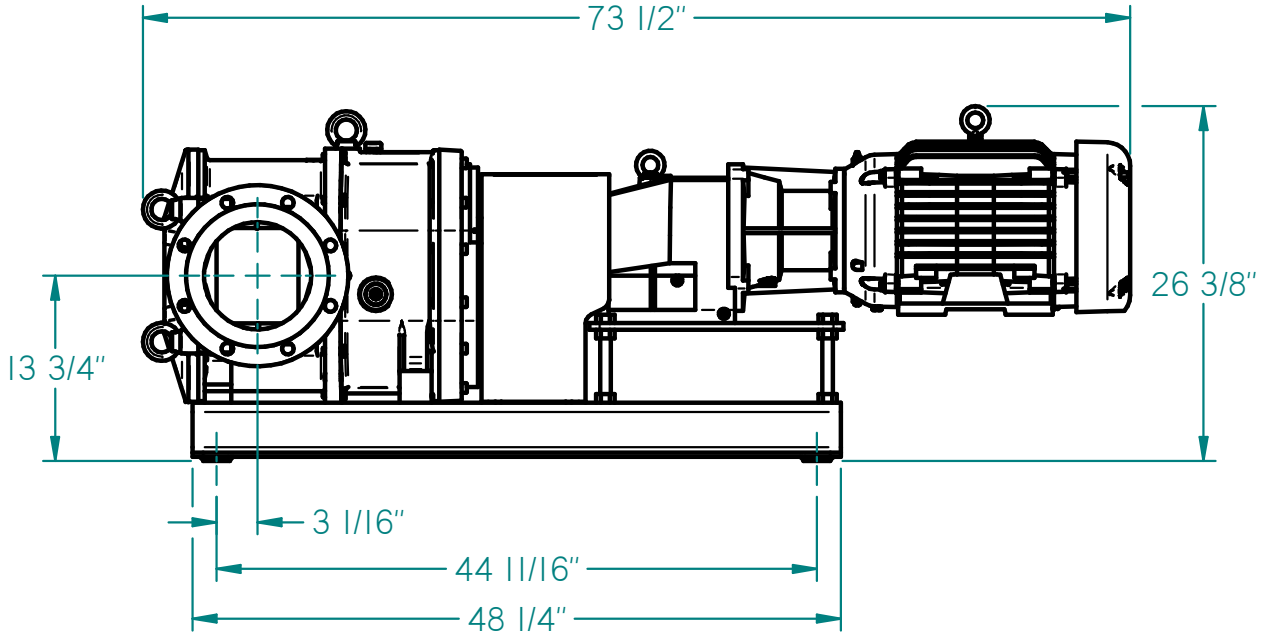
	PROJECTION	APPROVALS	DATE (YYMMDD)
GEOMETRICAL PRODUCT SPECIFICATION ACCORDING TO ISO 1101:2005.		DRWN AK	160301
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED	SCALE 1:25	CHKD SK	160301
GENERAL TOLERANCES ACCORDING TO ISO 2768:1989-mK-E.	SIZE A3	APVD AT	160301
MATERIAL –			
SIZE –		DWG. NO. ZW500D-CS2-52-A-007	REV. R1
STANDARD –	FINISH –	PART NO. –	SHEET 1 of 1

ZW500D
CS2 52M 6IN TAKEOFF LEAP CASSETTE SYSTEM CONNECTIONS







PROPRIETARY AND CONFIDENTIAL
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BOERGER, LLC
2860 Water Tower Place
Chanhassen, MN 55317
TEL: 612-435-7300
FAX: 612-435-7301

THIRD-ANGLE PROJECTION

BÖRGER®

Model: FL 776
Gear: Nord - In-Line SK42-250TC
Power: 20 HP CECP82334T

	NAME	DATE
DRAWN	MLindquist	05/07/20
CHECKED		

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED

TOLERANCES ± 1/2"

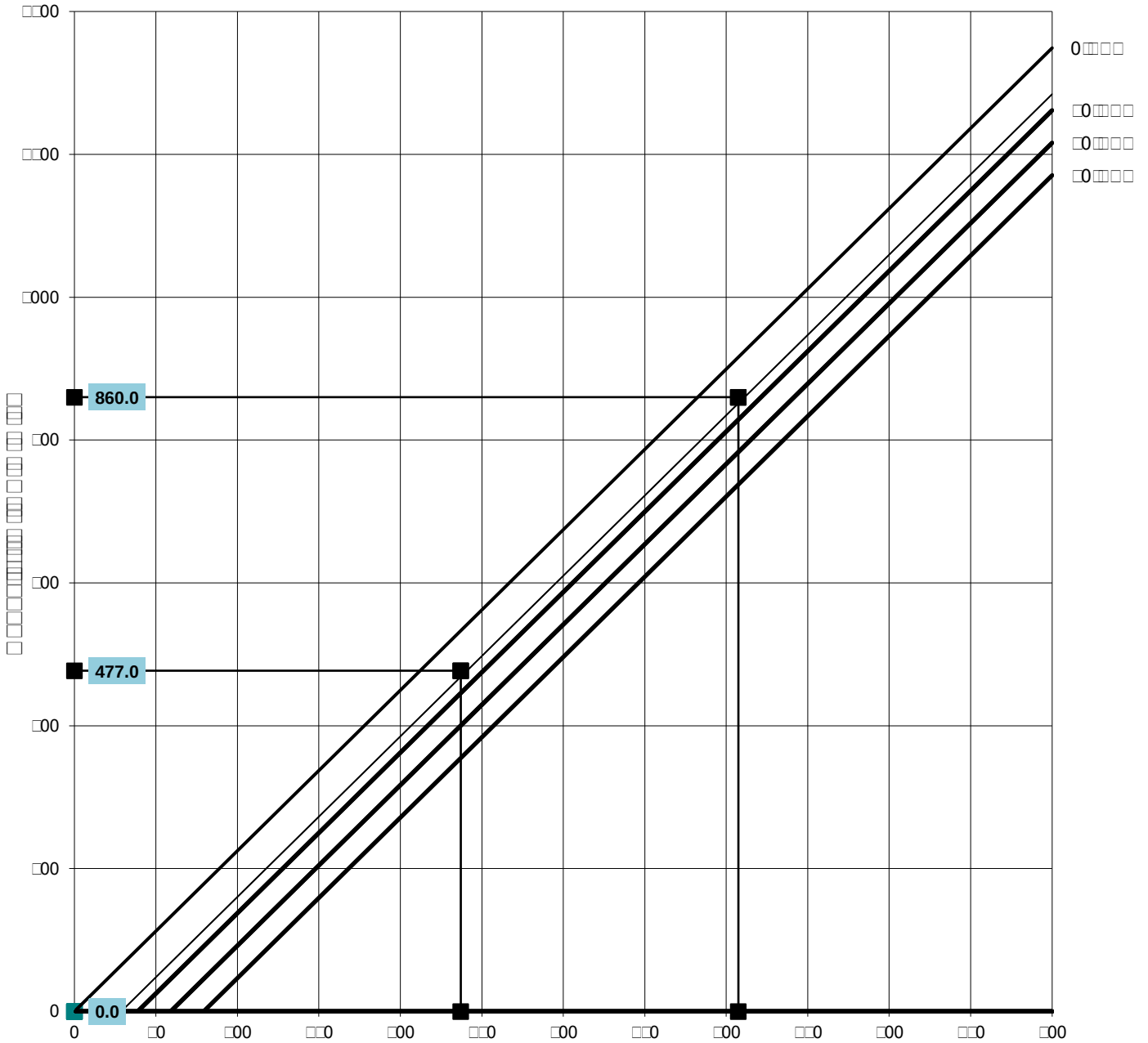
DO NOT SCALE DRAWING

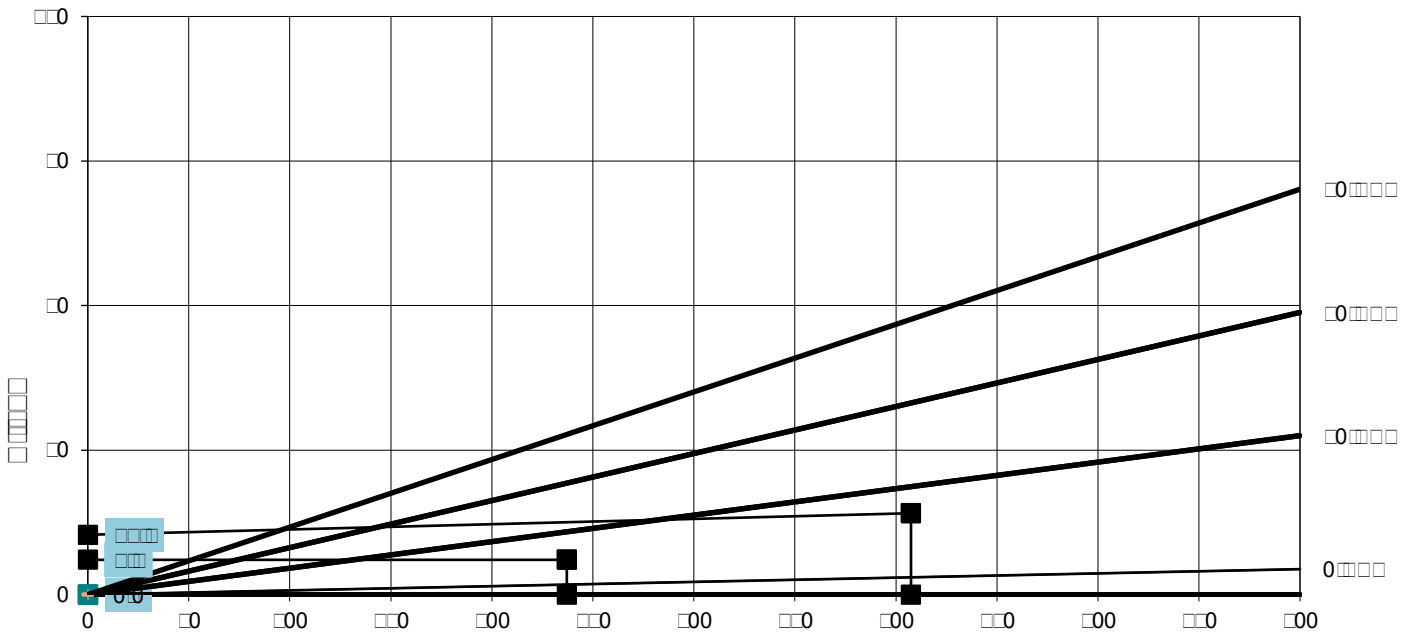
SHEET 1 OF 1

SIZE	DWG. NO.	REV
A	SD-003-977	0

Performance Curve

FL776 Rotor Type G





Kennlinienrechner-JMO-V-2.04

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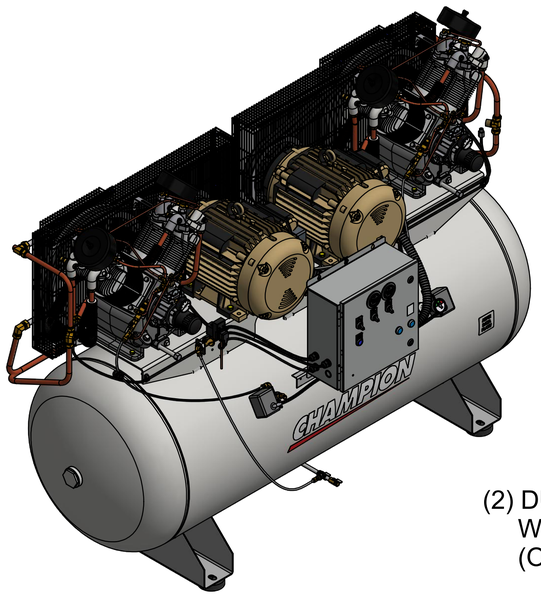
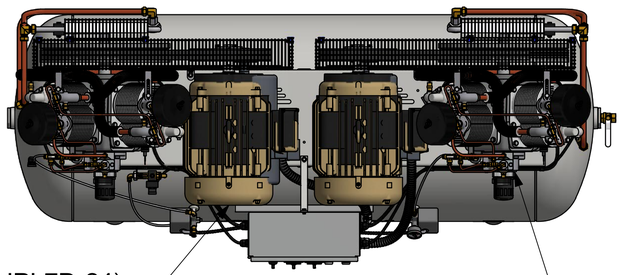
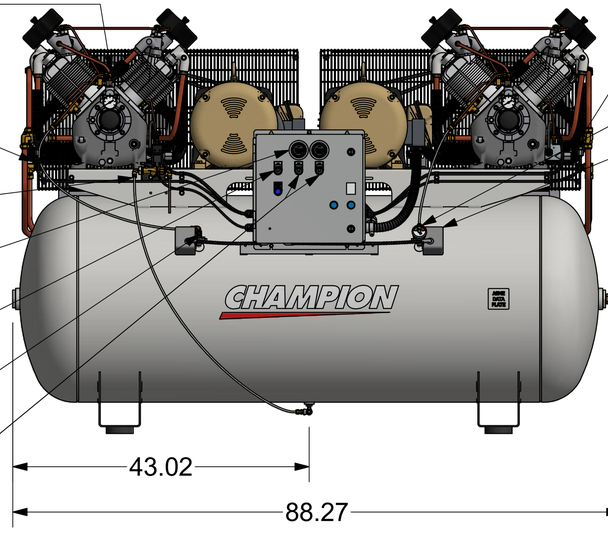




(2) MOTOR: 7.5HP (HPL7D-24)
10HP (HPL10D-24)
15HP (HPL15FD-24)

(2) COMPRESSOR: PL30



(2) DUAL CONTROL PILOT VALVE WITH HEAD UNLOADERS (OPTIONAL)

(2) HIGH TEMPERATURE SWITCH (OPTIONAL)

ELECTRIC TANK DRAIN (OPTIONAL)

(2) HOUR METER (OPTIONAL)

COMP1-AUTO-COMP2 SWITCH (OPTIONAL)

ASME PRESSURE RELIEF VALVE

(2) TEST-OFF-AUTO SWITCH (OPTIONAL)

LOW OIL STOP CONTROL (BEHIND STARTER) (OPTIONAL)

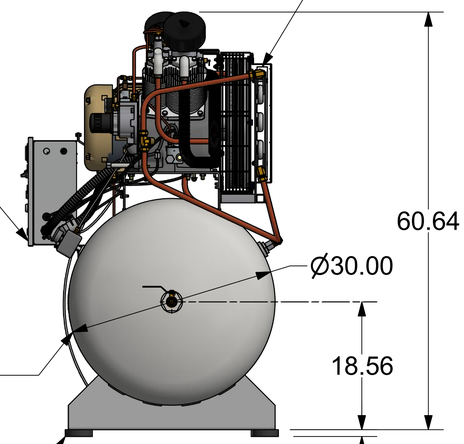
PRESSURE GAUGE

(2) PRESSURE SWITCH

DUPLEX CONTROL PANEL (OPTIONAL)

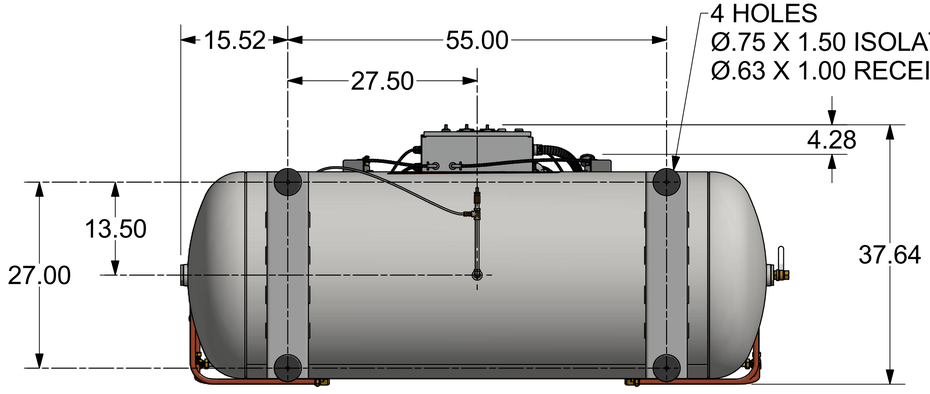
3/4" NPT VALVE

(2) AIR COOLED AFTERCOOLER (OPTIONAL)



240 GALLON ASME AIR RECEIVER

VIBRATION ISOLATORS (OPTIONAL)



NOTES:
1. DO NOT SCALE DRAWING.
2. SPECIFICATIONS AND DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.
3. ALL DIMENSIONS ARE IN INCHES.

FINISH OF CHAMFERS AND FILLETS TO CONFORM TO ROUGHEST ADJACENT AREA.

SURFACE ROUGHNESS MAXIMUM PER ASME B46.1. FULL THREAD DEPTHS ARE MINIMUM.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOL. ON DECIMALS: .X = ± .05
TOL. ON DECIMALS: .XX = ± .02
TOL. ON DECIMALS: .XXX = ± AS SPECIFIED
TOL. ON ANGLES: = ± 0'-30'

THIRD ANGLE PROJECTION

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DIMENSIONING AND TOLERANCING PER ASME Y14.5-2009
THREADS PER ASME B1.1 GAGING SYSTEM 21 U.O.S., ANSI B1.20.1 & B1.20.3

Gardner Denver
Gardner Denver Inc.
Quincy, IL.

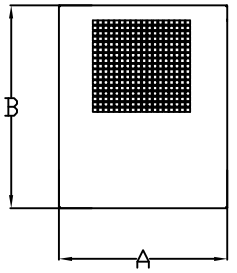
HEAT TREATMENT | ENG. REF:

DESCRIPTION 0804-OUTLINE-UNIT/PKG
OUTLINE-PKG,PL30,240D,DCP

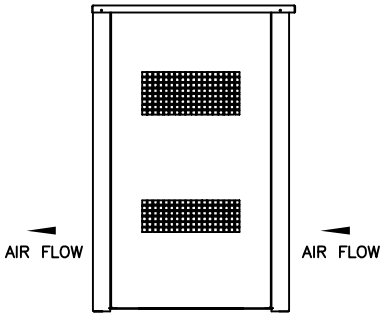
DRAWN BY:		SIZE	ENGR. APPROVAL	DWG.NO.	REV
dxm3115	6/26/2019	D	bxh4877	405CBD800	00
CHECKED BY:		SCALE		SHEET	
kwt0829	8/5/2019			1 OF 1	

A	REF. SUCTION GAUGE
B	DRYER ON–OFF SWITCH

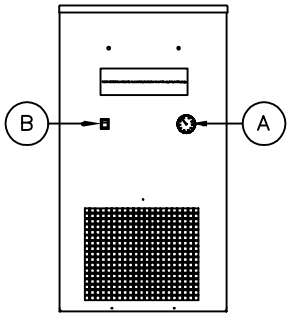
NOTES:
1. ALL DIMENSIONS ARE IN INCHES.



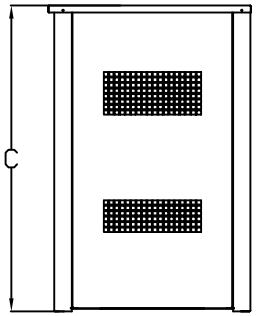
TOP VIEW



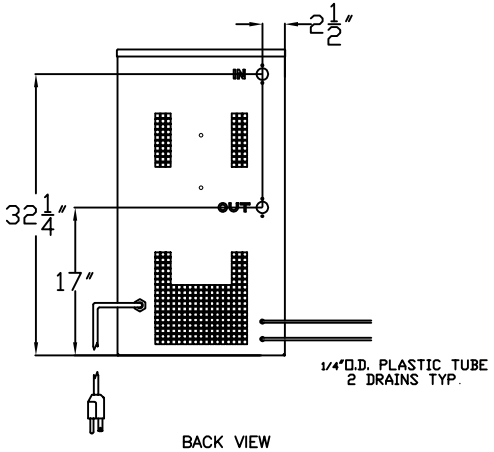
LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW



BACK VIEW

THIS DRAWING IS FOR REFERENCE ONLY.
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MODEL GHRN	Capacity in SCFM @		REFRIG. COMP. H.P.	MAX WORKING PRESS.	WEIGHT (LBS.)	DIMENSIONS IN INCHES			
	100PSIG	120PSIG				A	B	C	IN\OUT CONNECTION
43	43	50	1/3	220PSIG	175	19	23	35	3/4" NPT
67	67	80	1/2	220PSIG	185	19	23	35	3/4" NPT

REV.	DATE	DRN.	CHK'D

Gardner Denver

DRN.	P. Begley	CHK'D	K. Larson
DATE	12/10/12	DATE	12/10/12
SCALE	1"=1"	TOL.	+/– .25"
CAD FILE NO.	Refrig/GHRNMech/GHRN43–67 Standard		

TITLE GHRN 43–67 HIGH INLET TEMP. STANDARD REFRIGERATED AIR DRYER

DRAWING NO. 91692

PROJECT: Standard

Note: Johnstown Central WWTP P&IDs will be updated to reflect any agreed upon changes as the Low Point P&IDs are finalized through final submittal.

Water Technologies & Solutions

TOWN OF JOHNSTOWN CENTRAL WWTP MEMBRANE FILTRATION SYSTEM

PIPING AND INSTRUMENTATION DIAGRAMS

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

CUSTOMER INFORMATION: TOWN OF JOHNSTOWN CENTRAL WWTP

TITLE PAGE

DRAWING NUMBER	REVISION
490084-AA-01	A

REF.: -
DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
490084		NONE	D	1 OF 1

LAST SAVED: Tuesday, February 15, 2022 11:23:44 AM

FILE LOCATION: C:_ADATA\vault\NAM-ITO\490084 - Town of Johnstown Central WWTP\1. PFD and P&ID\490084-AA-01.dwg

CONTROL VALVE ACTUATORS

ACTUATED VALVE OPERATION IS NORMALLY CLOSED UNLESS MARKED OTHERWISE

- PISTON DOUBLE ACTING
- PISTON SPRING TO OPEN
- PISTON SPRING TO CLOSE
- DIAPHRAGM DOUBLE ACTING
- DIAPHRAGM SPRING TO OPEN
- DIAPHRAGM SPRING TO CLOSE
- DIAPHRAGM DOUBLE BALANCING
- BACK PRESSURE CONTROL (EXTERNAL REGULATING)
- BACK PRESSURE CONTROL (INTERNAL REGULATING)
- PRESSURE REDUCING (EXTERNAL REGULATING)
- PRESSURE REDUCING (INTERNAL REGULATING)
- ROTARY MOTOR ANALOG
- ROTARY MOTOR DIGITAL
- I/P CONVERTER
- POSITIONER
- TRAVEL STOP
- GEAR — MANUAL GEAR WHEEL
- CHAIN — MANUAL CHAIN WHEEL
- SOLENOID
- SOLENOID 3 WAY
- SOLENOID 4 WAY

VALVE SYMBOLS

OPEN DURING NORMAL PROCESS OPERATION — CLOSED DURING NORMAL PROCESS OPERATION

- GATE (OR GENERIC)
- BALL
- BUTTERFLY
- NEEDLE
- GLOBE
- DIAPHRAGM
- ANGLE
- PLUG
- PINCH
- V–BALL
- KNIFE GATE (K)
- UPWARD OPENING SLIDING GATE
- DOWNWARD OPENING SLIDING GATE
- MANUAL BLAST GATE
- BACKFLOW PREVENTER
- CHECK
- INJECTION QUILL
- FOOT
- FLOAT
- MUD
- 3 WAY
- 4 WAY
- 5 WAY
- 6 WAY
- 2 VALVE MANIFOLD
- 3 VALVE MANIFOLD
- 5 VALVE MANIFOLD
- SAMPLE

RELIEF

- PRESSURE SAFETY
- VACUUM SAFETY
- MULTIFUNCTION
- PRESSURE RUPTURE DISK
- VACUUM RUPTURE DISK
- AIR RELEASE
- VACUUM BREAKER
- VENT — VENT
- GROUND
- DRAIN — DRAIN

PUMPS, BLOWERS, & COMPRESSORS

- CENTRIFUGAL PUMP
- CENTRIFUGAL/ REGENERATIVE BLOWER
- PROPELLER PUMP
- ROTARY LOBE COMPRESSOR BLOWER
- METERING PUMP
- AIR OPERATED DOUBLE DIAPHRAGM PUMP
- VACUUM PUMP (DRY)
- POSITIVE DISPLACEMENT PUMP
- VACUUM PUMP LIQUID RING
- VERTICAL TURBINE PUMP
- AIR COMPRESSOR PISTON
- CAN PUMP
- AIR COMPRESSOR ROTARY SCREW
- WELL PUMP
- REFRIGERATED AIR DRYER
- DRUM PUMP
- FAN
- SUBMERSIBLE SUMP PUMP
- ERI PRESSURE EXCHANGER (HP / LP)
- HYDRAULIC PRESSURE BOOSTER (HP / LP)
- MOTOR

FLOW ELEMENT

- PADDLE WHEEL
- ANNUBAR
- FLOW NOZZLE
- FLUME
- MAGNETIC
- PITOT
- SONIC/ ULTRASONIC
- TURBINE
- VENTURI TUBE
- VORTEX
- MASS FLOW/ CORIOLIS
- ROTAMETER
- IN–LINE FLOW GLASS
- FLOW STRAIGHTENER
- FIXED ORIFICE
- ADJUSTABLE ORIFICE
- RESTRICTED ORIFICE
- RESTRICTED ORIFICE ANGLE
- ORIFICE PLATE QUICK–CHANGE

CONNECTIONS

- FLANGE
- FLANGE BLIND
- MECHANICAL COUPLING OR VICTAULIC
- MECHANICAL COUPLING OR VICTAULIC PLUG
- SANITARY
- SANITARY PLUG
- THREADED
- THREADED PLUG
- SOCKET
- UNION
- CAMLOCK
- CAMLOCK PLUG
- HOSE BARB
- WELDED PIPE CAP
- PLAIN END PIPE COUPLING
- REDUCER
- COMPRESSION FITTING
- COMPRESSION FITTING PLUG
- SPECTACLE BLIND OPEN
- SPECTACLE BLIND CLOSED

HEATING

- TANK HEATER
- HEAT EXCHANGER
- IN–LINE HEATER
- PLATE & FRAME HEAT EXCHANGER
- DESUPERHEATER

FILTERS

- FIXED SCREEN
- TOP HAT STRAINER
- BAR SCREEN
- HEPA FILTER
- Y STRAINER
- CONICAL STRAINER
- FILTER (F)
- PUMP SCREEN
- STEAM TRAP (ST)
- RESIN TRAP (R/T)

RO/UF

- FOUR PORT HOUSING
- TWO PORT HOUSING
- END PORT HOUSING
- MEMBRANE MODULE

VESSELS/TRIM

- CONICAL BOTTOM TANK
- TANK (CLOSED TOP)
- TANK (OPEN TOP)
- DOMED TANK
- PRESSURE VESSEL HORIZONTAL/ VERTICAL OR RECEIVER
- PROPELLER AGITATOR (M)
- VORTEX BREAKER (VB)
- VESSEL INSULATION
- LEVEL GLASS
- ELLIPTICAL MANWAY
- MANHOLE
- MANHOLE W/ DAVIT ARM
- VESSEL SIGHT GLASS
- WATER LEVEL
- LADDER/ PLATFORM

MISCELLANEOUS

- MUFFLER
- EDUCTOR
- STATIC MIXER
- EXPANSION JOINT
- SILENCER
- VIBRATION ISOLATOR
- HIGH PRESSURE FLEXIBLE CONNECTOR
- INJECTION SPARGER
- DIAPHRAGM SEAL/ GAUGE GUARD
- PULSATION DAMPENER
- SPRAYER NOZZLE
- DESICCANT AIR DRYER
- HYDROMETER POT
- COARSE BUBBLE DIFFUSER ELEVATION VIEW
- FINE BUBBLE DIFFUSER ELEVATION VIEW
- THERMOWELL
- TOP MOUNT LEVEL SWITCH
- ULTRASONIC LEVEL
- CALIBRATION COLUMN
- XXX / XXX — PIG TAIL
- ION EXCHANGE BOTTLE

SCOPE BREAK

- CLIENT/OTHER / SUEZ
- MATERIAL BREAK — MATERIAL A / MATERIAL B
- PIPE INSULATION/ DOUBLE CONTAINMENT
- PP 2" ("PP" INDICATES PERSONNEL PROTECTION –OPTIONAL)

LINE TYPES

- PRIMARY PROCESS
- SECONDARY PROCESS
- SAMPLE/DRAINS/ VENTS/ETC
- PRIMARY PROCESS (BY OTHERS)
- SECONDARY PROCESS (BY OTHERS)
- FUTURE
- EQUIPMENT LIMIT OR BOUNDARY LINE
- EQUIPMENT
- EQUIPMENT (BY OTHERS)
- FLEX HOSE/TUBING
- SOFTWARE–LINK
- ELECTRICAL
- ELECTROMAGNETIC OR SONIC SIGNAL (WIRELESS)
- PNEUMATIC
- HYDRAULIC SIGNAL
- CAPILLARY TUBING
- HEAT–TRACING
- STEAM–TRACE
- ELECTRICAL–TRACE

MISCELLANEOUS LINE OBJECTS

- SLOPE
- CONTINUATION SYMBOL
- CONTINUATION SYMBOL
- CROSSOVER LINE
- REVISION CLOUD
- REVISION TRIANGLE (A)

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

TOLERANCES UNLESS NOTED
DECIMALS: .X, .XX, .XXX — ANGLES — FRAC

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CUSTOMER INFORMATION: TOWN OF JOHNSTOWN CENTRAL WWTP

LEGEND SHEET

DRAWING NUMBER: 490084-AA-02 — REVISION: A

REF.: - — DOC. OWNER:

PROJECT NO.: 490084 — PART/MATERIAL NO.: — SCALE: NONE — SIZE: D — SHEET: 1 OF 2

LAST SAVED: Tuesday, February 15, 2022 11:21:02 AM

FILE LOCATION: C:_ADSKVault NAM-ITO-KP0084 - Town of Johnstown Central WWTP\1. PFD and P&ID\KP0084-AA-02.dwg

INSTRUMENT FUNCTIONS

FIRST LETTER	SUCCEEDING LETTER / MEASURED OR INITIATING VARIABLE	A						C		E	G	I	K	L	Q	R	S					T		Y	V,Z			SPECIAL IDENTIFICATION	
		ALARM	HIGH- HIGH ALARM	HIGH ALARM	LOW ALARM	LOW-LOW ALARM	SENSOR FAULT ALARM	BLIND CONTROLLER	INDICATING CONTROLLER	SENSOR (PRIMARY ELEMENT)	GLASS	INDICATOR	CONTROL STATION	PILOT LIGHT	TOTALIZER	RECORD	SWITCH	HIGH-HIGH SWITCH	HIGH SWITCH	LOW SWITCH	LOW-LOW SWITCH	BLIND TRANSMITTER	INDICATING TRANSMITTER	SOLENOID VALVE (PILOT), RELAY, COMPUTATION, CONVERTER	CONTROL VALVE	VALVE	FINAL CONTROL ELEMENT	SYMBOL	DESCRIPTION
A	ANALYSIS	AA	AAHH	AAH	AAL	AALL	AAT	AC	AIC	AE		AI		AL		AR	AS	ASHH	ASH	ASL	ASLL	AT	AIT	AY	ACV	AV	AZ		
B	BURNER, COMBUSTION																												
C	USER'S CHOICE																												
D	USER'S CHOICE																												
E	VOLTAGE	EA	EAHH	EAH	EAL	EALL	EAT	EC	EIC	EE		EI	EK	EL		ER	ES	ESHH	ESH	ESL	ESLL	ET	EIT	EY			EZ		
F	FLOW	FA	FAHH	FAH	FAL	FALL	FAT	FC	FIC	FE	FG	FI		FL	FQI	FR	FS	FSHH	FSH	FSL	FSLL	FT	FIT	FY	FCV	FV		FO	ORIFICE PLATE
FF	FLOW RATIO	FFA	FFAHH	FFAH	FFAL	FFALL		FFC	FFIC			FFI				FFR	FFS	FFSHH	FFSH	FFSL	FFSLL			FFY	FFCV				
G	USER'S CHOICE																												
H	HAND	HA						HC	HIC					HL			HS								HCV	HV		HMS	PUSHBUTTON SWITCH
I	CURRENT (ELECTRICAL)	IA	IAHH	IAH	IAL	IALL	IAT	IC	IIC	IE		II	IK	IL		IR	IS	ISHH	ISH	ISL	ISLL	IT	IIT	IY			IZ		
J	POWER	JA	JSHH	JAH	JAL	JALL	JAT	JC	JIC	JE		JI	JK	JL	JQI	JR	JS	JSHH	JSH	JSL	JSLL	JT	LIT	JY			JZ		
K	TIME SCHEDULE	KA										KI		KL			KS							KY					
KQ	TIME TOTAL	KQA	KQAHH	KQAH	KQAL	KQALL						KQI		KQL		KQR	KQS	KQSHH	KQSH	KQSL	KQSLL								
L	LEVEL	LA	LAHH	LAH	LAL	LALL	LAT	LC	LIC	LE	LG	LI		LL		LR	LS	LSHH	LSH	LSL	LSLL	LT	LIT	LY	LCV	LV		LKx	LEVEL RATE-OF-CHANGE
M	MOTOR CONTROL												MK				MS												
N	USER'S CHOICE																												
O	USER'S CHOICE																												
P	PRESSURE OR VACUUM	PA	PAHH	PAH	PAL	PALL	PAT	PC	PIC			PI		PL		PR	PS	PSHH	PSH	PSL	PSLL	PT	PIT	PIT	PY	PV		PSV	PRESSURE SAFETY VALVE
PD	PRESSURE DIFFERENTIAL	PDA	PDAHH	PDAH	PDAL	PDALL	PDAT	PDC	PDIC			PDI		PDL		PDR	PDS	PDSHH	PDSH	PDSL	PDSLL	PDT	PDIT	PDY	PDCV				
Q	QUANTITY														QQI														
R	RADIATION																												
S	SPEED OR FREQUENCY	SA	SAHH	SAH	SAL	SALL	SAT	SC	SIC	SE		SI	SK	SL		SR	SS	SSHH	SSH	SSL	SSLL	ST	SIT	SY	SCV		SZ		
T	TEMPERATURE	TA	TAHH	TAH	TAL	TALL	TAT	TC	TIC	TE		TI		TL		TR	TS	TSHH	TSH	TSL	TSLL	TT	TIT	TY	TCV	TV	TZ	TW	THERMOWELL
U	MULTI-VARIABLE																					UT	UIT						
V	VIBRATION OR MECH. ANALYSIS	VA	VAHH	VAH			VAT			VE		VI		VL		VR	VS	VSHH	VSH			VT	VIT	VY					
W	WEIGHT OR FORCE	WA	WAHH	WAH	WAL	WALL	WAT	WC	WIC	WE		WI		WL	WQI	WR	WS	WSHH	WSH	WSL	WSLL	WT	WIT	WY	WCV	WV	WZ		
X	UNCLASSIFIED																												
Y	EVENT, STATE OR PRESENCE	YA										YI	YK	YL		YR	YS							YY					
Z	POSITION OR DIMENSION	ZA	ZAO=OPEN		ZAC=CLOSE		ZAT	ZC	ZIC	ZE	ZG	ZI	ZK	ZL		ZR	ZS	ZSO=OPEN		ZSC=CLOSE		ZT	ZIT	ZY	ZCV	ZV	ZZ	ZKx	POSITION RATE-OF-CHANGE

INSTRUMENT SYMBOLS

PANEL MOUNT INSTRUMENT

FIELD MOUNT OR PRIMARY INSTRUMENT

BEHIND PANEL INSTRUMENT

PILOT LIGHT

PLC FUNCTION WITH DISPLAY

PLC FUNCTION, BLIND

PLC INPUT/OUTPUT

DI _ DISCRETE INPUT
DO _ DISCRETE OUTPUT
AI _ ANALOG INPUT
AO _ ANALOG OUTPUT

FUNCTIONS

I — UNDEFINED INTERLOCK LOGIC

Σ — SUMMING

CONTINUATION ARROWS

SERVICE
A | SHEET X
FLOW:
PRESSURE:
TEMP:

FLOW-SINGLE DIRECTION

SERVICE
A | SHEET X
FLOW:
PRESSURE:
TEMP:

FLOW-BOTH DIRECTIONS

A
TRANSFER ARROW TO SAME SHEET

1 | PID NUMBER SHEET X
ELECTRICAL TRANSFER ARROW TO DIFFERENT PID DOCUMENT

1
ELECTRICAL TRANSFER ARROW TO SAME PID DOCUMENT

EQUIPMENT / INSTRUMENT TAGGING SCHEME

11-XXX-222A-3

- IDENTICAL SKID/TRAIN IDENTIFIER (IF NECESSARY)
- MULTIPLE INSTRUMENT IDENTIFIER (IF NECESSARY)
- EQUIPMENT NUMBER/ INSTRUMENT LOOP NUMBER
- EQUIPMENT ABBREVIATION/ INSTRUMENT FUNCTION
- PROCESS AREA

LINE IDENTIFIER

X"-XXPPPA-SNN

- LINE CLASS SPECIFICATION
- SCHEDULE (OPTIONAL)
- SERVICE DIFFERNTIATOR (OPTIONAL)
- PR CODE (OPTIONAL)
- MATERIAL CODE
- PIPE SIZE

MATERIAL CODE	MATERIAL
CC	CONCRETE
	METALLIC
AUST	AUSTENITIC STAINLESS STEEL
AY	ALLOY 20
CI	CAST IRON
CS	CARBON STEEL
CU	COPPER
DI	DUCTILE IRON
DL	PVDF LINED
DUPL	DUPLEX STAINLESS STEEL
HC	HASTELLOY C
PL	POLYPROPYLENE LINED
SA	304, 304L STAINLESS STEEL
SB	AL-6XN
SC	254-SMO
SD	2205
SE	2507
SF	904L
SG	ZERON 100
SS	316, 316L STAINLESS STEEL
SUAU	SUPER AUSTENITIC STAINLESS STEEL
TL	PTFE LINED
	PLASTIC
CP	CPVC
FR	FIBER REINFORCED PLASTIC
PE	POLYETHYLENE
PP	POLYPROPYLENE
PV	PVC
PD	PVDF
PT	PTFE

PR CODE	CLASS
	METALLIC
125	ANSI CLASS 125
150	ANSI CLASS 150
300	ANSI CLASS 300
400	ANSI CLASS 400
600	ANSI CLASS 600
900	ANSI CLASS 900
	PLASTIC
040	SCHEDULE 40
080	SCHEDULE 80
120	SCHEDULE 120
D64	SDR 64
D41	SDR 41
D32	SDR 32.5
D26	SDR 26
D21	SDR 21
D17	SDR 17
D13	SDR 13.5
	MULTIPLE
P06	PN6
P10	PN10
P16	PN16
P20	PN20
P50	PN50
P68	PN68
P100	PN100
A00	ATMOSPHERIC
V00	VACUUM

EQUIPMENT ABBREVIATIONS

AB	ABSORBER
AC	AIR COMPRESSOR
ACF	ACTIVATED CARBON FILTER
AER	AERATOR
ARV	AIR RELEASE VALVE
B	BLOWER
BF	BAG FILTER
C	CENTRIFUGE, CYCLONE
CD	CONDENSER
CDM	CATALYTIC DESTRUCT MODULE
CF	CARTRIDGE FILTER
CH	CHILLER
CHL	CHLORINATOR
CIP	CLEAN-IN-PLACE
CL	CLARIFIER
CONV	CONVEYOR
CORS	CATALYTIC OXYGEN REMOVAL SYSTEM
CP	CONTROL PANEL
CR	CRYSTALIZER
CS	CHEMICAL SYSTEM
CT	COOLING TOWER, CARBON TOWER
CV	CHECK VALVE
DAF	DISSOLVED AIR FLOATATION
DO	DISSOLVED OXYGEN
DMF	DUAL MEDIA FILTER
DR	AIR DRIER
E	EDUCTOR
EAF	ENTRAPPED AIR FLOATATION
ED	ELECTRODIALYSIS
EDI	ELECTRODEIONIZATION
EDR	ELECTRODIALYSIS REVERSAL
EV	EVAPORATOR
F	FILTER
FAN	FAN
F.C.	FAIL CLOSE
FDA	FORCED DRAFT AERATOR, DEGASIFIER
F.O.	FAIL OPEN
F.L.	FAIL LAST
FP	FILTER PRESS
GF	GRAVITY FILTER
H	HEATER
HF	HEPA FILTER
HMI	HUMAN-MACHINE INTERFACE
HOA	HAND-OFF-AUTO
HPB	HYDRAULIC PRESSURE BOOSTER
HX	HEAT EXCHANGER
IAS	INSTRUMENT AIR SUPPLY
IQ	INJECTION QUILL, INJECTION CHECK VALVE
IX	ION EXCHANGER
LS	LIME SOFTENER
M	MOTOR
MBR	MEMBRANE BIOREACTOR
MCC	MOTOR CONTROL CENTER
MD	MEMBRANE DEGASIFIER
MF	MICROFILTRATION
ML	MUFFLER, SILENCER
MMF	MULTIMEDIA FILTER
MX	MIXER
NF	NANOFILTRATION
N.O.	NORMALLY OPEN
OC	OXYGEN CONCENTRATOR
ORP	OXYGEN-REDUCTION POTENTIAL
OZ	OZONATOR
OZG	OZONE GENERATOR
P	PUMP
PD	PULSATION DAMPENER
PLC	PROGRAMMABLE LOGIC CONTROLLER
PSE	RUPTURE DISC
PUV	MULTIFUNCTION VALVE
PX	PRESSURE EXCHANGER
RO	REVERSE OSMOSIS
RP	ROTARY PRESS
RT	RESIN TRAP
SC	SCRUBBER
SCP	SCRAPER
SCR	SCREEN
SFT	SOFTENER
SKM	SKIMMER
SM	STATIC MIXER, INLINE MIXER
ST	STEAM TRAP
STK	MEMBRANE STACK (ED, EDR, EDI, E-CELL)
STR	STRAINER
SV	SAMPLE VALVE
TK	TANK
TOC	TOTAL ORGANIC CARBON
TRB	TURBINE
UF	ULTRAFILTRATION
UPS	UNINTERRUPTIBLE POWER SUPPLY
UV	ULTRAVIOLET IRRADIATOR
VB	VACUUM BREAKER
VD	VACUUM DEGASIFIER
VFD	VARIABLE FREQUENCY DRIVE

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

suez

CUSTOMER INFORMATION
TOWN OF JOHNSTOWN CENTRAL WWTP

LEGEND SHEET

DRAWING NUMBER: 490084-AA-02 — REVISION: A
REF.: - — DOC. OWNER:
PROJECT NO.: 490084 — PART/MATERIAL NO.: — SCALE: NONE — SIZE: D — SHEET: 2 OF 2

LAST SAVED: Tuesday, February 15, 2022 11:21:02 AM

FILE LOCATION: C:_ADSKVault\NAM-ITO\490084 - Town of Johnstown Central WWTP\1. PFD and P&ID\490084-AA-02.dwg

BLOWER PACKAGE AND PIPING SYSTEM ARE DESIGNED AND SUPPLIED BY OTHERS

AIR FOR MEMBRANE AERATION TO 20-TK-201-1/2/3/4

490084-AP-04

Membrae blowers Info

General Blower Info	As Installed
No of Duty Blowers	4
No of Standby Blowers	1
Total No of Blowers	
Tag Numbers	20-B-201-A/B/C/D/E
Type of Blower	Positive Displacement
Speed Control	Required

Blower Design Contions	As Installed	Build Out
Rated Capacity (unsheaved)		
Designed air flow per train	849 Icfm at 5.5 psig	898 icfm at 4.5 psig
Designed air flow per plant	3308 Icfm	3504 Icfm
Max. Design Capacity per blower	TBD Icfm @ 4.5 to 6.6 psig	TBD Icfm @ 4.5 to 6.6 psig
Min. Design Capacity per blower	TBD Icfm @ 4.5 to 6.6 psig	TBD Icfm @ 4.5 to 6.6 psig

NOTES:

1. ALL DOTTED-LINE EQUIPMENT TO BE SUPPLIED BY OTHERS. ----------
   VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. THE ACTUAL BLOWER DISCHARGE PRESSURE IS DETERMINED BASED ON MAXIMUM POSSIBLE LIQUID LEVEL IN TANKS BEING AERATED.
3. SYSTEM INTEGRATOR IS RESPONSIBLE FOR HOT AIR PIPE THERMO-INSULATION AS APPLICABLE.
4. ALL EQUIPMENT ON THIS PAGE IS SUPPLIED BY OTHERS.
5. REFER TO OTHERS ON BLOWER SCOPE.
6. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
7. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

CUSTOMER INFORMATION

TOWN OF JOHNSTOWN
CENTRAL WWTP

P&ID

MEMBRANE BLOWERS

POSITIVE DISPLACEMENT TYPE

DRAWING NUMBER	REVISION
490084-AP-02A	A
REF.: -	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
490084		NONE	D	1 OF 1

LAST SAVED: Wednesday, February 16, 2022 7:55:29 PM

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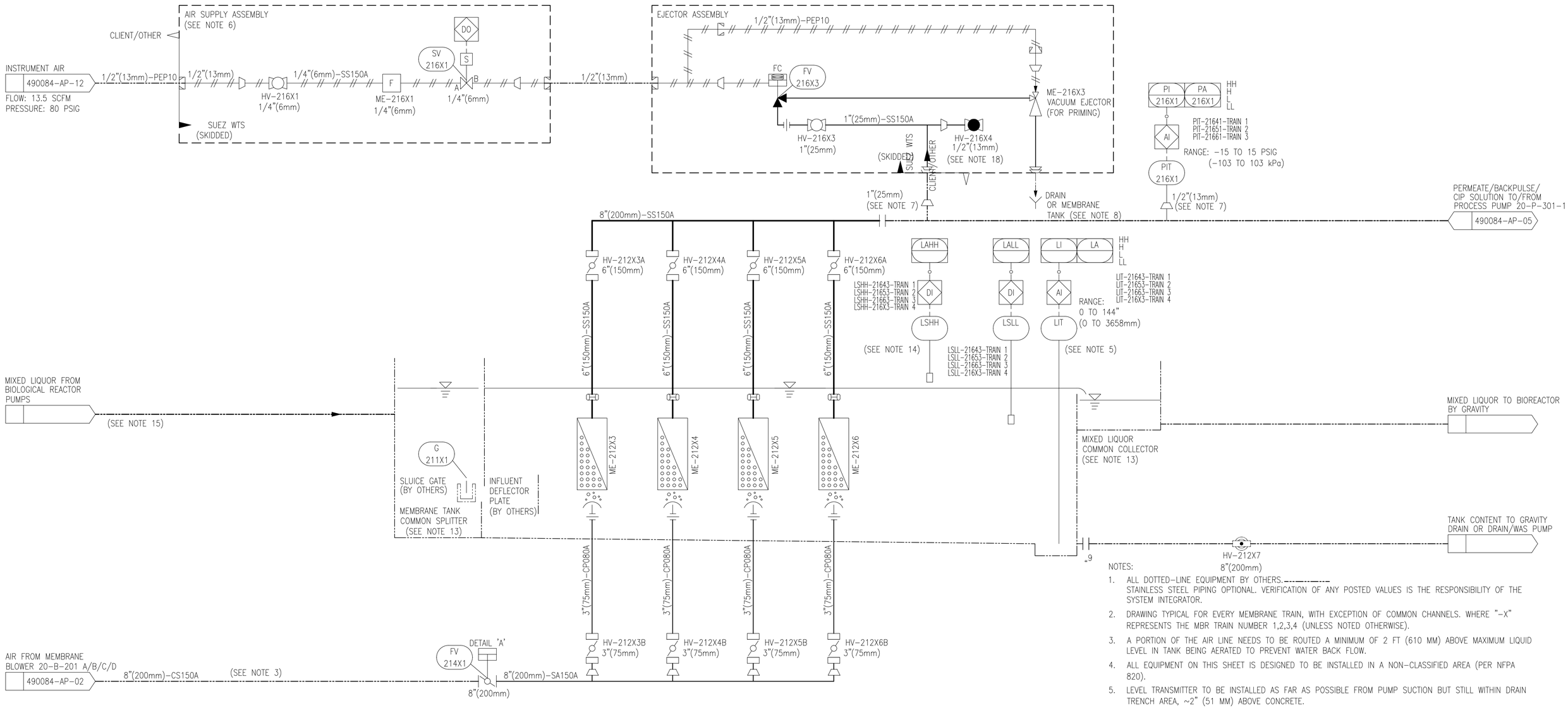
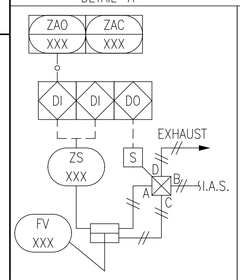
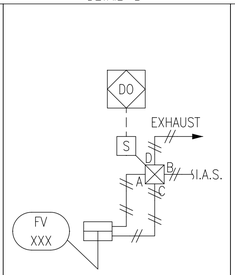


DETAIL 'A'



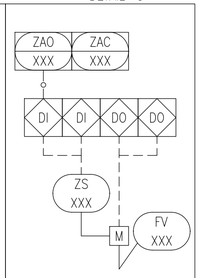
TYP. PNEUMATIC ACTUATED VALVE LIMIT SWITCHES CONTROL DETAIL

DETAIL 'B'



TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

DETAIL 'C'



TYP. MOTORIZED ACTUATED VALVE CONTROL DETAIL

MEMBRANE TANK DATA		
# OF TRAINS	4	
TAG NUMBERS	20-TK-201-1/2/3/4	
TANK MATERIAL	CONCRETE	
INTERNAL LENGTH	340	INCH
INTERNAL WIDTH	96	INCH
TOTAL DEPTH	144	INCH
MAX OPERATING LIQUID LEVEL	118	INCH
MIN OPERATING LIQUID LEVEL	108	INCH
TOP OF WEIR ELEV.	107	INCH
CLEANING LEVEL	95	INCH
TOP OF FIBERS (LSL) ELEVATION	92.3	INCH

MEMBRANE DATA	
CASSETTE & MODULE SERIES	ZW500D - LEAP
MODULE SURFACE AREA	430 FT2
MAX # OF MEMBRANE MODULES PER CASSETTE	52
# OF CASSETTE SPACES PER TANK	4
MAXIMUM # OF MODULES PER TANK	208
MAXIMUM # OF MODULES PER PLANT	832
# OF ROWS OF CASSETTES PER TANK	1
# OF FULL CASSETTES PER TRAIN	3
# OF FLEX CASSETTES PER TRAIN	1
# OF MODULES PER FLEX CASSETTE	40
# OF EMPTY CASSETTE SPACES PER TRAIN	0
TOTAL # OF MODULES INSTALLED PER TRAIN	196
SPARE SPACE	5.8%

NOTES:

1. ALL DOTTED-LINE EQUIPMENT BY OTHERS. ---------- STAINLESS STEEL PIPING OPTIONAL. VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. DRAWING TYPICAL FOR EVERY MEMBRANE TRAIN, WITH EXCEPTION OF COMMON CHANNELS. WHERE "-X" REPRESENTS THE MBR TRAIN NUMBER 1,2,3,4 (UNLESS NOTED OTHERWISE).
3. A PORTION OF THE AIR LINE NEEDS TO BE ROUTED A MINIMUM OF 2 FT (610 MM) ABOVE MAXIMUM LIQUID LEVEL IN TANK BEING AERATED TO PREVENT WATER BACK FLOW.
4. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
5. LEVEL TRANSMITTER TO BE INSTALLED AS FAR AS POSSIBLE FROM PUMP SUCTION BUT STILL WITHIN DRAIN TRENCH AREA, ~2" (51 MM) ABOVE CONCRETE.
6. BOTH EJECTOR AND INSTRUMENT AIR SUPPLY ASSEMBLIES ARE TO BE LOCATED INDOORS OR TO BE TEMPERATURE AND UV PROTECTED.
7. CONNECTION TO BE PROVIDED AT HIGHEST POINT ON PIPING BETWEEN PERMEATE HEADER AND PUMP.
8. AIR GAP IS REQUIRED ON EJECTOR DISCHARGE LINE EXHAUST TO MEMBRANE TANK OR DRAIN.
9. KNIFE GATE VALVES ARE RECOMMENDED FOR ALL WASTE WATER AND SLUDGE APPLICATIONS.
10. TANK ISOLATION/DRAIN VALVES ARE RECOMMENDED TO BE FULL LUG STYLE.
11. TANK COVERS ARE RECOMMENDED; GRATING NOT SHOWN FOR CLARITY.
12. CONNECTIONS TO BE LOCATED AT HIGHEST POINT ON PERMEATE PIPE. CONNECTIONS WILL BE PROVIDED ON PERMEATE HEADER PROVIDED BY SUEZ, WHICH CAN BE USED IF THE HEADER IS THE HIGHEST POINT.
13. MEMBRANE TANK SPLITTER & MIXED LIQUOR COLLECTOR CHANNELS ARE COMMON FOR ALL TRAINS, AND ARE FOR PROVIDING EVEN DISTRIBUTION.
14. LEVEL SWITCH IS PLACED 1 FT BELOW THE TOP OF THE TANK.
15. THIS LINE CAN BE A CHANNEL / PIPE OR THE "BIOREACTOR" AND "MEMBRANE TANK COMMON SPLITTER". WALLS CAN BE SHARED WITH THE WATER LEVEL BEING HYDRAULICALLY LINKED.
16. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.
17. ALL EQUIPMENT ON THIS PAGE IS POWERED BY OTHERS.
18. VALVE TO BE USED AS AIR INLET FOR MEMBRANE DECAY TEST. TO BE CLOSED ALL OTHER TIMES WITH HANDLE LOCKED IN PLACE TO PREVENT ACCIDENTAL OPENING.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

CUSTOMER INFORMATION

TOWN OF JOHNSTOWN
CENTRAL WWTP

P&ID,

MEMBRANE TANK

DRAWING NUMBER: 490084-AP-04
REVISION: A
REF.: -
DOC. OWNER:
PROJECT NO.: 490084
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 1

FILE LOCATION: C:\...ADSKVault\NAM-ITO\490084 - Town of Johnstown Central WWTP\1. PFD and P&ID\490084-AP-04.dwg
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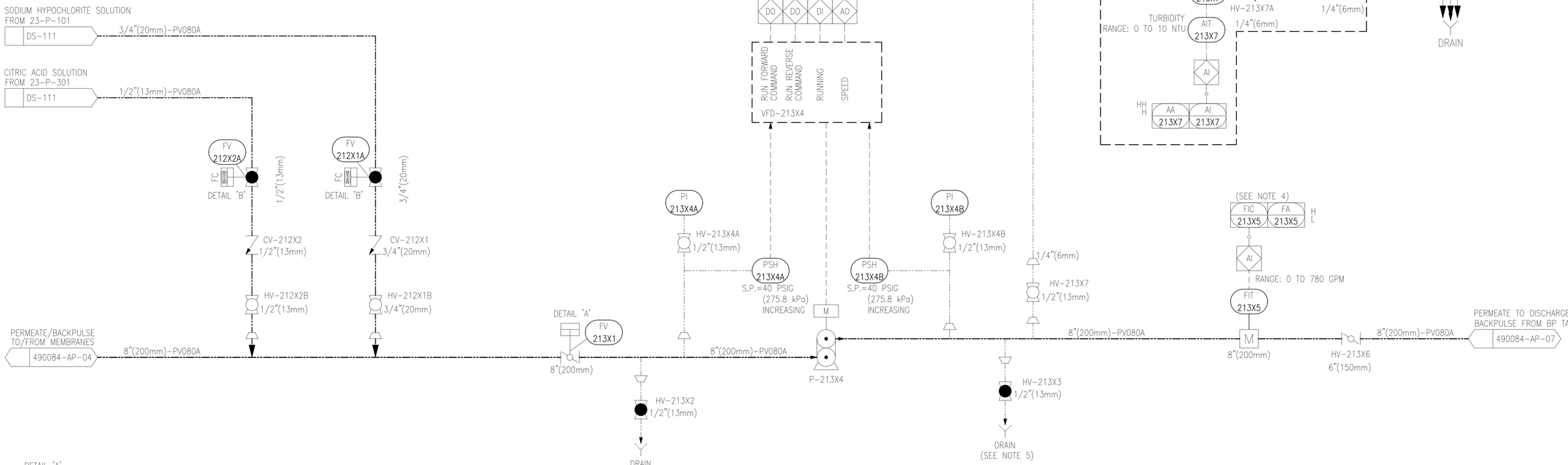

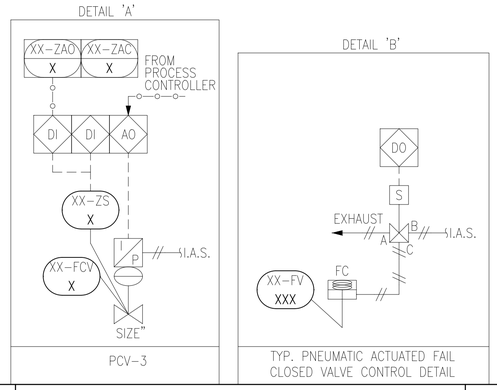

General Pump Info	
No of Duty Pumps*	4
No of Shelf Spare Pumps	0
Tag Numbers	20-P-301-1/2/3/4
Type of Pump	Rotary-Lobe, Reversible
Speed Control	YES (BY OTHERS)
Electric Motor	TEFC, 20HP at 1800 RPM
Voltage	460 V/3 Ph/60 HZ
Pump Vendor and Model	Boerger, FL776

* One Dedicated pump per train is used

NOTES:

1. ALL DOTTED-LINE ---------- EQUIPMENT TO BE SUPPLIED BY OTHERS. STAINLESS STEEL PIPING IS OPTIONAL. VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. DRAWING TYPICAL FOR EACH TRAIN. WHERE "X" REPRESENTS THE MBR TRAIN NUMBER. 1,2,3,4 (UNLESS NOTED OTHERWISE).
3. FOR MAGMETER INSTALLATION INSTRUCTIONS, REFER TO VENDOR LITERATURE. NOTE THE FLOW IS BIDIRECTIONAL, SO IDENTICAL STRAIGHT PIPE RUNS MUST BE PROVIDED ON BOTH SIDES OF THE INSTRUMENT.
4. DESIGN ENGINEER TO ENSURE MAGMETER AND PERMEATE COLLECTOR REMAIN FLOODED AT ALL TIMES.
5. FLOOR DRAINS TO BE PROVIDED AND PIPED INTO BY GENERAL CONTRACTOR, AS REQUIRED.
6. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
7. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.
8. ALL EQUIPMENT ON THIS PAGE IS POWERED BY OTHERS.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

CUSTOMER INFORMATION

TOWN OF JOHNSTOWN
CENTRAL WWTP

P&ID

PROCESS PUMP

POSITIVE DISPLACEMENT

DRAWING NUMBER	REVISION
490084-AP-05	A
REF.: -	DOC. OWNER:
PROJECT NO. 490084	PART/MATERIAL NO.
SCALE NONE	SIZE D
SHEET 1 OF 1	

LAST SAVED: Wednesday, February 16, 2022 7:55:29 PM

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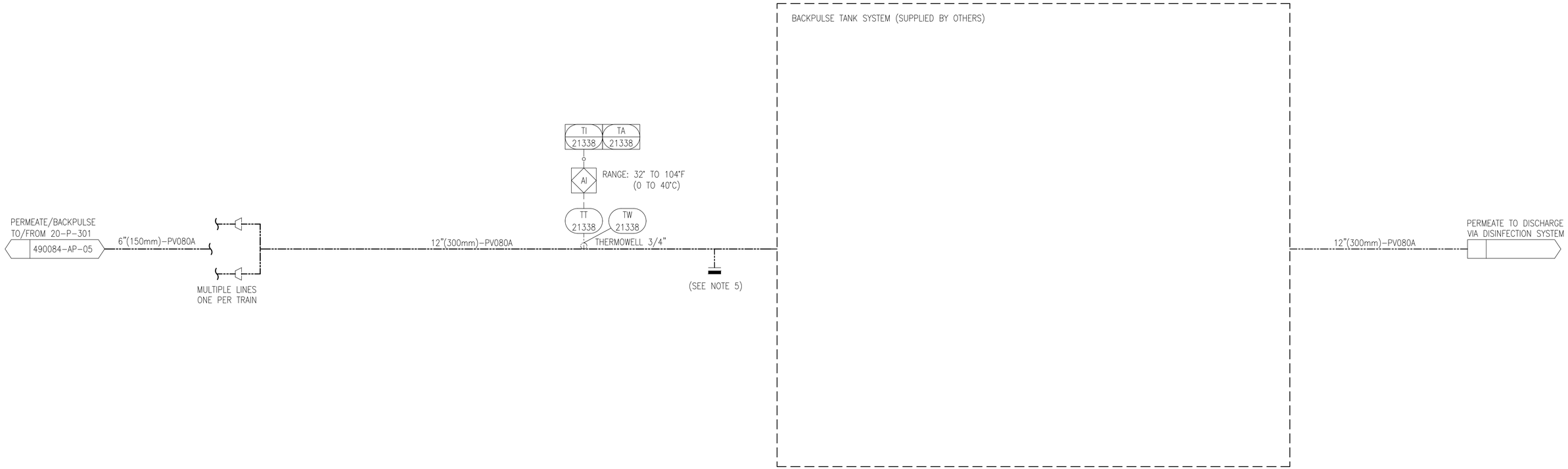

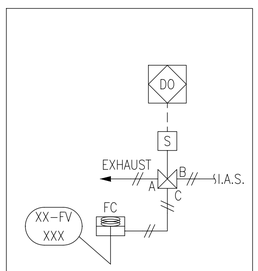

TYP. PNEUMATIC ACTUATED FAIL CLOSED VALVE CONTROL DETAIL

NOTES:

1. ALL DOTTED LINES/EQUIPMENT TO BE SUPPLIED BY OTHERS. ----------- VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. FLOOR DRAINS TO BE PROVIDED AND PIPED INTO BY GENERAL CONTRACTOR, AS REQUIRED.
3. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
4. PLANT START-UP WATER TO BE ADDED TO TANK THROUGH MANWAY WITH HOSE.
5. CAPPED CONNECTION FOR RECIRCULATION BACK TO THE BIOREACTOR DURING START-UP. TEMPORARY PIPING IS PROVIDED BY OTHERS.
6. TANK EMERGENCY BYPASS RECOMMENDED FOR ANY TANK SERVICE/REPAIR.
7. VALVE NEEDS TO BE LOCKED OPEN.
8. THIS LINE TO BE SIZED AT LEAST 2 SIZES LARGER THAN THE TANK INFLUENT LINE TO PREVENT OVERFLOW.
9. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

CUSTOMER INFORMATION

TOWN OF JOHNSTOWN
CENTRAL WWTP

P&ID

BACKPULSE TANK

DRAWING NUMBER				REVISION
490084-AP-07				A
REF.: -	DOC. OWNER:			
PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
490084		NONE	D	1 OF 1

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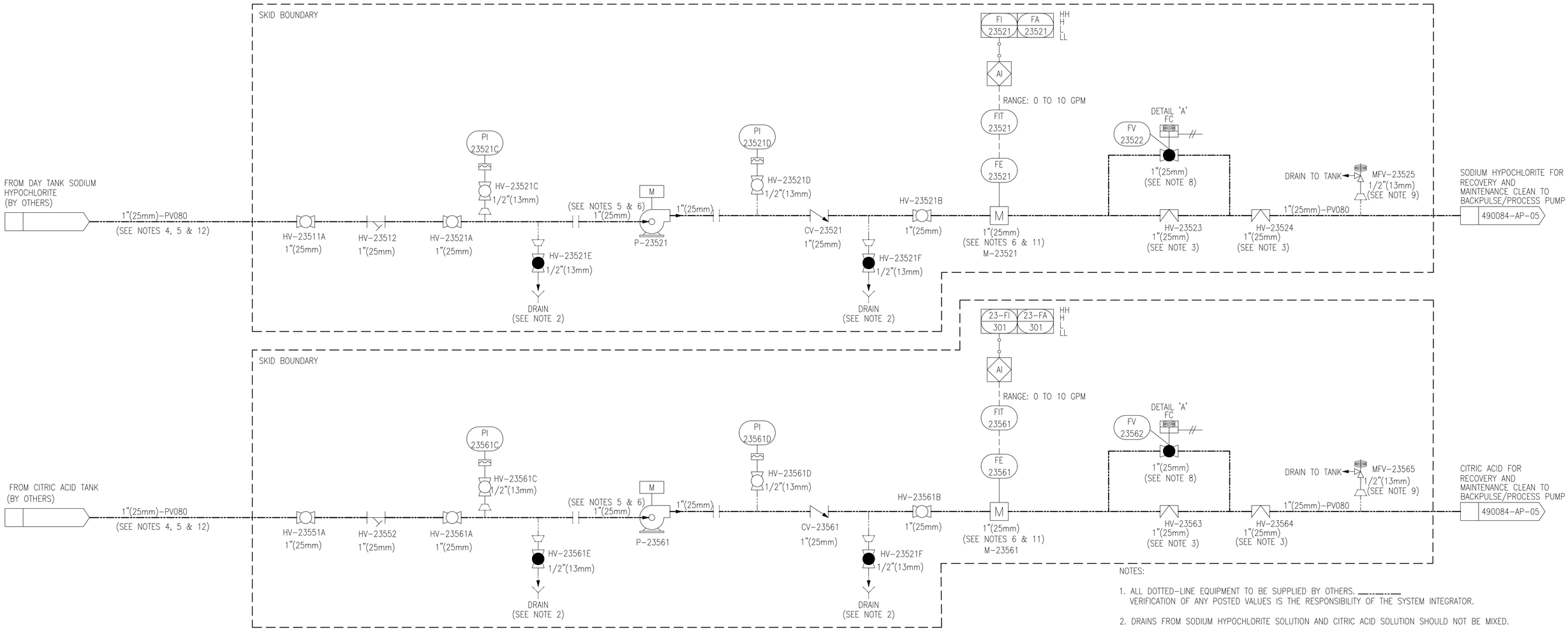
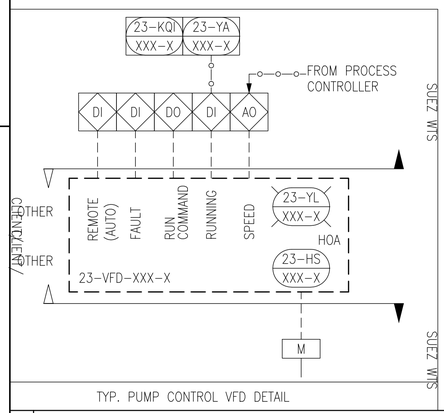
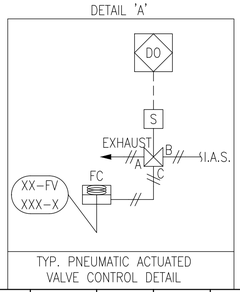




TYP. PUMP CONTROL VFD DETAIL



TYP. PNEUMATIC ACTUATED VALVE CONTROL DETAIL

Chemical Dosing pump Tag Number:	23-P-301		
Cleaning Chemicals	Citric Acid (50%)		
Chemical Pump Model #:	Mag Drive pump, DB9V		
Pump flow Range:	2.27 gpm - 2.64 gpm		
Voltage:	120V/1Ph/60Hz		
Maintenance Clean flowrate		Recovery Clean flowrate (gpm)	
As Installed	Buildout	As Installed	Buildout
2.27	2.40	2.49	2.64

Chemical Dosing pump Tag Number:	23-P-101		
Cleaning Chemicals	Sodium Hypochlorite (10.3%)		
Chemical Pump Model #:	Mag Drive pump, DB9V		
Pump flow Range:	1.17 gpm - 6.81 gpm		
Voltage:	120V/1Ph/60Hz		
Maintenance Clean flowrate		Recovery Clean flowrate (gpm)	
As Installed	Buildout	As Installed	Buildout
1.17	1.24	6.42	6.81

NOTES:

1. ALL DOTTED-LINE EQUIPMENT TO BE SUPPLIED BY OTHERS. ——-.—.—— VERIFICATION OF ANY POSTED VALUES IS THE RESPONSIBILITY OF THE SYSTEM INTEGRATOR.
2. DRAINS FROM SODIUM HYPOCHLORITE SOLUTION AND CITRIC ACID SOLUTION SHOULD NOT BE MIXED.
3. HV-23523 AND HV-23563 TO BE USED SET FOR MAINTENANCE FLOW. HV-23524 AND HV-23564 TO BE USED SET FOR RECOVERY FLOW.
4. BOTTOM CONNECTION FROM THE TANK IS MANDATORY.
5. FLOODED SUCTION SET-UP REQUIRED FOR PUMP OPERATION.
6. REFER TO MANUFACTURER'S I&O MANUAL FOR PIPING AND INSTALLATION REQUIREMENTS.
7. ALL EQUIPMENT ON THIS SHEET IS DESIGNED TO BE INSTALLED IN A NON-CLASSIFIED AREA (PER NFPA 820).
8. VALVE TO OPEN ONLY FOR RECOVERY CLEAN PROCESS.
9. PRESSURE RELIEF VALVE FOR OFF-GASSING PURPOSE.
10. VENTED BALL VALVES TO BE USED FOR SODIUM HYPOCHLORITE SERVICE.
11. GROUNDING RINGS SELECTION SHOULD BE BASED ON CHEMICAL COMPATIBILITY.
12. SECONDARY CONTAINMENT IF REQUIRED IS BY OTHERS.
13. FLOOR DRAINS TO BE PROVIDED AND PIPED INTO BY GENERAL CONTRACTOR, AS REQUIRED.
14. ONE COMMON SHELF SPARE PUMP WILL BE SUPPLIED BY SUEZ.
15. OUTDOOR PIPING/EQUIPMENT TO BE HEAT TRACED AND INSULATED BY OTHERS.
16. FOR DW & TERTIARY APPLICATIONS VFD MAY NOT BE REQUIRED (IF FLOW SPACING IS NOT REQUIRED).

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		VM	KK		04 FEB 22

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

CUSTOMER INFORMATION

TOWN OF JOHNSTOWN CENTRAL WWTP

P&ID

CLEANING CHEM. SYSTEMS

CENTRIFUGAL, MAG DRIVE PUMP

DRAWING NUMBER 490084-AP-11
REVISION A
REF.: -
DOC. OWNER:
PROJECT NO. 490084
PART/MATERIAL NO.
SCALE NONE
SIZE D
SHEET 1 OF 1

FILE LOCATION: C:_ADSKVault\NAM\TO\490084 - Town of Johnstown Central WWTP\1 PFD and P&ID\490084-AP-11.dwg
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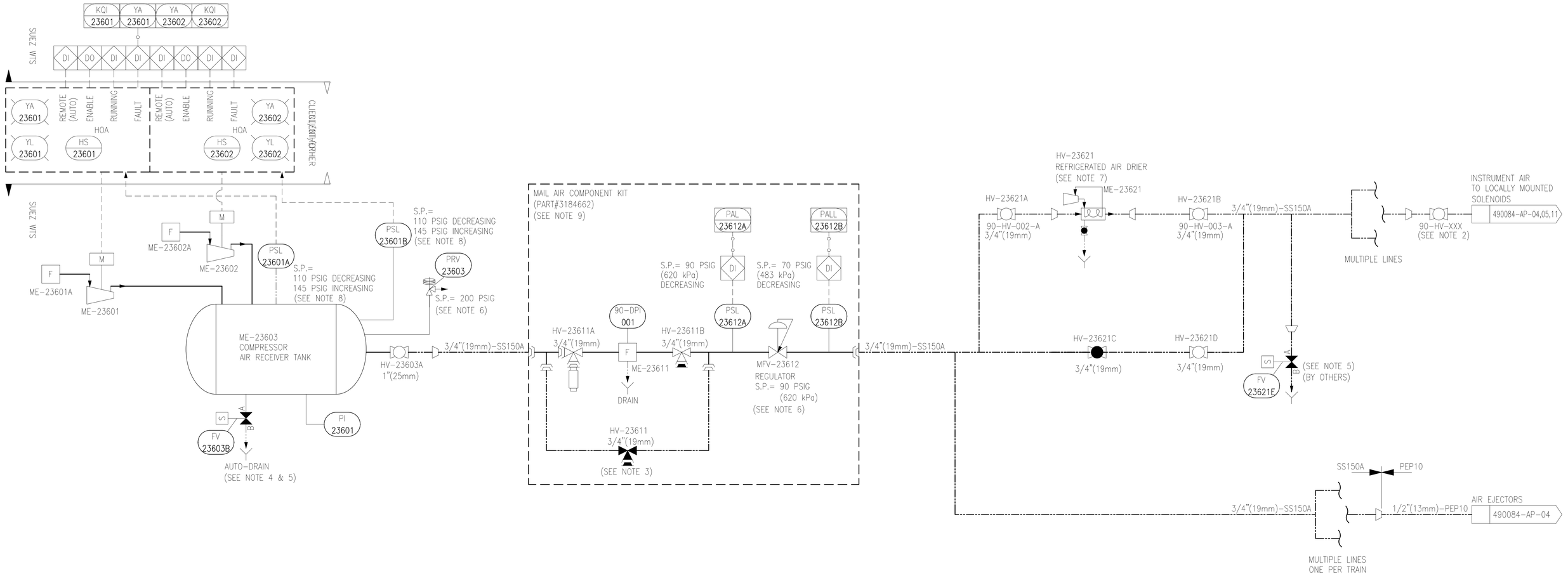

GENERAL COMPRESSOR INFO	
NO OF DUTY COMPRESSORS	1
NO OF STANDBY COMPRESSORS	1
TOTAL NO OF AIR RECEIVER TANK	1
TAG NUMBER FOR COMPRESSOR	ME-23601 & ME-23602
TAG NUMBER FOR AIR RECEIVER TANK	ME-23603
TYPE OF COMPRESSORS	GARDNER DENVER
COMPRESSOR MODEL	HPL 10D-24
AIR RECEIVER VOLUME	240 GAL
CONTROL PANEL INCLUDED	NO
SPEED CONTROL	NO
ELECTRIC MOTOR	TEFC, 10 HP AT 718 RPM
VOLTAGE	115 VAC / 3 ph / 60 Hz

FILTER DATA	
TAG NUMBERS	ME-23611
FILTER TYPE	100% PRIMARY COALESCING FILTER WITH AUTODRAIN
FILTER SIZE	1 μm

AIR DRYER DATA	
TAG NUMBERS	ME-23621
DRYER TYPE	REFRIGERATED
DRYER CAPACITY	43 CFM @ 100 PSI
MODEL INFO	GHRN43
ELECTRIC INFO	120 VAC / 1 ph / 60 Hz

NOTES:

1. ALL DOTTED LINES/EQUIPMENT BY OTHERS. _ _ _ _ _
2. MULTIPLE LINES WITH AT LEAST 1 ISOLATION VALVE PER TRAIN. (VALVES SUPPLIED BY OTHERS).
3. HANDLE FOR BYPASS VALVE TO BE REMOVED OR VALVE LOCKED IN CLOSED POSITION.
4. AUTO-DRAIN PLUGS INTO LOCAL 120VAC RECEPTACLE.
5. TIMED DRAIN VALVES TO BE LOCATED AT ANY LOW POINTS IN PIPING WHERE MOISTURE MAY ACCUMULATED, VALVES BY OTHERS.
6. PRESSURE RELIEF AND PRESSURE REGULATING VALVES TO BE SET IN THE FIELD BY SUEZ FSR.
7. ONLY ONE DRYER TO OPERATE AT A TIME AND TO BE ROTATED MANUALLY ON A WEEKLY BASIS.
8. CONTRACTOR TO WIRE AIR COMPRESSOR PRESSURE SWITCH TO MCC. SUEZ FSR TO CONFIRM DURING COMMISSIONING.
9. MAIN AIR COMPONENT KIT, SUPPLIED BY SUEZ, LOOSE SHIPPED TO SITE AND INSTALLED BY OTHERS.
10. FINAL SIZING AND DESIGN TO BE VERIFIED DURING DETAILED PROJECT ENGINEERING.

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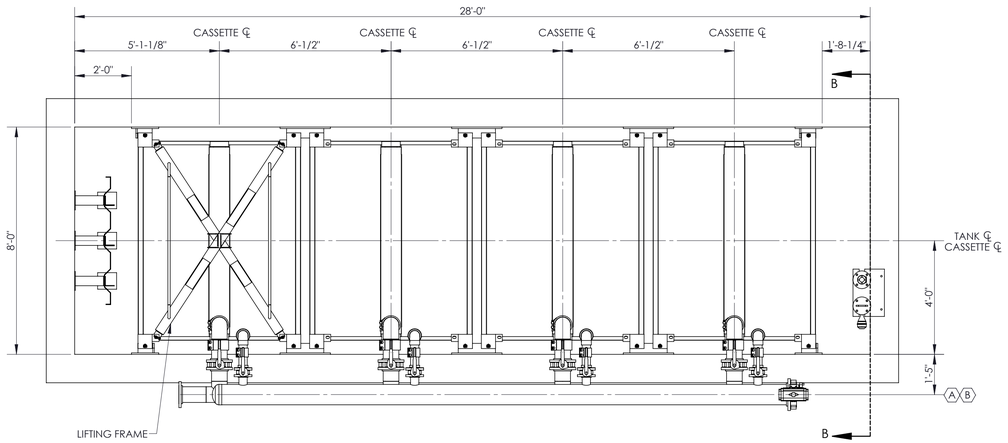
TOLERANCES UNLESS NOTED
DECIMALS .X .XX .XXX
ANGLES
FRAC

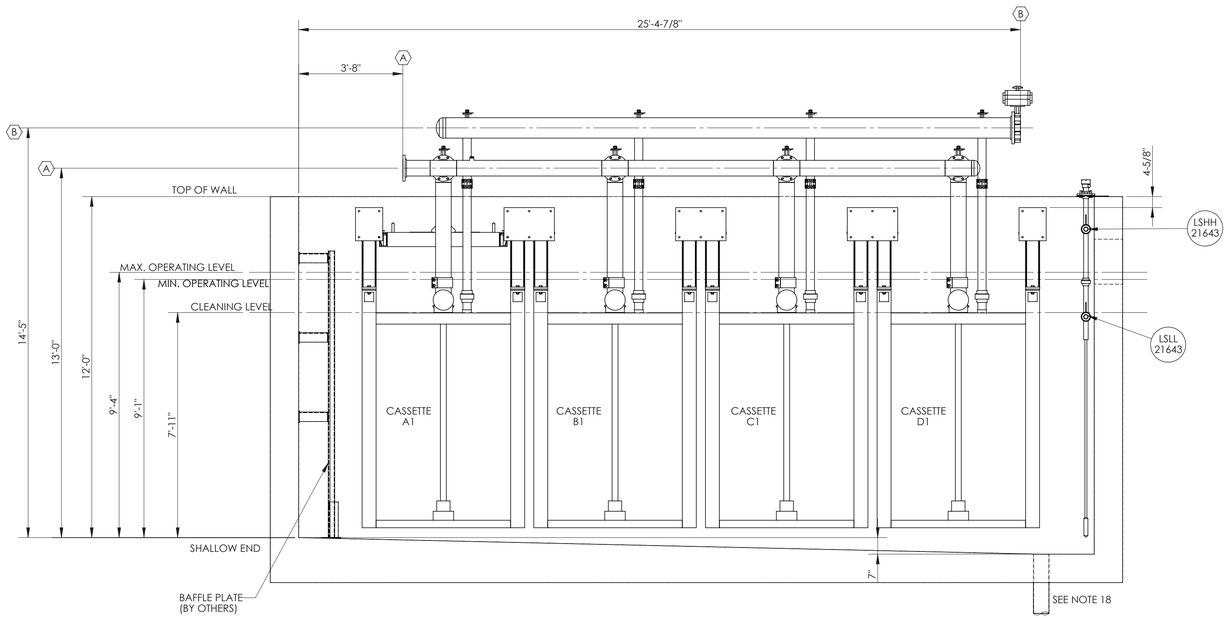
CUSTOMER INFORMATION
TOWN OF JOHNSTOWN CENTRAL WWTP

P&ID
AIR COMPRESSOR

DRAWING NUMBER: 490084-AP-12
REVISION: A
REF.: -
DOC. OWNER:
PROJECT NO.: 490084
PART/MATERIAL NO.:
SCALE: NONE
SIZE: D
SHEET: 1 OF 1

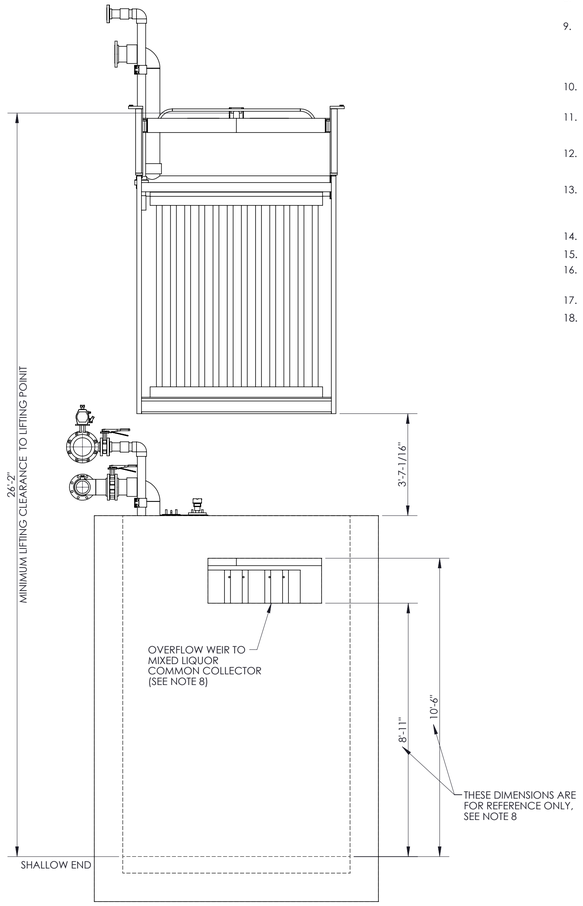
FILE LOCATION: C:\...ADS\Vault NAM\TO\490084 - Town of Johnstown Central WWTP\1 PID and P&ID\490084-AP-12.dwg
LAST SAVED: Wednesday, February 16, 2022 8:42:40 PM

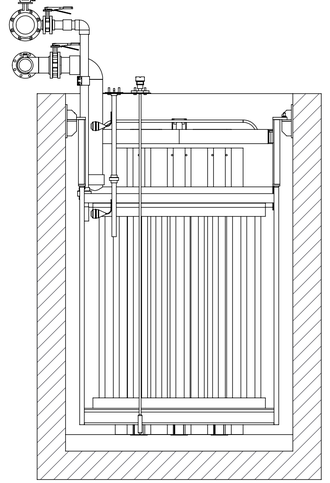




(TANK FRONT WALL REMOVED FOR CLARITY)

Note: Johnstown Central WWTP GA will be updated to reflect any agreed upon changes as the Low Point GA are finalized through final submittal.





SECTION B-B

CONNECTION TABLE			
ITEM	DESCRIPTION	TYPE	SIZE
A	PERMEATE OUTLET	150# RF FLG	8.0
B	AIR INLET	150# RF FLG	8.0

NOTES:

1. DESIGN DATA:
   • EST. CASSETTE SHIPPING WEIGHT: 4,500 LBS [2,040 kg.]
   • EST. CASSETTE MAX. WEIGHT (SLUDGED): 9,500 LBS [4,310 kg.] (INCLUDING LIFTING MODULE)
   • RECOMMENDED CRANE LIFTING CAPACITY: 10,000 LBS [4,535 kg.]
2. FOR SCOPE OF SUEZ SUPPLIED EQUIPMENT AND TECHNICAL DATA REFER TO THE P&IDS AND EQUIPMENT BILL OF MATERIAL.
3. DESIGN, SUPPLY AND INSTALLATION OF MEMBRANE TANK INFLUENT FLOW SPLITTER (GRAVITY CHANNEL), EMERGENCY OVERFLOW, AND/OR WALKWAYS/HANDRAILS ON TOP OF WALLS (IF REQUIRED) ARE BY OTHERS. THESE ARE NOT SHOWN FOR CLARITY.
4. MEMBRANE TANK COVERS ARE RECOMMENDED. DESIGN AND SUPPLY OF MEMBRANE TANK COVERS ARE NOT BY SUEZ. (TANK OPEN TO ATMOSPHERE AT EFFLUENT WEIR.)
5. DESIGN AND SUPPLY OF SUPPORTS FOR PERMEATE AND AIR HEADERS ARE BY OTHERS. OVERALL SYSTEM ENGINEER TO DETERMINE DESIGN, NUMBER AND LOCATION OF SUPPORTS.
6. INFLUENT DEFLECTOR PLATE IS REQUIRED TO PREVENT DIRECT IMPACT OF FEED WATER ON CASSETTES. THE SUEZ DESIGN GUIDELINE LISTED BELOW.
7. THE FOLLOWING DESIGN GUIDELINES ARE AVAILABLE FROM GE UPON REQUEST:
   • MG-09011-A MEMBRANE TANK TOLERANCES.
   • ZEEWEED 500 SERIES MEMBRANE LIFTING EQUIPMENT GUIDELINE
   • BEP #2007-04 BAFFLE DESIGN
8. OVERFLOW WEIR IS FOR REFERENCE ON THIS DRAWING. FINAL DESIGN OF OVERFLOW WEIR IS BY OTHERS.
9. FOR INTERIOR TANK WALLS THAT HAVE BRACKETS ON BOTH SIDES, IF THE ANCHOR EMBEDMENT PLUS TWO TIMES THE ANCHOR DIAMETER IS GREATER THAN HALF OF TANK WALL THICKNESS, THEN THRU-WALL 5/8" DIA THREADED RODS, 316A, ASTM F593 MUST BE USED (RODS TO BE SUPPLIED BY OTHERS)
10. LIFTING MODULE IS NOT TO BE LEFT INSIDE MEMBRANE TANK DURING OPERATION. A STORAGE SPACE WILL BE REQUIRED WHEN LIFTING MODULE IS NOT IS USE.
11. PIPING MATERIAL:
    • AIR: SA150A (304 SS)
    • PERMEATE: SS150A (316 SS)
12. GASKET MATERIAL:
    • SS LINES: EPDM
    • PVC/CPVC LINES: EPDM
13. FASTENER MATERIAL:
    • FOR HARDWARE ON MEMBRANE AIR AND PERMEATE PIPING,SA307 GRADE B, ZINC COATED, BOLTS AND STUDS.
    • FOR CASSETTE HARDWARE, SEE ASSEMBLY DRAWING FOR DETAILS.
14. ALL DIMENSIONS IN FEET AND INCHES.
15. REFERENCE - PIPING & INSTRUMENTATION DIAGRAM: 507987-WTS-ME-SYS-EN21-DS-104
16. SUMP DESIGN IS BY OTHERS. DIMENSIONS ARE SHOWN FOR REFERENCE ONLY. TO ENSURE FULL TANK DRAIN, VORTEX BREAKER IS RECOMMANDED.
17. THIS TANK GENERAL ARRANGEMENT IS TYPICAL FOR 20-TK-201-1/2/3.
18. MEMBRANE TANK TO BE DRAINED BY 6" MANUAL MUD VALVE. SEE CLIENT DRAWING FOR DETAILS. MUD VALVES ARE NOT PROVIDED BY SUEZ.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		MR	KK		16 FEB 22

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF SUEZ AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY SUEZ AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS: .X, .XX +/-0.50, .XXX
ANGLES: +/-0.5°
FRAC: +/- 1/2"

CUSTOMER INFORMATION: TOWN OF JOHNSTOWN CENTRAL WWTP

EQUIPMENT ARRANGEMENT
MEMBRANE TANK

DRAWING NUMBER	REVISION
490084-PG-01	A
REF.:	DOC. OWNER:

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
490084		1:32	D	1 OF 2

LAST SAVED: Wednesday, February 16, 2022 8:13:29 PM

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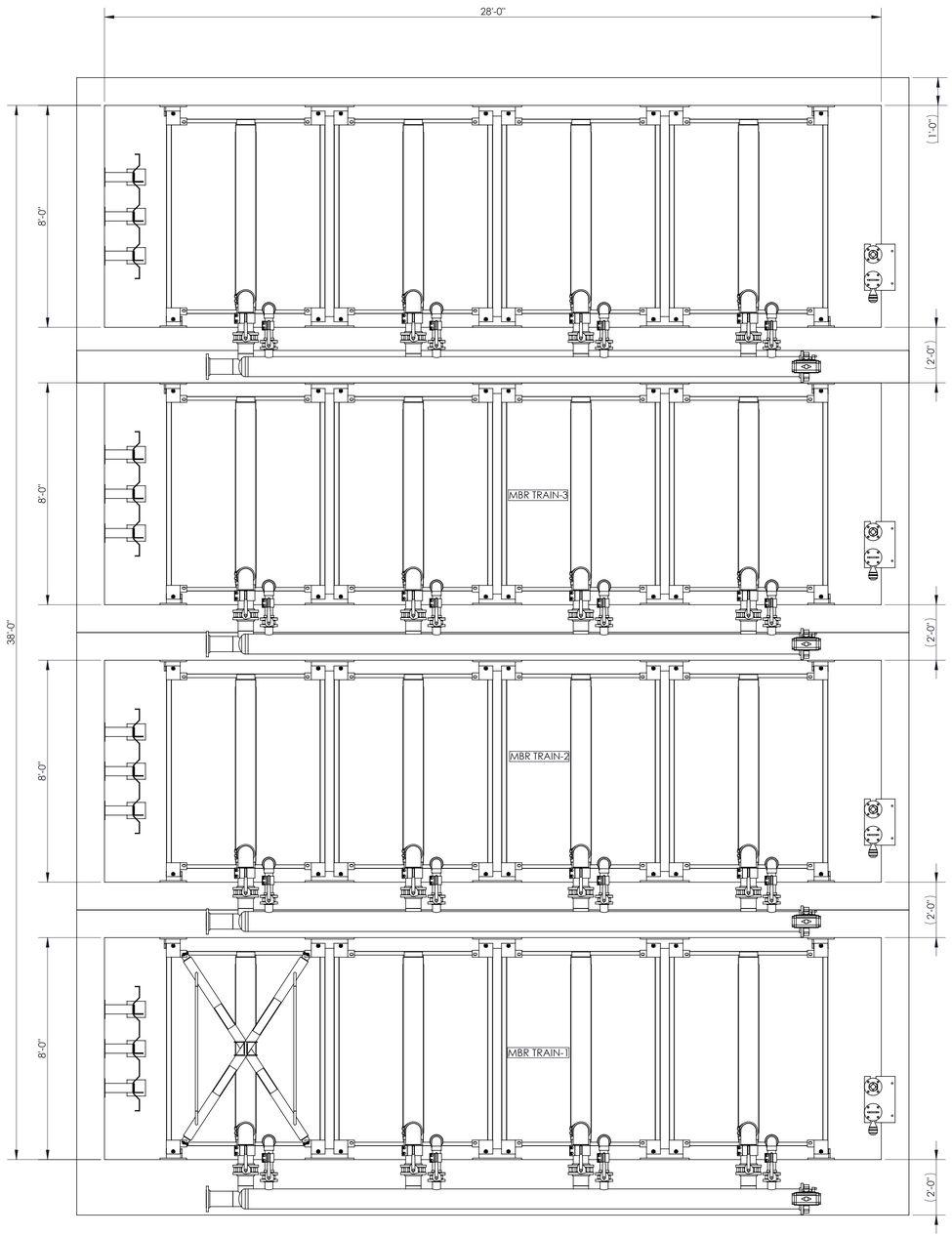
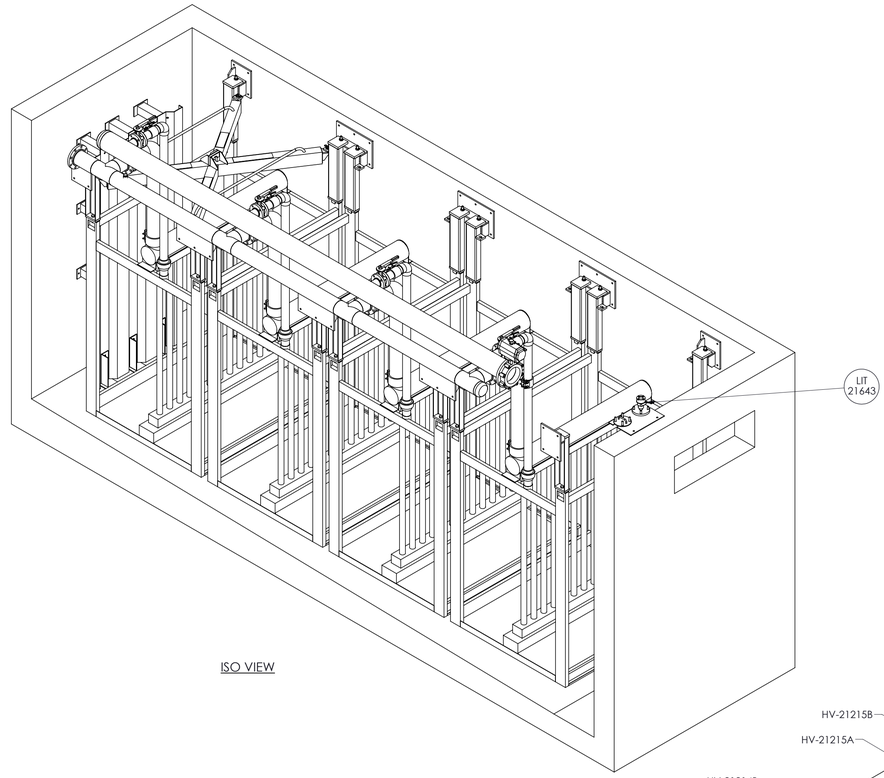
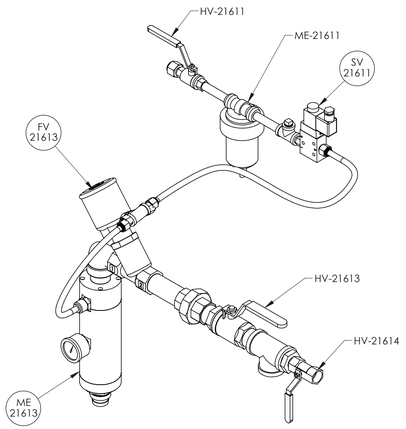


MEMBRANE TANK LAYOUT

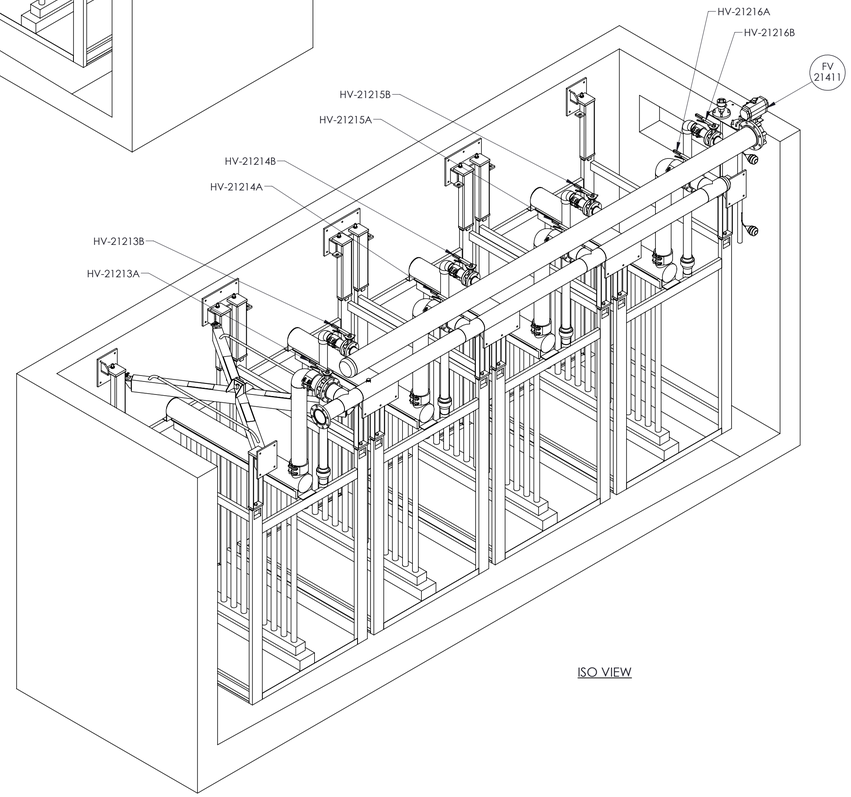


ISO VIEW

NOTE:
TAG NUMBERS SHOWN ON THIS GA IS REPRESENT FOR MBR TRAIN-1 ONLY. SEE SUEZ P&ID AND BOM FOR DETAIL TAG NUMBERS FOR TRAIN-2 AND TRAIN-3



EJECTOR ASSEMBLY



ISO VIEW

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
A	INITIAL RELEASE		MR	KK		16 FEB 22

PROPRIETARY AND CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION AND KNOWLEDGE CONTAINED OR REFERRED HEREIN ARE THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF SUEZ AND AS SUCH ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. THESE INSTRUMENTS OF SERVICE SHALL NOT BE REPRODUCED, TRANSMITTED, DISCLOSED OR USED OTHERWISE IN WHOLE OR IN PART, WITHOUT PRIOR WRITTEN AGREEMENT BY SUEZ AND MUST BE IMMEDIATELY RETURNED OR DESTROYED UPON REQUEST.

TOLERANCES UNLESS NOTED
DECIMALS: X +/-0.5", .XX +/-0.50, .XXX +/- 1/2"
ANGLES: +/-0.5°
FRAC

CUSTOMER INFORMATION
TOWN OF JOHNSTOWN
CENTRAL WWTP

EQUIPMENT ARRANGEMENT
MEMBRANE TANK

DRAWING NUMBER: 490084-PG-01
REVISION: A
REF.:
DOC. OWNER:
PROJECT NO.: 490084
PART/MATERIAL NO.:
SCALE: 1:32
SIZE: D
SHEET: 2 OF 2
LAST SAVED: Wednesday, February 16, 2022 8:13:29 PM

FILE LOCATION: D:\SWPDM\NAM-ITO\490084 - TOWN OF JOHNSTOWN CENTRAL WWTP\2. Mechanical Drawings\

3.4 INFORMATIONAL TABLES

A. The following tables shall be completed as part of the proposal.

JOHNSTOWN WWTP EXPANSION – MBR INFORMATION SHEET		
General Design Information		
Total Usable Membrane Area	337,120	ft²
Number of Trains	4	Each
Number of Modules per Train	196	Each
Surface Area per Module	430	ft²
Flux Rate @ Max Month Flow (one train offline)	9.89	gal/ft²/day
Maximum Allowable Flux Rate for 24-hour duration	22.9 with 4 trains	gal/ft²/day
Maximum Design Transmembrane Pressure	-8 to 8	psig
Membrane Basin Dimensions	8' W x 28.3' L x 12' H	ft x ft x ft
Cleaning Process - Provide for Each Chemical Required (attach additional sheets as needed)		
Type of Chemical	sodium hypochlorite	--
Frequency of cycles	2 recovery cleans/ year	no. per week or month
Volume of chemical required	478	gal/cycle
Type of Chemical	citric acid	--
Estimated Frequency of cycles	2 recovery cleans/ year	no. per week or month
Volume of chemical required	185	gal/cycle
Other Design Parameters		
Estimated Labor	3 hours/year*	~~hours/week~~
Estimated Permeate Pump Power (Total)	67	kWh/day
Maximum Air Volume Required for Scour (per train)	691	scfm
Minimum Air Volume Required for Scour (per train)	332	scfm
Maximum Air Volume Required for Scour (Total)	2,764	scfm
Air Pressure Required for Scour	4.4	psig
Air Compressor Power Requirements	5	kWh/day
Membrane Life	131,490-175,200	hours
Membrane Replacement Cost	$1,150 USD	--
Other Annual Replacement Costs (specify)	NA	--

4 Warranty and Services

4.1 Warranty Confirmation

Suez is confirming that this proposal is in complete adherence to all warranty provisions required as outlined in the RFP.

4.2 Warranty Description

The seller offers a comprehensive three-part warranty for the Town of Johnstown Central WWTP as follows:

- **mechanical warranty:** seller will repair or replace any device or part thereof that was supplied by the seller that proves to be defective. This warranty excludes the membrane modules.
- **membrane warranty:** This warranty provides protection and assurances to the buyer/owner with respect to the membrane modules.
- **reliability acceptance test warranty:** This warranty provides protection and assurances to the buyer/owner with respect to the ability of the seller's system to meet the established performance criteria.

The start date for all warranties is upon substantial completion or six (6) months from equipment shipment, whichever occurs first. Substantial completion is defined as when the buyer/owner makes beneficial use of the equipment supplied by the seller.

If for any reason outside seller's control, the performance test cannot be completed within sixty (60) days after installation of the membrane modules or eighteen months from shipment or if any changes are made to the system without the seller's written consent that would affect the seller's ability to meet this performance warranty, then all obligations to the buyer/owner under this performance warranty will be deemed fulfilled.

Once the performance test has been satisfactorily completed, mechanical and membrane warranty provisions shall apply.

4.2.1 Warranty Provisions

In addition to the membrane warranty limitations as defined in the "Seller's warranty – ZeeWeed membrane modules" in this section, all of the warranties are subject to the following provisions:

general (applicable to all warranties)

- the membrane system is operated and maintained at all times in accordance with the seller's operations & maintenance manual;

- the seller has, until performance of its obligation herein is met, reasonable access to the equipment and the operational data relating thereto;
- the equipment is operated within the mixed liquor characteristics defined in table 1 of this section. Any value above or below the ranges stated may not automatically invalidate the membrane warranty but rather they would impact the system performance; for example, backwashing in lieu of relaxing may be implemented, or cleaning requirements may be affected.
- the buyer/owner furnishes adequate and competent operating, supervisory and maintenance staff, and necessary laboratory facilities with test equipment and personnel;
- the buyer/owner utilizes the services of the Seller until its performance obligations are met;
- the buyer/owner supplies all necessary raw materials and services of a quantity and of a quality specified by the Seller; and
- an adequate and continuous power supply is available that will enable operation of all required equipment.

pre-treatment (applicable to membrane warranty)

- ***pretreatment*** - Fine screening with a maximum size opening of no greater than 2 mm and without possibility of bypass of any particle larger than 2 mm in all directions must be included in the headwork's.
- ***process chemical additives*** - The use of any chemicals added to the wastewater treatment process (e.g.: polymers, flocculants, coagulants, antifoams) that may come in contact with the ZeeWeed membranes must be approved by Seller prior to use. This includes chemicals used in processes outside of the seller's system that may be transferred to the seller's system, such as in solids handling facilities.

table 1: mixed liquor characteristics for warranty purposes

Parameter	design target value	accepted operating range
mixed liquor temperature (°C)	10	10-25
MLSS concentration in membrane tanks (mg/L) [1]	10,000	≤ 10,000 – 12,000
soluble $cBOD_5$ concentration in mixed liquor entering membrane tanks (mg/L)	5	≤ 5
NH_3-N concentration in mixed liquor entering membrane tanks (mg/L)	≤ 0.5	≤ 1.0
colloidal TOC (cTOC) concentration in mixed liquor entering membrane tanks (mg/L) [2]	7	≤ 10
soluble alkalinity of mixed liquor entering membrane tanks (mg/L as $CaCO_3$)	100	50 – 150
Time-to-filter (TTF) of mixed liquor in membrane tanks [3]	100	≤ 200
material greater than 2 mm in size in mixed liquor entering membrane tanks (mg/L) [4]	Less than detectable level	≤ 1
instantaneous air flow rate to independent membrane modules during air scour at diffuser (scfm per module)	11.9	11.3 – 12.5

Note 1: Membrane tank MLSS concentration of up to 12,000 mg/L is permissible during MDF, PHF and N-1 events only. Membrane tank MLSS concentration to be maintained at or under 10,000 mg/L during all other flow conditions.
Note 2: Colloidal TOC (cTOC) is the difference between the TOC measured in the filtrate passing through a 1.5-µm filter paper and the TOC measured in the ZeeWeed membrane permeate.
Note 3: Per seller's standard Time-to-Filter (TTF) procedure (available upon request).
Note 4: Per seller's standard Sieve Test procedure (available upon request).
Note 5: Chemicals that are not compatible with the ZeeWeed PVDF membrane are not permitted in the membrane tank.

4.2.2 Mechanical Warranty

The mechanical warranty is only applicable to equipment supplied by the seller. Seller's obligation under this warranty is to the repair or replace, at its factory, of any device or part thereof, which shall prove to have been thus defective. The mechanical warranty period on all equipment supplied, unless otherwise noted, is twenty four (24) months from the date of substantial completion or thirty (30) months from equipment shipment, whichever occurs first. Warranty repair, replacement or re-performance by seller shall not extend or renew the applicable warranty period.

Seller assumes no liability for any damage to equipment caused by inadequate storage or handling per manufacturer's recommendations in supplied technical literature, or by defective or sub-standard workmanship or materials provided by the buyer/owner or any other third party responsible for handling, storing or installing the equipment.

The buyer/owner undertakes to give immediate notice to seller if goods or performance appear defective and to provide seller with reasonable opportunity to make inspections and tests. If seller is not at fault, the buyer/owner shall pay seller the costs and expenses of the inspections and tests.

Goods shall not be returned to seller without seller's permission. Seller will provide buyer/owner with a "return goods authorization" (RGA) number to use for returned goods. All returns are F.C.A. – Oakville, Ontario, Canada. All costs associated with the removal and shipment of the defective part from the buyer/owner's facility to the seller's factory and all costs related to return shipment to the buyer/owner's facility and installation of a repaired or replacement part shall be the buyer/owner's responsibility.

Implied warranties, including but not limited to warranties of fitness for particular purpose, use or application, and all other obligations or liabilities on the part of the seller, unless such warranties, obligations or liabilities are expressly agreed to in writing by seller, are null and void.

4.2.3 Membrane Warranty

A ten (10) year non-prorated/cliff warranty is offered on the membrane modules with full replacement. Refer to "Seller's warranty – ZeeWeed membrane modules" in this section for a detailed description of the membrane warranty offered. Refer to the commercial section of this proposal for the membrane module replacement price proposed for this project.

4.2.4 Membrane Performance

Seller warrants, subject to the provisions set forth above, that after stable operation of the biological treatment (by others) has been attained and operators have acquired reasonable skills, the membrane modules supplied for this project will be capable of producing the results set forth in table 2.

table 2: guaranteed membrane filtration system performance – effluent quality

Parameter	**guaranteed values**
membrane filtration system hydraulic capacity	
maximum month flow, MMF, with all trains in service (mgd) [1]	≤ 2.50
maximum day flow, MDF, with all trains in service (mgd) [1]	≤ 3.11
peak hour flow, PHF, with all trains in service (gpm) [1]	≤ 2,160
maximum flow with one train offline for maintenance or cleaning (for less than 24 hours) (mgd)	≤ 3.11
maximum flow with one train offline (for less than 30 days) (mgd)	≤ 2.50
membrane filtration system permeate quality [2]	
TSS (mg/L)	≤ 10
turbidity (NTU)	≤ 0.2

Note 1: The flow conditions are defined as follows:

- *Maximum Month Flow (MMF)* – The average daily flow rate occurring during the 30-day period with the highest flow based on annual flow rate data.
- *Maximum Day Flow (MDF)* – The maximum flow rate that occurs over a 24-hour period based on annual flow rate data.
- *Peak Hour Flow (PHF)* – The maximum flow rate sustained over a 1-hour period based on annual flow rate data.

Note 2: Guaranteed values are as measured by online instrumentation on the permeate for each train.

Note 3: Any flow conditions that exceed the above-noted flow limits must be equalized prior to treatment in the membrane bioreactor unit.

4.2.5 Reliability Acceptance Testing (RAT)

A thirty (30) day reliability acceptance test is to be carried out to demonstrate the ability of the seller's system to meet the performance warranty requirements as well as to demonstrate functional control and operation of the system.

Once the performance test has been satisfactorily completed, mechanical and membrane warranty provisions shall apply.

The performance test shall be performed once the biological treatment process has stabilized and can occur at any time within the duration of the performance warranty described above, at a time mutually agreed upon by the buyer/owner and the seller. If for any reason the reliability acceptance test is not completed within twelve (12) months from the date of substantial completion or eighteen (18) months from membrane shipment, whichever occurs first, the seller's obligation for an operations/performance test will be deemed fulfilled.

Within thirty (30) days of installation of the membrane modules, the buyer/owner shall start-up the Equipment. Thereafter, the buyer/owner shall use its reasonable best efforts to maintain continuous and stable operation of the system until the seller's obligation under this performance guarantee has been discharged. The buyer/owner shall notify the Seller that the system is ready for the stress test or notify why the system is not ready and the party responsible for the lack of readiness shall promptly take the appropriate remedial action.

The guaranteed plant hydraulic loading criteria under the performance warranty are based on values in table 2 in this document, with testing performed to applicable industry-approved standards. On-line instrumentation and grab sample testing are indications of the performance of the plant and assist in the proper operation and control of the system. These results may include values beyond the stated warranty values (during process upsets or if instrumentation is poorly/not calibrated, etc.) and additional composite testing must be performed to establish that the plant is not meeting performance requirements. All analytical work shall be carried out by the buyer/owner.

The buyer/owner shall afford the seller full access to the system and to all operating data pertaining to system performance until discharge of the latter's obligations hereunder. The performance test and the MBR system operation shall be conducted by the buyer/owner in accordance with a mutually agreeable test protocol, applicable standard techniques, operating procedures specified by seller in the operations and maintenance manual and operating parameters specified in this section.

In the event of an interruption during the reliability acceptance test due to any of the following events, the test shall be extended by the period of the interruption plus the time required to re-attain operating conditions in effect at the time of the interruption, and data recorded during that period shall not be included. Such interruptions include:

1) power interruption in excess of sixty (60) minutes per day.

2) mechanical failure of the system.

3) any influent or operating parameter outside the accepted operating ranges defined in this section.

If during the execution of the reliability acceptance test the wastewater flow and/or load into the plant are outside the specified acceptable operating ranges in this document, the seller will modify the test protocol within reason to mimic the design condition. The seller is not responsible for any limitations on the RAT protocol or results due to wastewater flow and/or load that is outside of the specified acceptable operating ranges.

When seller is of the opinion (based on the results obtained at the completion of the reliability acceptance test), that the system has fulfilled the performance guarantees herein contained, it shall give written notice to the buyer/owner to that effect. Within two (2) weeks immediately following receipt of such notice, the buyer/owner shall notify the seller in writing that it accepts the system, or that it does not accept the system, in which latter case the buyer/owner shall state the specific reason for non-acceptance. In the absence of such reply from the buyer/owner within the two (2) week period, the system shall be deemed to have been accepted and the seller's obligation under this performance warranty shall be discharged.

If, after the system has been operated pursuant to the conditions hereinabove set forth, it becomes reasonably apparent, based on the results obtained at the completion of the performance test, that the system performance is short of the guaranteed performance, then additional reliability acceptance test of the system shall be conducted by the buyer/owner whenever seller shall reasonably request. In such event, seller shall be responsible to undertake all necessary reasonable corrective measures in an effort, consistent with commercial and technical reasonableness, to bring the system up to the guaranteed performance levels.

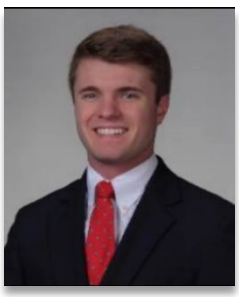
4.3 Extended Warranties

Suez is offering a non-prorated/cliff warranty for 10 years as part of our standard offering.

4.4 Local Service

4.4.1 Local Presence

This section will include a larger description of the service and support capabilities of SUEZ Water, but it is often instructive to consider your "first responders" in the case of any emergency. In addition to the largest network of services and support tools in the industry, we are pleased to be able to point to several local resources.



Jared Butler is a graduate of the University of Minnesota with experience in service and commissioning in over 100 water and wastewater plants in the USA. Jared has extensive expertise in commissioning, process optimization, operations, programming and troubleshooting. Jared will lead commission at the Johnstown Central Wastewater Treatment Plant site and will test and commission your MBR system. He has already shown himself to be a valuable resource to the staff at the Stonegate Village MBR and I encourage you to reach out to them about Jared. His expertise and in-depth knowledge of your system will be a valuable asset for years to come.

In addition to Jared being available quickly for any emergency, his local presence has allowed us to **include 3 service visits above and beyond those required in the specifications.** These visits can be scheduled at the Town's convenience if at any point the operators are looking for guidance or a refresher on operations.

Grant MacInnis is a Professional Engineer with a B. Sc. in Mechanical Engineering from Queen's University in Canada. He has over 20 years of water treatment and engineering experience with SUEZ / Zenon and currently manages SUEZ's municipal business in the Rocky Mountain Region. Grant has been a resident of Denver for 12 years and recently became a US citizen.

The **Coombs Hopkins Company** has been representing quality equipment for over 30 years. Throughout those years, Coombs Hopkins has been dedicated to the long-term success of all its clients and has established a first in class service department to further that goal. Coombs Hopkins partners with clients and manufacturers to promote a long-term alliance based on responsiveness and integrity.

Your local service contact, based in south Denver, is **Jason Morgan**. Jason is a valuable resource to many plants in the area as he combines deep equipment expertise with an extensive background in service coordination. Jason has over 15 years' experience in operations of small to large municipal water and wastewater plants.

4.4.2 Other Local SUEZ Resources

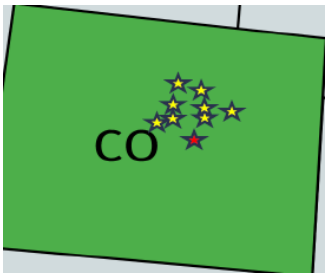
In addition to the above resources, SUEZ maintains an office of professional water and wastewater process experts, engineers and technicians in Boulder, CO. The **Boulder SUEZ** office germinated from water and wastewater research being done at the University of Colorado and has grown to include over 180 employees. The Boulder site includes all manufacturing of instruments, consumables, parts, and reagent vials as well as factory service, supply chain, engineering and R&D, quality, applications, product management, marketing, and leadership teams.

4.4.2.1 Services Provided - Annual ZeeWeed Users Group

The community of ZeeWeed Operators is so extensive that it now includes its own conference!

As an on-going support to ZeeWeed plants, an annual, two-day ZeeWeed users group meeting is organized by SUEZ consisting of formal meetings and a tour of a hosting ZeeWeed plant. New technologies are introduced, current issues are tabled, and roundtable discussions ensue. The users' group has become an excellent forum for experienced operators to keep current, to renew old acquaintances, to exchange the "tricks of the trade" with each other, and to impart their knowledge to newer ZeeWeed operators. Generous hospitality combines with informal experiences and exercises to enhance the camaraderie amongst domestic and international plant operators.

All ZeeWeed owners are invited to send operators representing their plant. SUEZ covers the conference fee and food expenses. SUEZ supports this forum to facilitate interaction between ZeeWeed plant operators and to provide real-world feedback to SUEZ's management, design and operations staff. Host plants are usually some of the newer facilities – maybe someday the staff at Johnstown might be willing to show off your new plant and their beautiful Rocky Mountain location as a host of the annual users group!



In addition to users across the globe, operators at Johnstown can benefit from the largest local community of MBR users in Colorado and in the west. **The Stonegate Village MD MBR** in Parker is currently the largest MBR on the Front Range and is quite representative of what you could expect at the Johnstown Wastewater Treatment Plant. Having said that, there are another seven SUEZ MBRs in Colorado to visit and learn from. A short drive south, there are another 8 SUEZ MBRs in northern New Mexico, with another 20+ installations in AZ and UT (including some of the larger MBRs in the country).

All of this community is available to you as a SUEZ MBR operator.

ZeeWeed Membrane Module Extended Warranty

This schedule sets out the warranty with respect to ZeeWeed membrane modules ("membrane modules"). No other warranties, expressed or implied are made in connection with the sale of these products, including, without limitation, warranties as to fitness for any purpose or use or merchantability of these products. The warranty provided herein will be the exclusive and sole remedy of Buyer. This warranty is not transferable.

1 Definitions

The follow terms shall have the meaning set forth below when used in the warranty document:

a. "Buyer" means **[Town of Johnstown, Colorado].**

b. "Seller" means a business component of, or legal entity within the SUEZ Water Technologies & Solutions business which is selling the ZeeWeed membranes.

2 Warranty Product

This warranty applies to only the membrane modules supplied under the contract of sale. Membrane module means the hollow fiber ultrafiltration membranes and the potted plastic headers. This warranty does not cover air piping to the membrane module, permeate piping from the membrane module, piping connection fittings, connecting hardware and cassette frames with their associated components including but not limited to spacers, aerator tubes, aerator assemblies, screen, module dummies or module blanks.

3 Scope of Warranty

The Seller warrants that its membrane module(s) will be free of defects due to faulty materials or errors in manufacturing workmanship.

Regular membrane module inspection and normal fiber repair shall be the responsibility of Buyer.

All replacement membrane modules will be shipped on the basis of INCOTERMS 2020 FCA SUEZ manufacturing facility.

All ancillary costs including but not limited to bagging, boxing, crating, freight, freight insurance, applicable taxes, import duties, certifications, brokerage, receiving, forklift services, storage at site, reattachment hardware, hose/clamp/camlock replacement, crane services, installation, fiber repair materials, glycerin flushing, commissioning and waste disposal are the responsibility of Buyer.

4 Warranty Start Date

Membrane warranty will start on the earlier of:

a. The date that installation of the original membrane module(s) has been substantially completed, or

b. Three (3) months from the date of delivery of the original membrane module(s) to Buyer.

5 Warranty Duration

Total Warranty Duration: a total of 120 months of full replacement warranty coverage.

Membrane modules replaced under warranty shall assume the remainder of the warranty for the original membrane modules being replaced, with such warranty to be not less than a **24** month full replacement warranty from the date of replacement with a new membrane module.

Replacement membrane modules are covered by warranty only to the extent of the warranty of the original membrane module which has been replaced. At all events, this warranty shall expire and be of no force or effect **24** months following the warranty start date.

6 Notification of Claim

All claims filed under this warranty shall be made in writing by Buyer within 30 days of identifying a defect.

Buyer shall provide the following information:

a. A description of the defect giving rise to the claim;

b. Photographs showing the manufacturing defect;

c. The serial number(s) of the membrane module(s) which is (are) the subject of the warranty claim; and

d. Operating data and repair history for the life of membrane modules which are the subject of a warranty claim.

7 Verification of Claim

After receipt of written notification of a defect, the Seller will promptly undertake such investigations as, in the Seller's opinion, are necessary to verify whether a defect exists. The Seller reserves the right to require additional data as necessary to validate claims. Buyer may, in the course of these investigations, be requested to return membrane module(s) to the Seller for examination (see Section 11). The Seller may also conduct reasonable tests and inspections at Buyer's plant or premises. If the results of the investigation do not validate the defect claimed, Buyer will reimburse the Seller for all reasonable expenses associated with said investigation, including expenses for all tests, inspections, and associated travel.

8 Satisfaction of Claims

The Seller will have the right to satisfy claims under this warranty in a flexible manner. Such flexibility may include the repair of existing membrane modules or changes in operating protocols or membrane module replacement or by upgrading failed membrane modules with newer membrane module(s) that may embody design and efficiency improvements. Buyer consents to the supply of replacement membrane modules which may be of a different design than original membrane modules.

9 Operating Information

To maintain the membrane module warranty, membrane system operation records from initial start-up date until claim must be maintained by Buyer and made available to the Seller upon request. Records must be provided in sufficient detail as applicable to verify the subject of a warranty claim and can include but is not limited to, operation data including information on feed water quality, temperatures, flows, trans-membrane pressures, aeration rates, permeate quality, cleaning intervals, cleaning chemical concentrations, elapsed time since start-up, relevant analytical data and reporting of any screen bypass events.

Buyer shall maintain and share access to a single reference copy in electronic form of a membrane module map containing the history of activity by membrane module and the serial number for each module. Buyer shall log its procedures performed related to a membrane module including relocation of membrane modules, repairs, replacements and any other noteworthy events.

Buyer authorizes the Seller to conduct any reasonable review of operation and maintenance records or to inspect facilities where membrane modules are installed, upon reasonable notice to Buyer. Such reviews and/or inspections are intended to also assist the Seller and Buyer in detection of membrane system faults and to optimize the care and operation of the membrane modules.

10 Limitation of Warranties

Occurrence of any of the following as reasonably determined by the Seller will void this warranty:

a. A material failure to operate the membrane system in accordance with Seller's operations and maintenance manual supplied to Buyer as part of the contract, including material failure to adhere to the Seller's specified membrane module cleaning procedures and the use of anything other than Seller-approved membrane module cleaning agents.

b. Failure to adhere to the preventive maintenance program as presented in the Seller's operations and maintenance manual, in published product manuals and in specifications.

c. Failure to adhere to all transportation and storage requirements. ZeeWeed membrane modules may be stored up to 12 months from date of receipt and must be transported and stored in original intact packaging out of direct sunlight in ambient temperatures between 5-35 Degrees Celsius. Storage beyond 12 months from date of receipt requires a written request to SUEZ to maintain membrane module warranties.

d. Introduction of destructive foreign materials and chemical agents into the membrane module.

e. Failure to maintain and provide system operating data and repair history for the life of membrane modules which are the subject of a warranty claim.

f. Physical abuse or misuse, incorrect removal or installation of membrane modules by non-Seller personnel including fiber damage caused by operator error in handling of membrane modules or cassettes.

g. Unauthorized alteration of any components or parts originally supplied by the Seller.

h. Intentional damage.

11 Return Procedure

In the event that the return of a membrane module is required pursuant to this warranty, Buyer will first obtain a Return Goods Authorization (RGA) number from the Seller. Membrane module(s) shipped to the Seller for warranty examination must be shipped freight prepaid in environmentally controlled freight and storage with ambient air temperature between 5-35 degree Celsius. If Buyer desires temporary replacement membrane module(s) to replace those alleged to be defective and returned to the Seller for warranty examination, Buyer shall be responsible for the cost associated with any such replacements until examination of the returned membrane modules pursuant to this warranty is complete. Any membrane module examined by Seller as part of a warranty claim where the membrane module is subsequently found to be performing as warranted or where a membrane module failure is not covered under the warranty will be returned to Buyer, freight collect or disposed of by Seller and the cost associated with any membrane analysis and diagnostic work will be levied against the Buyer based on SUEZ standard labor rates.

12 Disclaimer and Limitation on Liability

To the maximum extent permitted by law, in no event shall Seller be liable for any loss of profit or revenues, loss of production, loss of use of equipment or services or any associated equipment, interruption of business, cost of capital, cost of replacement water or power, downtime costs, increased operating costs, claims of Buyer's customers for such damages, or for any special, consequential, incidental, indirect, punitive or exemplary damages arising out of or relating to the performance or actual or alleged breach of the agreement, regardless of whether a claim is based in contract (including warranty or indemnity), extra-contractual liability, tort (including negligence or strict liability), statute, equity or any other legal theory.

5 Preventative Maintenance Schedule and Cost

5.1 Preventative Maintenance Schedule

Suez MBRs are the simplest MBR systems in the industry to operate and maintain. The system is fully automated with operators having the ability to review operation, adjust set points, or schedule operating tasks through the easy-to-understand HMI graphical displays.

Most operators describe typical maintenance as “just keeping the lights on”. As with any wastewater plant, typical maintenance is required of rotating equipment and valves (oil checks, occasional valve seat or o-ring replacement, turbidity meter calibration, etc.), but the membrane-specific maintenance is limited to just a few activities per year. With the additional three visits from your local SUEZ technical leader Jared already included in the proposal, these can easily be scheduled so that he is on site the first time they are performed.

1- Cassette Inspection:

We recommend lifting and inspecting a cassette from each train. An operator at that point is just looking for any obvious concerns – accumulation of construction materials would be the most common finding, although even that is quite rare, Lifting, inspecting and replacing a cassette is typically a 45-60 minute procedure. We recommend performing several checks in the first year and then once per year subsequently.

2- Recovery Cleaning

Membrane Recovery Cleans are performed 1-2 times per year. The membranes are left to soak in a mild chemical solution for 6-8 hours (often overnight). Operators will ensure that chemical totes are in place at the suction side of the chemical feed pumps (hypochlorite or citric acid) and then manually initiate a clean. The membranes remain in-situ for the entire clean and, after initiation, the clean is automated, although some operators will observe chemical levels during the initial tank fill to ensure the proper dosage is metered out. Most operators report spending approximately 1 hour on each recovery clean.

Please see section 5.2 for complete chemical usage volumes and costs.

5.2 O&M Estimate

Estimated power and chemical usage for the membrane system proposed is outlined in the table below.

Power Estimate		
Equipment[1]	**Power**	**Units**
Permeate Pumps	24,600	kW-h
Membrane Blowers	177,500	kW-h
RAS Pumps	45,800	kW-h
Compressor	1,815	kW-h
Chemical Consumption Estimate		
Chemical	**Number/year[2]**	**Total gal/year**
Sodium Hypochlorite	2	955
Citric Acid	2	370

Note 1: Calculations based on assumed plant hydraulics and average day flow conditions with 2 trains required to operate.

Note 2: Cleaning is based on recovery cleans only. Maintenance cleans are not required for the proposed system for The Town of Johnstown Central WWTP.

6.1 Confirmation of Payment Terms

This is to confirm acceptance of payment terms outlined in the RFP.

6.2 Commercial Terms

6.2.1 System Price

Pricing shall be as outlined on the Bid Forms included in section 2.1 of this proposal.

Please note that the presented pricing does not include any provision for any procurement restrictions imposed on Seller by Buyer's funding parties. Should these restrictions be required, such as "Buy America", Seller reserves the right to adjust the pricing herein upon review of the restrictions.

6.2.2 Price Validity

Validity of the quoted system price will be as the RFP.

6.2.3 Taxes

Pricing provided herein does not include any taxes or duties, as specified in the RFP.

Buyer shall be directly responsible, and reimburse Seller, for the gross amount of any present, for future sales, use, excise, value-added, environmental, or other similar tax or duty applicable to the price, sale or delivery of any equipment or services furnished under this proposal. Unless Buyer has furnished Seller with evidence of tax exemption or direct pay permit acceptable to taxing authorities prior to the execution of any Purchase Order / Agreement or Seller's acceptance of Buyer's Purchase Order (as applicable), Buyer shall pay all taxes as invoiced by Seller and Seller is relieved of any obligation to (i) apply any tax exemption or direct pay permit, and/or (ii) refund the Buyer any tax paid by the Seller.

Seller's price and schedule shall be based on applicable Federal and State laws, local ordinances, codes, and standards as well as duties, sales or use taxes in effect as of the date of Seller's proposal. Should such laws, codes, taxes and standards change and increase the cost of performing the work or impact the schedule, Seller shall, upon notice to Buyer of such, be entitled to an equitable adjustment of price and /or schedule. Similarly, should such laws, codes, taxes and standards change and decrease the cost of performing the work, Buyer shall be entitled to an equitable adjustment of price.

6.3 Delivery

The following freight terms for delivery of equipment used are as defined by INCOTERMS 2010.

All pricing is CIP designated Project **TOWN OF JOHNSTOWN CENTRAL WWTP** site. Delivery to the project site is conditional upon provision of access roads of a nature that

will permit access by tractor-trailers. Off-loading and positioning of equipment at the job-site is not included.

6.4 Shipment to storage

If any part of the equipment cannot be delivered when ready due to any cause not attributable to Seller, Buyer shall designate a climate-controlled storage location and Seller shall ship such equipment to storage. Upon shipment to the storage location then (i) title and risk of loss shall thereupon pass to the Buyer if it had not already passed; (ii) any amounts payable to the Seller upon delivery or shipment shall become payable upon presentation of Seller's invoice(s); (iii) any amounts otherwise payable to Seller, such as for preparation for storage, handling, inspection, preservation, insurance and any taxes shall be payable by Buyer upon submission of Seller's invoice(s); (iv) the Services provided herein shall subsequently charged at the rate prevailing at the time of actual use and Buyer shall pay the net increase; and (v) Buyer is responsible for direct payment of all costs for storage of the equipment and subsequent transportation from the storage facility to their place of installation.

6.5 Bonds

A Performance and Labor & Material Payment Bonds are not included in the system price, as specified in the RFP. These bonds can be purchased on request.

6.6 Payment terms

Upon approved credit for the Buyer, payment terms will be as outlined in section IX of the RFP.

6.7 Proposed Project Schedule

The proposed schedule is per Page 8 of the RFP.

The delivery schedule is presented based on current workload backlogs and production capacity. If a formal Purchase Order is not approved within the period of validity of this proposal, the delivery schedule is subject to review and adjustment.

Seller would like to note that under the current exceptional circumstances under the COVID 19 Pandemic situation, Seller may not be in a position to guarantee and comply with the planned schedule for project delivery or performance and that should there be any new measures taken by any governmental authority which may impede or delay the said schedule or performance, Seller reserves the right to modify the schedule / contract accordingly. Seller will promptly inform you of any changes which may impact the contract or the project.

note 1: Please note that Seller's engineering team requires some information from the Buyer prior to commencing work on the First Engineering Submittal, including but not limited to:

- ❑ confirmation of the hydraulic profile of the plant, especially regarding the feed to the membrane system and the pump discharge head requirements for all pumping applications connected outside of the Seller's system;

- site considerations for plant layout and preliminary plant information including overall plant layout considerations from the Buyer and elevations;
- relative humidity range;
- confirmation of all site conditions such as elevation or any wind loading and seismic requirements.

Seller clarifies that the timeline defined above assumes that Seller's engineering team has all the required site information.

6.8 Membrane Module Replacement Price

The price of replacement ZeeWeed 500 membrane modules for this project is $1,245 USD per module. Seller will guarantee this price for twenty (20) years from the start date of the membrane warranty. Pricing for replacement modules is subject to adjustment for inflation from the date of this proposal according to the North American Consumer Price Index (CPI) + 1.0%. If the same module is not available due to product improvements, an equivalent price per gallon of treatment capacity will be used.

The membrane replacement price quoted refers to replacement of membrane modules no longer under warranty.

The membrane module replacement price is not applicable for membrane modules purchased for any non-replacement purposes, such as for flux reduction or hydraulic capacity increase. Modules purchased under these scenarios can be purchased at the list price at the time of order.

Membrane module replacement price does not include bagging, boxing, crating, and will be shipped on the basis of INCOTERMS 2010 FCA SUEZ Manufacturing Facility. Membrane module replacement price is quoted without taxes.

6.9 Royalty and License Fees

6.9.1 Application Patents

Seller has a number of patents covering the products, equipment and applications offered in this proposal.

6.9.2 Non-exclusive Royalty Free License

Seller grants Buyer a non-exclusive, non-terminable, royalty free license to use the intellectual property embedded in the equipment delivered to and paid for by the Buyer, as well as any drawings, design or data delivered to and paid for by the Buyer, for the purposes of owning, financing, using, operating, and maintaining the relevant equipment at Buyer's site. Such license may only be assigned to a subsequent owner of the equipment or to an operations and maintenance sub-contractor. Such license does not extend to the re-creation of the equipment or the manufacture of spares or consumables by Buyer or third parties.

Any software Seller owns and provides pursuant to this proposal shall remain Seller's property. Seller provides to Buyer a limited, non-exclusive and terminable royalty free

project-specific license to such software for the use, operation or maintenance at Buyer's site of any equipment purchased hereunder to which software is a necessary component. Buyer agrees not to copy, sub-license, translate, transfer or reverse engineer, or decode the software. Single user versions of software may be used on one CPU. LAN/WAN versions may be used on a single server with only the number of concurrent users as agreed to by the Parties. Unless otherwise expressly agreed by Seller, this license shall terminate and the software shall be returned to Seller as soon as the Buyer no longer operates the equipment as sold, or upon the material breach of these terms.

Furthermore, the chemistries used in the manufacture of Seller's ultrafiltration and microfiltration membranes sold under the ZeeWeed brands are proprietary and the Buyer undertakes not to analyze these membranes or to permit analysis of these membranes by a third party.

6.10 Terms and Conditions

Our proposal assumed that the engineering order will be executed under the same terms that were previously negotiated with the Town of Johnstown for the Low Point MBR Project.

Our proposal further assumes the eventual Buyer of the equipment (presumably a contractor like Moltz) agrees to include Seller's proposal as a Contract document in any Purchase Order or Procurement Agreement.

These final Terms and Conditions can be negotiated to the mutual agreement of Seller and the Buyer. Buyer's Terms & Conditions may typically include specific bonding requirements, liquidated damages, cancellation clauses, equipment warranty requirements and other contractual liabilities for which Seller has made no provision in the pricing provided herein. Seller therefore reserves the right to adjust the pricing herein upon review of any Buyer supplied Terms and Conditions.

6.3 Requirements Attachment One

This is to acknowledge that requirements listed in Attachment One have been addressed within this proposal.

6.4 Requirements Attachment Two

This is to acknowledge that requirements listed in Attachment Two have been addressed within this proposal.

6.5 Acknowledgement of Equipment Anchoring

This is to acknowledge that the scope of supply by SUEZ will include design and calculations for equipment anchoring.

general terms and conditions of sale – sale of capital equipment

1. Exclusive Terms and Conditions. Together with any other terms the Parties agree to in writing, these General Terms and Conditions – together with the last proposal in order of time issued by the Seller – form the exclusive terms ("Agreement") whereby Buyer agrees to purchase, and Seller agrees to sell products and equipment (jointly "Equipment") and to provide advice, instruction and other services in connection with the sale of that Equipment ("Services"). If Buyer sends to Seller other terms and conditions to which Seller may not respond, including but not limited to those contained in Buyer's purchase order, such shall not apply. This Agreement may only be revised by a change order approved in writing by both Parties. All terms not defined herein shall be defined in Seller´s proposal.

2. Equipment and Services. The Equipment to be delivered and the Services to be provided shall be as set out in this Agreement. Unloading, handling, storage, installation, and operation of Buyer's systems or the Equipment are the responsibility of Buyer. Buyer shall not require or permit Seller's personnel to operate Buyer's systems or the Equipment at Buyer's site.

3. Prices and Payment. Buyer shall pay Seller for the Equipment and Services in accordance with the payment schedule (as set forth in Seller´s proposal or, if applicable, in any special conditions agreed to in writing by the Parties). Unless otherwise specified in writing, payment is due net thirty (30) days from the date of Seller's invoice. Seller may require a Letter of Credit or other payment guarantee, in which case the stated amount of the guarantee will be adjusted by Buyer in the event of any currency-based adjustment to prices or payment amounts per the Payment Schedule, and Buyer shall deliver the adjusted guarantee within five (5) days of request by Seller. Buyer agrees to reimburse Seller for collection costs, including 2% (two percent) interest per month (not to exceed the maximum amount permitted by applicable law), should Buyer fail to timely pay. Buyer shall have no rights to make any deduction, retention, withholding or setoff relating to any payments due under this Agreement.

4. Taxes and Duties Seller shall be responsible for all corporate taxes measured by net income due to performance of or payment for work under this Agreement ("Seller Taxes"). Buyer shall be responsible for all taxes, duties, fees, or other charges of any nature (including, but not limited to, consumption, gross receipts, import, property, sales, stamp, turnover, use, or value-added taxes, and all items of withholding, deficiency, penalty, addition to tax, interest, or assessment related thereto, imposed by any governmental authority on Buyer or Seller or its subcontractors) in relation to the Agreement or the performance of or payment for work under the Agreement other than Seller Taxes ("Buyer Taxes"). The Agreement prices do not include the amount of any Buyer Taxes. If Buyer deducts or withholds Buyer Taxes, Buyer shall pay additional amounts so that Seller receives the full Agreement price without reduction for Buyer Taxes. Buyer shall provide to Seller, within one month of payment, official receipts from the applicable governmental authority for deducted or withheld taxes. Buyer shall furnish Seller with evidence of tax exemption acceptable to taxing authorities if applicable, prior to execution of the Agreement by both Parties or issuance by the Seller of the order acceptance. Buyer's failure to provide evidence of exemption at time of order will relieve Seller of any obligation to refund taxes paid by Seller.

5. Delivery, Title, Risk of Loss. Unless otherwise specified in this Agreement, Seller shall deliver all Equipment to Buyer FCA (Incoterms 2010) Seller's facility. The time for delivery of the Equipment to Buyer shall be specified in this Agreement. Seller's sole liability for any delay in delivery of the Equipment shall be as expressly set out in this Agreement. The place of delivery specified herein shall be firm and fixed, provided that Buyer may notify Seller no later than forty-five (45) days prior to the scheduled shipment date of the Equipment of an alternate point of delivery, Buyer shall compensate Seller for any additional cost in implementing the change. If any part of the Equipment cannot be delivered when ready due to any cause not attributable to Seller, Buyer shall designate a climate-controlled storage location, and Seller shall ship such Equipment to storage. Title and risk of loss shall thereupon pass to Buyer, and amounts payable to Seller upon delivery or shipment shall be paid by Buyer along with expenses incurred by Seller. Services provided herein shall be charged at the rate prevailing at the time of actual use and Buyer shall pay any increase, and Buyer shall pay directly all costs for storage and subsequent transportation. Failure by Buyer to take delivery of the Equipment shall be a material breach of this Agreement.

Title and risk of loss to the Equipment shall be transferred from Seller to Buyer at the point of delivery upon handover in accordance with this Agreement. Title and risk of loss to the Services shall pass as they are performed.

6. Warranties and Remedies. Seller warrants that Equipment shall be delivered free from defects in material, workmanship and title and that Services

shall be performed in a competent, diligent manner in accordance with any mutually agreed specifications. Seller's warranty does not cover the results of improper handling, storage, installation, commissioning, operation or maintenance of the Equipment by Buyer or third parties, repairs or alterations made by Buyer without Seller's written consent, influent water which does not comply with agreed parameters, or fair wear and tear.

Unless otherwise expressly provided in this Agreement, the foregoing warranties are valid:

(a) for chemicals and Services, for six (6) months from their date of delivery or the provision of Services;

(b) for consumables, including filters and membranes (other than membranes for process treatment), twelve (12) months from their date of delivery;

(c) for membranes for process treatment, ninety (90) days from their date of delivery, ;

(d) for Equipment other than chemicals and consumables, the earlier of, fifteen (15) months from delivery or shipment to storage, or twelve (12) months from start-up/first use;

(e) for software, ninety (90) days from the date of receipt;

(f) for Equipment not manufactured by Seller, the warranty shall be the manufacturer's transferable warranty only,

Any claim for breach of these warranties must be promptly notified in writing, and Buyer shall make the defective item available to the Seller, or the claim will be void. Seller's sole responsibility and Buyer's exclusive remedy arising out of or relating to the Equipment or Services or any breach of these warranties is limited to repair at Seller's facility or (at Seller's option) replace at Seller's facility the defective items of Equipment, and re-perform defective Services. In performance of its obligations hereunder, Seller will not control the actual operation of either Buyer's systems or the Equipment at the Buyer's site.

Warranty repair, replacement or re-performance by Seller shall not extend or renew the applicable warranty period.

The warranties and remedies are conditioned upon (a) proper unloading, handling, storage, installation, use, operation, and maintenance of the Equipment and Buyer's facility and all related system in accordance with Seller's instructions and, in the absence, generally accepted industry practice, (b) Buyer keeping accurate and complete records of operation and maintenance during the warranty period and providing Seller access to those records, and (c) modification or repair of Equipment or Services only as authorized by Seller in writing. Failure to meet any such conditions renders the warranty null and void.

Buyer is not entitled to extend or transfer this warranty to any other party. The warranties and remedies set forth in this article are in lieu of and exclude all other warranties and remedies, statutory, express or implied, including any warranty of merchantability or of fitness for a particular purpose.

Unless otherwise expressly stipulated in this Agreement, Seller gives no warranty or guarantee as to process results or performance of the Equipment, including but not limited to product quality, flow, production, capacity, membrane life, chemical consumption, regulatory compliance or energy consumption.

7. General Indemnity. Seller shall indemnify and hold harmless Buyer from claims for physical damage to third party property or injury to persons, including death, to the extent caused by the negligence of Seller or its officers, agents, employees, and/or assigns while engaged in activities under this Agreement. Buyer shall likewise indemnify and hold harmless Seller from claims for physical damage to third party property or injury to persons, including death, to the extent caused by the negligence of the Buyer, its officers, agents, employees, and/or assigns. In the event such damage or injury is caused by the joint or concurrent negligence of Seller and Buyer, the loss shall be borne by each Party in proportion to its negligence. For the purposes of this article (i) "Third party" shall not include Buyer or any subsequent owner of the Equipment, their subsidiaries, parents, affiliates, agents, successors or assigns including any operation or maintenance contractor, or their insurer; and (ii) no portion of the Equipment is "third party property".

8. Compliance with Laws and Permits. All permits, authorizations, and licenses which are required to construct, install and/or operate Buyer's facility or equipment, to use the Equipment, or to manage and dispose of any wastes, discharges, and residues resulting from Buyer's use of the Equipment, shall be obtained and maintained by Buyer at Buyer's sole expense. Buyer is responsible for compliance with all laws and regulations applicable to the storage, use, handling, installation, maintenance, removal, registration, and labeling of all Equipment after delivery of the Equipment, as well as for the proper management and disposal of all wastes, discharges, and residues.

9. Buyer's Site Conditions. Buyer warrants that any data furnished to the Seller concerning conditions at Buyer's site (including but not limited to any existing Buyer facility, equipment or processes, influent water or other substances to be treated or measured with the Equipment) is accurate and complete, and the Seller reserves the right to utilize

the most appropriate design compatible with generally accepted engineering practices, and to make changes in details of design, manufacture and arrangement of Equipment unless precluded by any limitations specified in this Agreement. Seller shall notify Buyer of (1) any conditions at Buyer's site which materially differ from those indicated in the data furnished by Buyer, (2) any previously unknown physical conditions at Buyer's site of an unusual nature, not revealed by previous investigations and differing from those ordinarily encountered in the type of work provided for in this Agreement, and (3) the presence of any Hazardous Materials (as defined below), the existence of a contaminated soil, unexploded ordinance, or archaeological remains. If such conditions cause an increase in Seller's cost or in the time required for the performance of Seller's obligations, Seller shall be entitled to an equitable adjustment in the Agreement Price and an extension in the time for performance.

10. Hazardous Materials and Wastes. In the event that Seller encounters any Hazardous Materials (meaning toxic substances, hazardous substances, pollutants, contaminants, regulated wastes, or hazardous wastes as such terms may be defined or classified in any law, statute, directive, ordinance or regulations promulgated by any applicable governmental entity) at Buyer's site, other than Hazardous Materials introduced by Seller or that are otherwise the express responsibility of Seller under this Agreement, Buyer shall immediately take whatever precautions are required to legally eliminate such Hazardous Materials so that the Seller's work under this Agreement may safely proceed. At no time shall Seller be deemed to have taken title to or the responsibility for the management or disposal of any wastes, Hazardous Materials, influent water, any resultant product streams, wastewater streams, discharges, cleaning materials, or any other materials or substances processed by the Equipment or otherwise located at Buyer's site. Seller does not take responsibility for and hereby expressly disclaims responsibility for the characterization of wastes, Hazardous Materials, or for the identification, selection, or management of disposal facilities for any wastes.

11. Excusable Delays. Seller shall not be liable nor in breach or default of its obligations under this Agreement to the extent performance of such obligations is delayed or prevented, directly or indirectly, due to causes beyond the reasonable control of Seller, including, but not limited to: acts of God, natural disasters, unusually severe weather, fire, terrorism, war (declared or undeclared) epidemics, material shortages, insurrection, act (or omissions) of Buyer or Buyer's suppliers or agents, any act (or omission) by any governmental authority, strikes, labor disputes, transportation shortages, or vendor non-performance. The delivery or performance date shall be extended for a period equal to the time lost by reason of delay or non-performance, plus such additional time as may be necessary to overcome the effect of the delay or non-performance. If delivery or performance is delayed for a period exceeding 180 (one hundred and eighty) days, either Party may terminate this Agreement without further liability provided that Seller shall be paid an amount equal to that which would be payable to Seller under the article entitled "Termination". If Seller is delayed by any acts (or omissions) of Buyer, or by the prerequisite work of Buyer's other contractors or suppliers, Seller shall be entitled to an equitable adjustment in schedule, price and/or performance, as applicable.

12. Emergencies. If the safety of Seller's personnel is threatened or likely to be threatened by circumstances outside the reasonable control of Seller, including but not limited to war, armed conflict, civil unrest, riots, terrorism, kidnapping, presence of or exposure to hazardous materials, unsafe working conditions, or by the threat of such circumstances or a lack of adequate protections against such circumstances, Seller shall be entitled to take all necessary steps to ensure the security and safety of its personnel including the evacuation of personnel until such circumstances no longer apply. Any such occurrence shall be considered an excusable delay event. Buyer shall reasonably assist in the event of any such evacuation.

13. Confidentiality, Intellectual Property. Both Parties agree to keep confidential the other Party's proprietary non-public information, if any, which may be acquired in connection with this Agreement. Buyer will not, without Seller's advance written consent, subject Equipment to testing, analysis, or any type of reverse engineering. Seller retains all intellectual property rights including copyright which it has in all drawings and data or other deliverables (including the Equipment) supplied or developed under this Agreement. Buyer agrees that it will not file patent applications on the Equipment or any development or enhancement of the Equipment, or of processes and methods of using the Equipment, without Seller's express prior written permission. Buyer further agrees that in any event any such patents will not be asserted against Seller or its other buyers based upon purchase and use of such Equipment. Seller grants to Buyer a non-exclusive, non-terminable, royalty free license to use the intellectual property embedded in Equipment delivered to and paid for by the Buyer, as well as any drawings, design or data delivered to and paid for by the Buyer, for the purposes of owning, financing, using, operating and maintaining the relevant Equipment at Buyer's site. Such license may only be assigned to a subsequent owner of the Equipment or to an operations and maintenance subcontractor. Such license does not extend to the re-

creation of the Equipment or the manufacture of spares or consumables by Buyer or third parties

Any software Seller owns and provides pursuant to this Agreement shall remain Seller's property. Seller provides to Buyer a limited, non-exclusive and terminable royalty free project-specific license to such software for the use, operation or maintenance at Buyer's site of any Equipment purchased hereunder to which the software is a necessary component. Buyer agrees not to copy, sub-license, translate, transfer, reverse engineer, or decode the software.

Seller shall indemnify and hold harmless Buyer from any rightful claim of any third party that any Equipment or Service infringe a patent in effect in the USA, or country of delivery (provided there is a corresponding patent issued by the USA), or USA copyright or copyright registered in the country of delivery. If the Buyer notifies the Seller promptly of the receipt of any such claim, does not take any position adverse to the Seller regarding such claim and gives the Seller information, assistance and exclusive authority to settle and defend the claim, the Seller shall, at its own expense and choice, either (i) settle or defend the claim and pay all damages and costs awarded in it against the Buyer, or (ii) procure for the Buyer the right to continue using the Equipment or Service, or (iii) modify or replace the Equipment or Service so that it becomes non-infringing, or (iv) remove the infringing Equipment and refund the price. The above paragraph shall not apply to any misuse of Equipment or Equipment which is manufactured to the Buyer's design, or to alleged infringement arising from the combination, operation, or use of any Equipment or Services with other equipment or services when such combination is part of any allegedly infringing subject matter. The foregoing list of sub-sections (i), (ii), (iii), and (iv) and related terms state the entire liability of the Seller for intellectual property infringement by any Equipment or Service.

14. Limitations on Liability. Notwithstanding anything else contained in this Agreement, to the maximum extent permitted by law, and regardless of whether a claim is based in contract (including warranty or indemnity), extra-contractual liability, tort (including negligence or strict liability), statute, equity or any other legal theory:

(a) THE TOTAL LIABILITY OF THE SELLER AND OF ITS INSURER FOR ALL CLAIMS ARISING OUT OF OR RELATING TO THE PERFORMANCE OR BREACH OF THIS AGREEMENT OR USE OF ANY EQUIPMENT OR SERVICES SHALL NOT EXCEED THE TOTAL PRICE PAID BY BUYER UNDER THIS AGREEMENT OR (IN THE CASE OF AN AGREEMENT FOR SERVICES WITH A TERM OF MORE THAN ONE YEAR) THE ANNUAL PRICE PAYABLE BY BUYER UNDER THIS AGREEMENT;

(b) IN NO EVENT SHALL SELLER BE LIABLE FOR ANY LOSS OF PROFITOR REVENUES, LOSS OF PRODUCTION, LOSS OF USE OF EQUIPMENT OR SERVICES OR ANY ASSOCIATED EQUIPMENT, INTERRUPTION OF BUSINESS, COST OF CAPITAL, COST OF REPLACEMENT WATER OR POWER, DOWNTIME COSTS, INCREASED OPERATING COSTS, CLAIMS OF BUYER'S CUSTOMERS FOR SUCH DAMAGES, OR FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, INDIRECT, PUNITIVE OR EXEMPLARY DAMAGES;

(c) SELLER'S LIABILITY SHALL END UPON EXPIRATION OF THE APPLICABLE WARRANTY PERIOD, PROVIDED THAT BUYER MAY CONTINUE TO ENFORCE A CLAIM FOR WHICH IT HAS GIVEN NOTICE PRIOR TO THAT DATE BY COMMENCING AN ACTION OR ARBITRATION, AS APPLICABLE UNDER THIS AGREEMENT, BEFORE EXPIRATION OF ANY STATUTE OF LIMITATIONS OR OTHER LEGAL TIME LIMITATION BUT IN NO EVENT – TO THE EXTENT PERMITTED BY APPLICABLE LAW – LATER THAN FIVE (5) MONTHS AFTER EXPIRATION OF SUCH WARRANTY PERIOD.

For the purposes of this article, "Seller" shall mean Seller, its affiliates, subcontractors and suppliers of any tier, and their respective agents and employees, individually or collectively. If Buyer is supplying Seller's Equipment or Services to a third party, Buyer shall require the third party to agree to be bound by this article. If Buyer does not obtain this agreement for Seller's benefit for any reason, Buyer shall indemnify and hold Seller harmless from all liability arising out of claims made by the third party in excess of the limitations and exclusion of this article.

15. Termination. This Agreement and any performance pursuant to it may be terminated by either Party, and the consequences of such termination shall be as set out in the next paragraph, if the other Party

(a) becomes insolvent, makes an assignment for the benefit of its creditors, has a receiver or trustee appointed for the benefit of its creditors, or files for protection from creditors under any bankruptcy or insolvency laws; or

(b) fails to make any payment when due or to establish any payment security required by this Agreement, or commits a material breach or defaults in its material obligations under this Agreement, and such default is not cured within thirty (30) days of written notice from the other Party.

Upon the termination of this Agreement by Buyer for cause (i) Seller shall reimburse Buyer the difference between that portion of the Agreement price allocable

to the terminated scope and the actual amounts reasonably incurred by Buyer to complete that scope, and (ii) Buyer shall pay to Seller (a) the portion of the Agreement price allocable to Equipment completed, and (b) amounts for Services performed before the effective date of termination. Upon the termination of this Agreement by Seller for cause Buyer shall pay to Seller within thirty (30) days of receipt of invoice the price of all Equipment or Services delivered at the date of termination, plus an amount equal to all costs and expenses incurred in the engineering, sourcing, financing, procurement, manufacture, storage and transportation of the Equipment including materials, work in progress and any cancellation charges assessed against Seller by Seller's suppliers including reasonable overhead and profit on all such costs and expenses. Alternatively, if any schedule of termination payments has been agreed between the Parties, Buyer shall pay to Seller within thirty (30) days of receipt of invoice the amounts set out in that schedule.

16. Governing Law, Dispute Resolution. This Agreement shall be governed by the substantive laws of the State of New York. In the event of a dispute concerning this Agreement, the complaining Party shall notify the other Party in writing thereof. Management level representatives of both Parties shall meet at an agreed location to attempt to resolve the dispute in good faith. Should the dispute not be resolved within thirty (30) days after such notice, the complaining Party shall seek remedies exclusively through arbitration. The seat of arbitration shall be the federal district court in Philadelphia, PA, and the rules of the arbitration will be the Commercial Arbitration Rules of the American Arbitration Association, which are incorporated by reference into this article

Notwithstanding the foregoing, each Party shall have the right to commence an action or proceeding in a court of competent jurisdiction, subject to the terms of this Agreement, in order to seek and obtain a restraining order or injunction to enforce the confidentiality intellectual property provisions set forth in the first two paragraphs of article 13; nuclear use restrictions set forth in article 17, or to seek interim or conservatory measures not involving monetary damages.

17. No Nuclear Use. Equipment and Services sold by Seller are not intended for use in connection with any nuclear facility or activity, the Buyer warrants that it shall not use or permit others to use the Equipment or Services for such purposes, without the advance written consent of Seller. If, in breach of this, any such use occurs, Seller (and its parent, affiliates, suppliers and subcontractors) disclaims all liability for any nuclear or other damage, injury or contamination, and, in addition to any other rights of Seller, Buyer shall indemnify and hold Seller (and its parent, affiliates, suppliers and subcontractors) harmless against all such liability.

18. Export Control. Seller's obligations are conditioned upon Buyer's compliance with all USA and other applicable trade control laws and regulations. Buyer shall not trans-ship, re-export, divert or direct Equipment (including software and technical data) other than in and to the ultimate country of destination declared by Buyer and specified as the country of ultimate destination on Seller's invoice.

19. Changes. Each Party may at any time propose changes in the schedule or scope of Equipment or Services. All changes to the Equipment or Services shall be subject to mutual agreement via a written change order or variation, which shall only become effective once signed by both Parties. The scope, Agreement price, schedule, and other provisions will be equitably adjusted to reflect additional costs or obligations incurred by Seller resulting from a change, after Seller's proposal date, in Buyer's site-specific requirements or procedures, or in industry specifications, codes, standards, applicable laws or regulations. It shall be acceptable and not considered a change if Seller delivers Equipment (including Equipment replacement under warranty) that bears a different, superseding or new part or version number compared to the part or version number listed in the Agreement, provided that in no circumstance shall this affect any other of Seller's obligations including those set forth in article 6.

20. Conflicts; Survival, Assignment. If there is any conflict between this Agreement and any written proposal or quotation provided by Seller, then the terms and conditions set forth in this Agreement shall prevail. If any term or condition of this Agreement or any accompanying terms and conditions are held invalid or illegal, then such terms and conditions shall be reformed to be made legal or valid, or deleted, but the remaining terms and conditions shall remain in full force and effect, and this Agreement shall be interpreted and implemented in a manner which best fulfills Parties' intended agreement. Those provisions which by their nature remain applicable after termination shall survive the termination of this Agreement for any reason. Seller may assign or novate its rights and obligations under the Agreement, in whole or in part, to any of its affiliates or may assign any of its accounts receivable under this Agreement to any party without Buyer's consent, and the Buyer hereby agrees, by signing this Agreement, to such assignment and to execute any document that may be necessary to complete Seller's assignment or novation. This Agreement shall not otherwise be assigned by either Party without the other Party's prior written consent, and any assignment without such consent shall be void

Seller may (i) manufacture and source the Equipment and any part thereof globally in the country or countries of its choosing; and (ii) may subcontract

portions of the Services, so long as Seller remains responsible for such.

21. No third party beneficiary. Except as specifically set forth in the article entitled "Limitations on Liability" and “No Nuclear Use”, this Agreement is not intended to, and does not, give to any person who is not a party to this Agreement any rights to enforce any provisions contained in this Agreement.

22. Entire Agreement. This Agreement embodies the entire agreement between Buyer and Seller and supersedes any previous documents, correspondence or agreements between them. No modification, amendment, revision, waiver, or other change shall be binding on either Party unless agreed in writing by the Party's authorized representative. Any oral or written representation, warranty, course of dealing, or trade usage not specified herein shall not be binding on either Party. Each Party agrees that it has not relied on, or been induced by, any representations of the other Party not contained in this Agreement.

23. USA Government Contracts. This article 23 applies only if the Agreement is for the direct or indirect sale to any agency of the USA Government and/or is funded in whole or in part by any agency of the USA Government. Buyer agrees that all Equipment and Services provided by Seller meet the definition of “commercial-off-the-shelf” (“COTS”) or “commercial item” as those terms are defined in Federal Acquisition Regulation (“FAR”) 2.101. To the extent the Buy American Act, Trade Agreements Act, or other domestic preference requirements are applicable to this Agreement, the country of origin of Equipment is unknown unless otherwise specifically stated by Seller in this Agreement. Buyer agrees that any Services offered by Seller are exempt from the Service Contract Act of 1965 (FAR 52.222-41). Buyer represents and agrees that this Agreement is not funded in whole or in part by American Recovery Reinvestment Act funds unless otherwise specifically stated in the Agreement. The version of any applicable FAR clause listed in this Section 18 shall be the one in effect on the effective date of this Agreement. If Buyer is an agency of the USA Government, then as permitted by FAR 12.302, Buyer agrees that all paragraphs of FAR 52.212-4 (except those listed in 12.302(b)) are replaced with these Terms and Conditions. Buyer further agrees the subparagraphs of FAR 52.212-5 apply only to the extent applicable for sale of COTS and/or commercial items and as appropriate for the prices under this Agreement. If Buyer is procuring the Equipment or Services as a contractor, or subcontractor at any tier, on behalf of any agency of the U.S Government, then Buyer agrees that FAR 52.212-5(e) or 52.244-6 (whichever is applicable) applies only to the extent applicable for sale of COTS and/or commercial items and as appropriate for the prices under this Agreement.

Appendix A

Equipment Technical Specifications

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1 general

The ZeeWeed system described in SUEZ Water Technologies & Solutions (“SUEZ”) proposal incorporates many different components. Typical specifications for the individual pieces of equipment included within the complete membrane water/wastewater filtration system are discussed below. Refer to the main proposal text for details on the quantities and capacities of all items included with the membrane filtration system.

2 ZeeWeed membrane modules

ZeeWeed membranes are manufactured by SUEZ. The membrane chemistry is a proprietary hydrophilic polymer and is protected by patents. The membrane is a hollow fiber ultrafiltration membrane having a nominal pore size of 0.04 micron and an absolute pore size of 0.1 micron.

The membrane material is resistant to chemical oxidants including chlorine, chlorine dioxide, and potassium permanganate.

The 500-series membranes are designed for low-vacuum and immersed applications.

For the immersed design, the individual ZeeWeed membrane fibers are potted together into modules; groups of modules are assembled into cassettes, which are then suspended in the membrane tank, hung from support beams.

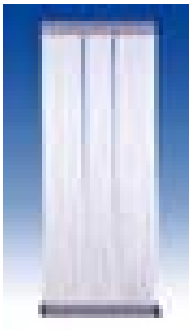
The membrane cassettes may be removed from the ZeeWeed membrane tanks by a lifting device, such as an overhead monorail, traveling bridge-crane and hoist, or similar lifting device.

Below is a brief summary of all current ZeeWeed membrane module and cassette types.

ZeeWeed membrane type	immersed or non-immersed	vacuum or pressure	surface area per module	max no. of modules per cassette	application	dry cassette weight [1]	lifting device rating
			ft²			lbs	lbs
500d	Immersed	vacuum	430	52	MBR	4,172	9,370

[1] With lifting frame.

Below is a pictorial presentation of all current ZeeWeed 500-series membrane module and cassette types.

ZW500d module and cassettes


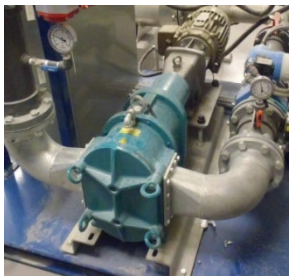
3 major equipment

3.1 process pumps

3.1.1 reversible rotary lobe process pumps

This specification applies to pumps that will be in contact with water that has been filtered by the membrane system, as well as water that will be fed back to the membranes for cleaning purposes.

capacity range	7 – 5,000 USgpm
pump manufacturer	Boerger, Vogelsang or equal
pump type	rotary lobe positive displacement
flanges	drilled to ANSI B16.1 Class 150 raised face or custom
configuration	reversible (Bi-directional)
casing	cast iron; 316 Stainless Steel optional
lobes	core: cast iron. elastomer: Buna-N; EPDM, FPM optional
shaft & sleeve	non-product wetted, materials manufacturer standard
lubrication	flooded oil bath / quench lubricated, no seal flush required
bearings	manufacturer standard
seal type	single acting, oil quenched mechanical seal. Material: duronit; SIC/SIC (silicon carbide) optional
seal lubrication	food grade oil or glycerin mixture
seal manufacturer	Boerger or equal
base plate	carbon steel, hot dipped galvanized
coupling	KTR flexible coupling, or as specified
motor	TEFC, std or premium efficiency; NEMA design B; Class F insulation; Class B temperature rise; maximum Speed: 3600 rpm; service factor: 1.15 suitable for constant torque inverter duty (15-60 Hz or 6-60 Hz; minimum turndown; 10:1 for premium efficiency motor), or as specified



4 priming systems

Neither air separators, nor vacuum pumps are being used by SUEZ for the purpose of removing air from permeate suction piping and/or priming the permeate pump. Instead, air-driven ejectors (eductors) are being used.

4.1 ejectors

The following table lists typical specifications for air-driven ejectors which are used to remove air from process piping:

type	air-driven
manufacturer	PIAB
model	P6010
feed air pressure (MAX)	101.5 psi
source of air	oil-less compressor
noise level	65-70 dBA
temperature range	14°F - 176°F
weight	3.74lb - 3.96lb
material	AL, PA, NBR, SS, TPE

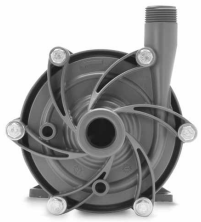
5 chemical pumps

The chemical pumps, listed below, are used with the membrane chemical cleaning systems for adding chemical solution within a short period of time into backpulse or CIP pump discharge for pulsing membranes during cleaning.

5.1 centrifugal pumps

Centrifugal pumps are used for membrane cleaning chemical solution transfer duty, where a high capacity is required.

capacity range	0.5 – 20 gpm
manufacturer	Finish Thompson
model & type	DB9V-R-FF-M219
body	PVDF
connection	FRP ANSI 150#
motor	1 HP



6 air compressors & driers

6.1 air compressors

Air compressors are used for pneumatic valve and air-diaphragm pump operation. Where possible, they will be freestanding, tank mounted units.

The compressor system, air receivers and other equipment will be sized to provide adequate air for the ZeeWeed system operation. The final sizing of the compressor will depend on the air requirements of the air-diaphragm pumps and valve actuators included with the membrane filtration system.

6.2 instrument air compressors

type	oil-lubricated style	
operating range	0 to 100 cfm	
manufacturer	Gardner Denver (champion), DV systems or equal	
series	Gardner denver PL series or DV systems HDI series **or equal**	
compressor type	two stage, oil-lubricated	
maximum pressure	up to 175 psig	
lubrication	pressure lubrication with positive displacement oil pump	
drive	belt-driven with belt guard	
motor	TEFC; 1800 rpm; Up to 25 hp	
standard accessories	pressure gauge, pressure relief valve, tank drain, shut-off valve, enclosed belt guard, pressure switch and inlet filter.	

6.3 air receivers

Receivers will be built according to ASME code, with compressor mounted on top.

type	free-standing, horizontal or vertical; painted carbon steel construction	
manufacturer	Gardner denver (Champion), DV systems or equal	
volume	80 to 500 USGAL, based on plant service air requirements	
standard accessories	receiver tank solenoid auto drain receiver tank discharge isolation valve pressure relief valve pressure gauge	

6.4 refrigerated air dryers

Refrigerated air driers are supplied for operation with the compressor units. Each drier has a condensing unit, refrigerant evaporator, mechanical separator, automatic condensate discharge valve, pre-filter, and after-filter. The drier is equipped with filters to remove oil carryover, oil aerosols, and other particulate matter.

type	non-cycling refrigerated air
manufacturer	Gardner denver (champion), DV systems or equal
model	CRN
capacity	based on plant service air requirements
connections	NPT threaded
accessories	auto drain
voltage	115 V / 1 Ph / 60 Hz

6.5 miscellaneous appurtenances

The compressor system is supplied with the necessary pressure relief valves, coalescing filters, particulate air filters, process air regulator assemblies, automatic drain valves, and controls, as required, to provide a complete functional system.

general service filter for valve service air

type	general purpose coalescing filter
manufacturer	Deltech 300 series, SMC /PNEUMATICS, or equal
connections	inlet & outlet: threaded 1/4" – 1" NPT (size varies based on system capacity) Automatic brass drain: threaded 1/8"FPT
body	die cast aluminum & chromated housing
max/min inlet air pressure	250 / 30 psig
max/min inlet air temperature	65 – 2°C (150 / 35 °F)
filter size	particulate removal: 1.0 micron oil removal: 2.0 mg/m^3
standard accessories	includes differential gauge, audible safety alarm, internal automatic drain
approvals	ISO 8573.1 class 2 solids, class 4 oil , tested to ISO12500 standard

7 valves

The following are the general specifications for the main types of valves used in ZeeWeed plants.

7.1 process valves

butterfly valves- 2”-20” diameter

type	butterfly
manufacturer	Bray series 30/31, resilient seated
style	lug pattern
body	cast iron, epoxy coated
disc	nylon coated ductile iron
shaft	stainless steel
seat	EPDM – NSF 61
manual operators	under 8” - manual lever; 8” & larger - gear

type	butterfly valve
manufacturer	Victaulic
style	Series 700
body	ductile iron conforming to ASTM A-536
disc	Al-Bz or 316 SS
shaft	416 SS
seat	EPDM or nitrile
manual operators	handle cast ductile iron

chemical feed Lines (< 3”)

type	ball
applications	chemical feed lines
manufacturer	George Fischer type 546 or equal
style	Tru-union
body, plug, shaft	PVC
seals	EPDM or viton (chemical pending)
manual operators	manual lever

7.2 process check valves

general service permeate lines

type	Wafer style double door / Swing style
manufacturer	Centerline 800 series, RitePRO or equal
style	Wafer suitable for installation between ANSI #150 flanges
body	cast iron / 304SS
disc	316 stainless steel
seat	EPDM

chemical feed lines (< 3")

type	Ball check
manufacturer	Georg fisher 561/562 series
body, disc	PVC / CPVC as required

7.3 actuators

7.3.1 pneumatic actuators

general service

type	double acting cylinder – rack & pinion drive	
manufacturer	Bray series 92/93	
operating pressure	965 kPa (140 psig)	
body material	extruded aluminum alloy, anodized	
travel stop	±5° at 0° and 90° positions	
end caps	die cast aluminum alloy	
pistons	die cast aluminum alloy	
output shaft	carbon steel (zinc plated)	
shaft bearings	Acetal	
fasteners	stainless steel	
'o' rings	Buna-N	
air solenoid	NAMUR direct mount, 110VAC or 24VDC, NEMA 4, 4X	
additional features	open and closing speed control	
position control	electro-pneumatic bray 6A digital positioner; 4-20mA Input; NEMA4X enclosure (note: position control is only needed and therefore supplied on control valve applications).	

general service - PVC valves

type	double acting	
manufacturer	George fischer type 230/233	

operating pressure	1034 kPa (150 psig)	
body material	PP, fiberglass-reinforced	
end caps	PP, fiberglass-reinforced	
selector switch	integral: local / off / remote	
indicating lights	integral: open / close	
state logic circuits	solid, with monitor relay output and phase discriminator	

7.4 miscellaneous valves

7.4.1 instrument isolation valves

The instrument isolation valves typically used throughout the membrane system are listed in the following table.

type	manual ball valve
manufacturer	Pinacle, Apollo or equal
style	reduced port threaded
body/ball	316 stainless steel
seat	PTFE
connection	typically 0.5” NPT

7.4.2 solenoid valves

2-way isolation

The solenoid valves typically used throughout the membrane system are listed in the following table.

type	solenoid valve	
service	air / water	
manufacturer	Burkert or equal	
model	type 6014	
style	FNPT, normally closed	
body	316 stainless steel / brass	
seal	EPDM	
power	120VAC or 24VDC	
power connection	0.5” NPT conduit, type H electrical	

7.4.3 angle-seat valves

Angle-seat valves are used in applications which may be subject to vacuum where a solenoid would otherwise be an ideal fit. This style of valve is used extensively in our MIT lines for delivering air to the membranes and pressure transmitters.

type	angle seat	
service	air/water vacuum rated	
manufacturer	Burkert or equal	
model	Type 2000	
style	typically, FNPT, normally closed	
body	316 stainless steel	
seal	PTFE	
packing gland	self-adjusting PTFE stem seals	
air	80 PSIG	
air connection	0.25” NPT	
power	120VAC or 24VDC	
power connection	0.5” NPT Conduit	
accessories	comes complete with stainless steel pilot solenoid	

7.4.4 needle valves

The needle valves typically used throughout the membrane system are listed in the following table.

manufacturer/series	Parker V-series
body/seat materials	316 stainless steel

8 process instrumentation

The following process instruments are included with the ZeeWeed system. Output signals from all these instruments are connected to the PLC system.

8.1 flow switches

Flow switches are included to provide flow confirmation in air or water lines from blowers and pumps respectively.

application	air	liquid
manufacturer	Kobald or equal	E&H or equal
series	KAL-L	T-switch, model ATT11
sensor type / material	probe sensor 316 stainless steel	flat face sensor 316 stainless steel
process connection	0.5” MNPT	
accuracy	+/- 5%	
housing	Nylon NEMA 4X	
integral LCD	yes, 4-digit	
power / connection	18 to 30 VDC / 0.5” NPT	

8.2 electromagnetic flowmeters

Flowmeters are included for monitoring the permeate flow from each train, the reject flow from each train and backpulse/CIP flow to the membranes as well as a train’s recirculation flow.

manufacturer	E&H
series	Promag 10
process connections	ANSI #150 flanged
housing	Aluminum NEMA 4X
flowtube	304 stainless steel
liner	PTFE
accuracy	+/- 0.5%
operator interface	Local
output	4-20 mA DC, scaled pulse output
power / connection	85-260 VAC 60 Hz / 0.5” NPT

8.3 air flow transmitters

Air flow transmitters are included on the discharge of some blowers to monitor airflow to the membrane aerators and/or aerobic diffusers.

manufacturer	E&H
series	T-mass, Model 65I
process connections	MNPT ANSI, 316L SS
housing	aluminum NEMA 4X
sensor material	316 stainless steel
seal	Viton
accuracy	+/- 2%
output	4-20 mA
power / connection	85 to 260 VAC / 0.5” NPT
integral LCD	Yes

8.4 level transmitters

Level transmitters are included for monitoring the liquid levels in the membrane tanks or in the inlet flow distribution channel to each series of membrane tanks. They are also included on the backpulse/CIP tank, if applicable. Two basic types of level transmitters, top and side entry, are generally used with ZeeWeed membrane systems depending on the application and both are described below.

manufacturer	E&H	
application	top entry	side entry
series	FMB52	PMC51 or FMB50
process connections	3” 150 # flange (316 stainless steel)	1-1/2” to 3” 150 # flange (316 stainless steel) & 1-1/2” NPT connections available.
mounting	1-1/2”, 2”, and 3” 150 # Flange (316 stainless steel) & 1-1/2” NPT connections available.	
output signal	4-20 mA	
voltage	11.5 to 30 VDC	
diaphragm	ceramic	
housing	aluminum NEMA 4X	
integral LCD	yes	

8.5 pressure transmitters

Pressure transmitters monitor the vacuum applied to the membranes during permeating and the positive pressure applied during backpulsing. The pressure transmitters are mounted on the permeate collection header pipes included with the ZeeWeed system and are typically calibrated at –15 psi to +15 psi. Typical specifications are listed in the following table.

manufacturer	E&H
model	Cerabar S PMC-41/51/71
mounting	0.5” NPT
output signal	4-20 mA
voltage	11.5 to 30 VDC
diaphragm	ceramic
housing	aluminum NEMA 4X
integral LCD	yes

8.6 temperature transmitters

manufacturer	E&H
type	head mounted temperature, TH13
model	TR 11 RTD assembly
mounting	0.75” NPT process connection
power supply	24 V DC
output signal	4-20 mA
voltage	– 125 to 1200 mV
housing	transmitter installed in aluminum enclosure mounted directly on sensor
ambient temperature range	– 40 to 85oC

8.7 turbidimeters

Continuous on-line turbidimeters are included as a means of verifying the integrity of the membranes by taking water samples from the discharge side of the permeate pumps. Typical component specifications are listed below.

manufacturer	Hach or equal
model	TU5300 SC
range	0-700 NTU
inlet	0.25” FNPT

outlet	0.25” FNPT
output signal	4-20 mA
power	120V/1ph/60 Hz
accessories	sensor, analyzer unit, interconnecting cable, alarm relays for indication of alarm conditions and one (1) Formazin Calibration Kit

manufacturer	Hach or equal
model	SC 200
output signal	4-20 mA
power	10 to 240 VAC; or 24 VDC
display	LCD

8.8 float level switches

Where included, float level switches are MJK Model 7030 or equal.

8.9 pressure gauges

Pressure gauges are included for the various pumps and blowers included with the ZeeWeed system. Pressure gauges are liquid filled and are Ashcroft or equal with 316SS wetted parts. Pressure gauges are supplied complete with isolation ball valves (refer to 1.18.5)/gauge cocks between the pressure gauge and the process line.

8.10 pressure switches

Pressure switches are provided for high-pressure alarm on the permeate collection pipes to prevent over-pressurizing of the membranes during backpulsing. In addition, pressure switches are included to provide low pressure warning for the compressed air for the pneumatic valves.

The types of flow switches used in the different applications are listed in the following table.

permeate lines	united electric J6 series or equal with 316 stainless steel wetted parts and bellows
compressed air line	united electric H100 series or equal with 316 stainless steel wetted parts and bellows

9 motor specifications

general duty

Electrical motors supplied with the equipment generally have the specifications outlined in the following table.

less than 0.50 HP	480 VAC or 600 VAC / 3 ph / 60 (50) Hz if possible 120 VAC / 1ph / 60 (50) Hz otherwise TEFC
0.50 HP or more	600, 480, or 400 V / 3 ph / 60 (50) Hz NEMA frame design B NEMA class “B” temperature rise meeting EPACT efficiency requirements

- motors fitted to permeate pumps are TEFC type.
- motors fitted to air blowers are ODP type.
- motors for use with VFDs are inverter duty rated.
- motors for use with VFDs shall have the following turn to turn insulation requirements:
- for motors <75HP:
  - at least 1000V for 230V or lower nominal power
  - at least 1600V for 460/480V nominal power
  - at least 1800V for 575/600V nominal power
- for motors ≥75HP motors should be fully compliant to NEMA standard MG1 part 31
- motors have cast iron or steel frames, cast iron end brackets, a cast iron conduit box, and a 1.15 service factor at 40°C.
- motors are GE, USEM, Brooks Hansen, Reliance, Westinghouse, Toshiba or equal.

10 fabricated equipment

10.1 membrane cassette supports

10.1.1 ZW-500d membrane cassette brackets

The ZW-500d membrane cassettes will be suspended from brackets which are anchored to the tank walls for concrete tanks. The brackets are designed to hold the weight of sludged cassette, tank covers, as well as a 300 lb concentrated load.

The brackets are designed to hold the weight of one hanging/installed sludged cassette plus one on top of the gratings (for cassette's inspection) , provided that the membrane tank is full of water.

10.2 lifting equipment for SUEZ membranes

Refer to section 2 for crane lifting capacities. For more complete information on lifting equipment refer to a SUEZ document 'ZeeWeed 500 series membrane lifting equipment guideline' that can be provided upon request.

10.3 permeate collection and air scour header pipes

The scope of supply for the permeate collection and air header distribution piping is specified on the P&ID's accompanying this proposal. Generally, SUEZ's scope for permeate and air distribution piping includes the piping from the cassettes to the header, and the header up to the internal side of the tank wall.

As a standard, each row of membrane cassettes will be provided with [one (1)] permeate collection header pipe, as well as [one (1) or two (2)] air headers. The permeate collection headers are manufactured of 316L stainless steel. The air scour headers are manufactured of 304L stainless steel.

10.4 piping

The following table lists the types of process piping supplied with ZeeWeed plants. These specifications do not include miscellaneous small bore tubing for instrument air, seal water lines, and so on. Note that these specifications are general, and the types of piping listed below are not necessarily included in SUEZ's scope of supply. Refer to the specific P&IDs accompanying the proposal, which delineate the scope of supply for the piping included with the system.

permeate piping	
in membrane tanks	schedule 10 316L SS, or schedule 80 PVC
outside of membrane tanks ≤ ϕ12" (300 mm)	schedule 80 PVC or schedule 10 316L SS
outside of membrane tanks ≥ ϕ14" (350 mm)	schedule 10 304L SS
air piping	
in membrane tanks	schedule 10 304L SS

outside of membrane tanks	schedule 40 carbon steel
chemical feed system piping	schedule 80 PVC or CPVC; PE tubing

10.4.1 PVC

- ❑ piping: conforming to ASTM D1785
- ❑ fittings: conforming to ASTM D2467
- ❑ flanges: slip-ring (Van-Stone) type

10.4.2 CPVC

- ❑ piping: conforming to ASTM F441
- ❑ fittings: injection molded type
- ❑ flanges: slip-ring (Van-Stone) type

10.4.3 stainless steel

- ❑ rolled pipe: conforming to ASTM A778 for pipe >12". ASTM A312 for <12", ANSI B36.19
- ❑ cast fittings: conforming to ASTM A778, ANSI B36.19 & ANSI B16.9
- ❑ fabricated pipe: from sheet conforming to ASTM A240
- ❑ fabricated fittings: from sheet conforming to ASTM A240
- ❑ fitting dimensions conform to ANSI B16.9
- ❑ flanges: welded or slip-ring (Van-Stone) with drilling conforming to ANSI B16.9