PORT ST. LUCIE CITY COUNCIL
AGENDA ITEM REQUEST

COUNCIL ITEM DATE 13f 2/27/12

Meeting Date: **February 27, 2012**

Public Hearing ____ Ordinance ____ Resolution ____ **Motion X**

Item: 20110120 – Reverse Osmosis Membrane Replacement. Award bid to Hydranautics in the amount of $242,550.00, plus $10.00 Indemnity Fee for a total of $242,560.00.

Recommended Action:
Approval to enter into a contract with Hydranautics for Reverse Osmosis Membrane Replacement in the amount of $242,550.00, plus $10.00 indemnification fee for a total of $242,560.00.

Exhibits: Department memo attached **[X] yes**
Copies of the Bid tabulation Report, Specifications, and the original submitted Bid Replies.

Summary Explanation/Background Information:

Bids were solicited to replace aging reverse osmosis (RO) membrane elements in train 1 and/or train 2 at the Prineville Water Treatment Plant. The bid was competed among three (3) pre-qualified manufacturers resulting from a pilot test program: Toray Membrane USA, Hydranautics, and Dow Film Tec. All three manufacturers responded and were determined responsive bidders:

1. Toray Membrane USA $253,260.00
2. Hydranautics $242,550.00
3. Dow Film Tec. $330,750.00

Hydranautics submitted the lowest responsive bid and met all specifications. The Utility Services Department is recommending the bid be awarded to Hydranautics and requests approval to enter into a contract.

Purchase (**X**) is a replacement Purchase (**X**) was budgeted.

One time Expenditure:	**$242,550.00**
Indemnification Fee	**$10.00**
Total	**$242, 560.00**

Department requests expenditure from the following:

Fund	438	Renovation and Replacement
Cost Center	3310	Water-Plant Operation
Object Code	563000	Improvements Other Than Building
Project	00000	N/A

RECEIVED
FEB 21 2012
City Manager's Office

Director of OMB concurs with award: _____ City Manager concurs with award: _____

Submitted by: ***Jesus A. Merejo***

Title: Utility Director Date Submitted: February 21, 2012

INTEROFFICE MEMORANDUM

TO: David K. Pollard, Budget Director

From: Jesus A. Merejo, Utility Director

SUBJECT: Drinking Water RO Membrane Replacement Bid #20110120

DATE: February 17, 2012

The Reverse Osmosis Membranes from the original phase of the Prineville RO Water Treatment Facility are reaching the end of their useful life at 13 years.

The membrane manufacturers that responded to the bid prepared by OMB were Filmtec Corporation, Toray Membrane USA Inc., and Hydranautics.

Utility staff have reviewed the bid packages and recommends that the award be given to Hydranautics as they were the lowest bidder and met all specifications.

Total cost of the project is $242,550.00 and funding is available in account 438-3310-563000-00000.

Your assistance in forwarding this item for the City Council's consideration will be appreciated.

PV/

Copy: Brad Macek, Assistant Utility Director
Jeanette Thompson, Budget Manager
Pierre Vignier, Plant Superintendent
Helen Quintana, Contract Specialist

SB #20110120

DRINKING WATER REVERSE OSMOSIS (RO) MEMBRANE REPLACEMEMENT

OPENED: DECEMBER 27, 2011 @ 3:00 P.M

BID TABULATION REPORT

FILMTECH CORP/DOW		TORAY MEMBRANE USA		HYDRANAUTICS	
Total Cost		Total Cost		Total Cost	
$330,750.00		$253,260.00		$242,550.00	
Additional Items Reviewed:					
Bid Checklist Included	☑		☑		☑
Drug Free Workplace Form Included	☑		☑		☑
Bid Bond	☑		☑		☑
Each Addendum Acknowledged	☑		☑		☑
Copy of Ins. Certificate Certificate	☑		☑		☑
Copies of licenses and certification	☑		☑		☑
Shop drawings and instrumentation requirements	☑		☑		☑
List of information to maintain warranty	☑		☑		☑
Submitted warranty and guarantees	☑		☑		☑
Product Literature including design specifications for membrane elements	☑		☑		☑
Performance test data on all membranes	☑		☑		☑
Provided five (5) References	☑		☑		☑
Submited one (1) Original and three (3) copies of required documents	☑		☑		☑
Will accept VISA purchasing card	N		N		N

CITY OF PORT ST. LUCIE
OFFICE OF MANAGEMENT & BUDGET
BID TABULATION REPORT

BID # 20110129
OPEN: December 27, 2011
TIME: 3:00:00pm

BID TITLE: Drinking Water RO Membrane Replacement

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22 DEC PM 1:41 10s
RECEIVED

Hydranautics

27 DEC AM 9:54 12s
RECEIVED

TMUS

27 DEC PM 2:55 53s
RECEIVED

Filmtec

SB #20110070

CITY OF PORT ST. LUCIE
OFFICE OF MANAGEMENT & BUDGET
BID TABULATION REPORT

BID #.20110120
OPENED: December 27, 2011
TIME: .3:00 P.M.

BID TITLE: Drinking Water RO Water Main

The following vendor(s) submitted proposals:

Dow/Filmtech Corp - $ 330,750.00

Toray membrane USA - $ 253,260.00

Hydranautics - $242,550.00

The following vendor's submitted a "No Bid":

Number of Companies Notified: .....
Number of Bid Documents Distributed: .....
Number of Bids Received: .....

NOTE: Offers from vendors listed herein are the only offers received timely as of the above opening date and time. All other offers submitted in response to this solicitation, if any, are hereby rejected as late.

Harold G Trowell / Dow Chemical Co.

BID ADDENDUM #2

BID # 20110120
Drinking Water RO Membrane Replacement
Addendum Date: December 16, 2011

Please make the following changes/modifications to the subject bid:

NOTE: The bid opening date is changed to December 27, 2011 @3:00 P.M.

Questions & Answers

Q1. We request that you review the specifications for the subject project, namely section 3.04, C.2. It states "*Prior to starting the performance testing, the MES shall provide a temporary piping system to direct the test water to the domestic sewer system*".

This work should be done by the City's contractor who will be installing the membrane elements. This company will be making mechanical modifications to the membrane trains, so it will be logical and more cost effective for them to install the temporary PVC piping.

A1. Replace Section 3.04 C.2.

"*Prior to starting the performance testing, the MES shall provide a temporary piping system to direct the test water to the domestic sewer system.*"

With the following revised 3.04 C.2.:

"The MES shall notify the City two weeks prior to starting the performance testing. During the two weeks, the City will coordination of all temporary piping to direct the test water to the domestic sewer system. The City will be responsible for procurement and installation of the test piping. Once the test piping is completed, the MES shall obtain bacteriological clearance and complete the three-day testing within two weeks from the MES requested start date of the performance testing. Any additional rental or other fees associated with the use of the temporary piping required for performance testing and bacteriological clearance will be at the MES's expense."

Q2. We are currently reviewing the requirements for Sealed Bid 20110120. According to the Insurance Section on page 21 – Section 5.5 - It states that the certificate of insurance and policy shall unequivocally provide a minimum 30 day written notice to the City prior to cancellation, non-renewal …

Below is the statement from our insurance provider on this statement:

"Within the past year, Marsh and other US brokers have been forced by the various state departments of insurance to follow the policy terms and conditions with regard to cancellation wording on the certificates of insurance that we issue. Unfortunately, your casualty policies, and the vast majority of the casualty policies that are arranged in the USA, do not include a requirement that the insurer must provide 30 days notice of cancellation to a client's certificate holders. Most insurers will not even discuss the possibility of adding an endorsement when requested as they consider this to be an administrative issue that is not related to the coverage. Given this situation, we have been advising our clients to offer that they provide 30 days notice of cancellation if they decide to cancel their policies for some reason. Most certificate requestors

are now aware of the new restrictions and have been understanding of this since your competitors will be facing similar difficulties with their certificates, however, they have not yet updated their contract requirements to require that the bidder provide notice rather than the insurer."

Will the City accept the MES notifying them instead of the Insurance Company?

A2. Yes, the City will accept notice from the MES.

Instructions to Bidder:

Each bidder must acknowledge receipt of any addenda on the Bid Reply Sheet in order to have his/her bid to be accepted.

BID ADDENDUM #1

BID # 20110120

Addendum Date: December 12, 2011

Drinking Water RO Membrane Replacement

Please make the following changes/modifications to the subject bid:

Questions & Answers

Q1. Can you tell us the temperature range for the operation of the system and the design temperature?

A1. The temperature is estimated to range from 24 to 25 degrees Celsius.

Q2. It appears that Toray, Dow and Hydranautics are the only ones allowed to bid but there is significant On-site Representative to Supervise Membrane Installation, Performance Testing and Start-Up that would be done by an OEM not a membrane supplier. Do you plan to accept bids from companies like AEREX, HARN RO etc?

A2. The City currently has a contract in place with a qualified OEM.

NOTE: The bid opening date is unchanged.

Instructions to Bidder:

Each bidder must acknowledge receipt of any addenda on the Bid Reply Sheet in order to have his/her bid to be accepted.

"A City for All Ages"

CITY OF PORT ST. LUCIE

Sealed Bid #20110120

Drinking Water RO Membrane Replacement

Prepared By: Helen Quintana, CPPB
Office of Management & Budget
121 SW Port St. Lucie Boulevard
Port St. Lucie, FL 34984-5099
772-871-5221

INVITATION TO BID

NOTE: THIS INVITATION IS ONLY OPEN TO THE FOLLOWING CONSULTANTS WHO HAVE BEEN PREQUALIFIED WITH THE CITY THROUGH THE PILOT TESTING CONTRACT **#20100019:**

Toray Membrane USA;
Hydranautics; &
Dow Film Tec.

Sealed Bid **#20110120** for Reverse Osmosis (RO) Membrane Replacement will be received by the Office of Management and Budget of the City of Port St. Lucie no later than **3:00 p.m.** on **December 20, 2011**. Specifications are attached.

Bids must be mailed or delivered to the Office of Management & Budget, 3rd Floor, Suite 390, Building "A" of the Municipal Complex located at 121 SW Port St. Lucie Boulevard, Port St. Lucie, FL 34984-5099.

All bids must be received by the date and time specified above, when they will be opened and publicly read aloud. The bid time must be and shall be scrupulously observed. Under no circumstances shall bids delivered after the time specified be accepted or considered. It is the sole responsibility of the Bidder to ensure that his or her bid reaches the Office of Management and Budget on or before the closing date and time. The City shall in no way be responsible for delays caused by any occurrence. No exceptions will be made.

The City of Port St. Lucie reserves the right to reject any and all bids, to waive any and all informalities or irregularities, and to accept or reject all or any part of any bid as it may deem to be in the best interest of the citizens of the City.

Each Bidder must deposit with his bid, a bid bond, or bid guaranty, in the amount of five percent (5%) of the bid total, made payable to the City of Port St. Lucie.

Helen Quintana, CPPB
Contract Specialist

CAUTION

Bidders should take caution if United States mail or mail delivery services are utilized for the submission of bids. Internal mail distribution in City Hall frequently does not occur prior to 2:00 pm. It is suggested that you mail your response in adequate time to assure that it will arrive on the day prior to the closing date.

INVITATION TO BID

NOTE: THIS INVITATION IS ONLY OPEN TO THE FOLLOWING MANUFACTURERS WHO HAVE BEEN PREQUALIFIED WITH THE CITY THROUGH THE PILOT TESTING CONTRACT #20100019:

Toray Membrane USA;
Hydranautics; &
Dow Film Tec.

Sealed Bid **#20110120** for Reverse Osmosis (RO) Membrane Replacement will be received by the Office of Management and Budget of the City of Port St. Lucie no later than **3:00 p.m.** on **December 20, 2011**. Specifications are attached.

Bids must be mailed or delivered to the Office of Management & Budget, 3rd Floor, Suite 390, Building "A" of the Municipal Complex located at 121 SW Port St. Lucie Boulevard, Port St. Lucie, FL 34984-5099.

All bids must be received by the date and time specified above, when they will be opened and publicly read aloud. The bid time must be and shall be scrupulously observed. Under no circumstances shall bids delivered after the time specified be accepted or considered. It is the sole responsibility of the Bidder to ensure that his or her bid reaches the Office of Management and Budget on or before the closing date and time. The City shall in no way be responsible for delays caused by any occurrence. No exceptions will be made.

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SPECIFICATIONS
BID #20110120

REVERSE OSMOSIS MEMBRANE REPLACEMENT

OVERVIEW:

The City of Port St. Lucie ("City") is preparing to replace aging reverse osmosis (RO) membrane elements in train 1 and/or train 2 at the Prineville Water Treatment Plant (WTP). Trains 1 and 2 each operate with a two-stage, 31:14 array configuration with the first stage consisting of thirty-one (31) pressure vessels and the second stage consisting of fourteen (14) pressure vessels. Each pressure vessel houses seven (7) membrane elements for a total of three hundred fifteen (315) membrane elements per train. The City may elect to replace membranes for one or both trains.

NOTE: The City may not accept proposals from firms that have had adversarial relationships with the City or firms that have represented entities that have had adversarial relationships with the City. This includes the firm, employees and financial or legal interests.

INTENT:

The City of Port St. Lucie intends to enter into a lump sum contract with one contractor to provide all materials and services as required to manufacture, test, deliver, store as well as supervise installation and testing for six hundred and thirty (630) new eight inch (8") diameter brackish water membrane elements (315 per train) for trains 1 and 2 at the Prineville Water Treatment Plant (WTP) in accordance with the requirements specified herein.

1. GENERAL REQUIREMENTS

1.1 Invitation to Bid - All requirements contained in the Invitation to Bid are hereby incorporated in this specification.

1.2 Cost of Preparation of Bid - The City will not be responsible for any cost incurred by any bidder in the preparation of his/her bid.

1.3 Examination of Drawings and Contract Documents - Bidders shall thoroughly examine these specifications and all other drawings, documents or other materials referred to herein and conduct such investigations and visits as may be necessary to thoroughly inform themselves regarding existing plant, facility, personnel and other conditions relative to compliance with this specification. No plea of ignorance by the Bidder of conditions that exist or may hereafter exist, as a result of failure or omission on the part of the Bidder to make said investigations and visits, and/or failure to fulfill in every detail the requirements of this specification and documents promulgated therein, will be accepted as a basis for varying the requirements of the City or the compensation of the Bidder(s).

1.4 Bid Price - Bidders must agree to furnish all item(s) that are awarded to them as a result of their response to this specification at the price(s) indicated on their respective Bid Reply Sheet. Bidders guarantee that said price(s) are firm, not subject to escalation, for the ninety (90) days after bid opening period. Submittal of a bid shall be prima facie evidence of the Bidder's intent to comply with this requirement. Any bid submitted with escalation clauses shall be rejected.

1.5 Qualifications - Bidders shall have the necessary organization, experience, capital, and equipment to carry out the provisions of the Contract to the satisfaction of the City. Bidders will submit all required licenses and certifications required to perform this project with the bid reply. References from five (5) existing firms to which it has provided these types of services in the past or with which it is under Contract for such services presently and the names of company representatives who may be contacted for references shall be furnished on the **Reference Check Form** and returned with the **Bid Reply Sheet**. References are subject to verification by the City and will be utilized as part of the award process. Performance history, financial statements, list of projects recently completed and in process, major equipment available for this project and experience of the principal members of the Bidder's organization must be furnished within seven (7) days, *if requested.*

1.6 Award of Contract – The City shall take measures as deemed necessary to determine the ability of the Bidder to perform the obligations of the Contract. The City may reject any bid where an investigation of the available information indicates a Bidder is not the most qualified to perform the obligation of the Contract. The City may require a Bidder to furnish additional statements of qualifications. Some or all of the following criteria may be used to select the bid(s) that will provide the best value to the City:

- Have sufficient financial resources to complete the order.
- Can meet quoted delivery considering all other business commitments.
- Has a satisfactory record of performance.
- Has adequate staffing to fulfill requirements.
- Has the necessary production, technical equipment and facilities (or ability to readily obtain them).
- Has necessary organization experience, operational controls, and technical skills (or ability to readily obtain them).
- Bidder is a manufacturer, supplier, authorized distributor or vendor for the requirement.
- The Bidder is qualified and eligible to receive an award under applicable laws and regulations.
- Has bid within a competitive price range in relation to the needed goods, services or construction.
- The skill and experience demonstrated by the bidder in performing contracts of a similar nature.
- The Bidder's past performance with City.
- Has met all requirements of the solicitation (delivery, quality and price).
- Has met bounds of commonality. Absolute conformity is not required, just substantial or material compliance.
- Has met bid security requirements. Lack of security, where required, is a material nonconformity.
- Price: The element of price is but one of the criteria elements. When considering a proposal: Evaluate the pricing offered by the Bidder; consider lifecycle costing, and depreciation.
- Determine what proposal provides the best value to the City.
- City Ordinance 35.12 - Local Preference will apply.

The award date is the date that City Council executed the motion to award the bid(s) regardless of the date Bidder received the notification of award. Notification of the award may be given by e-mail, facsimile, U.S. mail system, courier, or on the City's web site.

1.7 Variances to Specifications - Bidders must indicate any variances to the Specifications. Additionally, if bids are based on alternate products, Bidder must indicate the manufacturer's name and number of the alternate item(s) being offered and attach appropriate specifications. If variations and/or alternates are not stated in Bidder's reply, it shall be construed that the bid fully conforms to the specifications.

1.8 OSHA Compliance - Bidders must agree that the products furnished and application methods will comply with applicable provisions of the Williams-Steiger Occupational Safety and Health Act of 1970. These requirements shall include all primary and refresher training mandated under the OSHA guidelines.

1.9 Submittal of Bid - Unless otherwise provided herein, all bids shall be submitted by completing and returning the **Bid Reply Sheet and any other documentation that is required by this bid**. The Bid Reply Sheet should be typed or printed and signed in black ink. The individual signing the bid must initial all changes. Bidders shall submit **one (1) unbound original and three (3) copies** of the required bid documents. The documents must be returned in an envelope marked with the vendor's name, bid number, title of bid, and date and time of opening on the outside of the envelope. Responses by telephone, telegram or facsimile shall not be accepted.

1.9.1 Right to Reject -The City reserves the right to waive irregularities, reject and/or accept any and all bids, in whole or in part, to solicit and re-advertise for new bids, abandon the project in its entirety, or take other such action as serves the best interests of the City.

1.9.2 Timeliness of Submittal - All bids must be received by the date and time specified above, when they will be publicly opened and read aloud. The bid time must be and shall be scrupulously observed. Under no circumstances shall bids delivered after the time specified be considered. It is the sole responsibility of the Bidder to ensure that his or her bid reaches the Office of Management and Budget (located on the 3rd Floor, Suite 390, of Building "A") on or before the closing date and time. The City shall in no way be responsible for delays caused by any occurrence.

1.9.3 Bid Opening Extension – The City reserves the right to extend the bid opening date when no responses or only one (1) response is received. The City will return the received response unopened.

1.9.4 Checklist - Bidders are requested to return the attached Checklist that is contained in the bid package **with the Bid Reply Sheet**.

1.10 Shipping Terms - Bidders shall quote F.O.B. Destination. (See also 1.05 DELIVERY, STORAGE AND HANDLING, on Page 13.)

1.11 Payment Terms - Invoices shall be submitted once a month, by the10th of the month and payments shall be made within thirty - (30) days from receipt of an acceptable invoice, unless Contractor has chosen to use the Purchasing Card. Cash discounts for using the Purchasing Card will be considered when evaluating bids.

PLEASE NOTE

The City has implemented a **Purchasing Card Program.** The Bidder can take advantage of this program and in consideration receive payment within several days instead of the City's policy of Net 30 Days After Receipt of Invoice (ARI). Any percentage off the bid price for the acceptance

of Visa will be considered in the bid award. If no such percentage is given, the City shall assume 0% discount applies.

Bidders are requested to **state on the Bid Reply Sheet** if they will honor the VISA Purchasing Card. In the event of failure on the part of the Bidder to make this statement the City shall assume the purchase or Contract price shall be governed by the Net 30 ARI.

1.12 Execution of Contract or Purchase Order – If awarded the contract, the Contractor will be required to execute a Standard City Contract within ten (10) days after notification by the City that Contract is available and thereafter comply with the terms and conditions contained therein. No Contract shall be considered binding upon the City until all parties have properly executed it and a purchase order or Visa order form has been issued. The Bidder will be required to accept the terms and conditions of the City's Contract as provided in this proposal. Read the insurance requirements carefully. If Bidder cannot accept these terms and conditions do not submit a bid.

1.13 Failure to Execute Contract – Failure on the part of the Bidder to execute the Contract as required may be justification for the annulment of the award.

1.14 Subcontracting or Assigning of the Contract – The Contractor shall not subcontract, sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of the work provided for therein, or of his right, title or interest therein, to any person, firm or corporation without the written consent of the City. **Each Bidder shall list all subcontractors and the work provided by the suppliers in the area provided on the Bid Reply Sheet.**

1.15 Time of Award - The City reserves the right to hold bid guarantees for a period not to exceed 90 days after the date of the bid opening stated in the Invitation to Bid before making award.

1.16 Public Entity Statement - Section 287.133 of the Florida Statutes places the following restrictions on the ability of persons convicted of public entity crimes to transact business with the City:

"A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in s. 287.017 for CATEGORY TWO for a period of 36 months following the date of being placed on the convicted vendor list." § 287.133(2) (a), Fla. Stat. (2010)

1.16.1 Discrimination – An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not award or perform work as a contractor, supplier, subcontractor, or consultant under contract with any public entity, and may not transact business with any public entity.

1.17 City's Public Relations Image – The Contractor's personnel shall at all times handle complaints and any public contact with due regard to the City's relationship with the public. Any personnel in the employ of the Contractor involved in the execution of work that is deemed to be conducting him/her self

in an unacceptable manner shall be removed from the project at the request of the City Manager, or his/her designee.

1.18 Patent Fees, Royalties, and Licenses – If the Contractor requires or desires to use any design, trademark, device, material or process covered by letters of patent or copyright, the Contractor and his surety shall indemnify and hold harmless the City from any and all claims for infringement in connection with the work agreed to be performed. The Contractor shall indemnify the City from any cost, expense, royalty or damage which the City may be obligated to pay by reason of any infringement at any time during the prosecution of or after completion of the work.

1.19 Tie Bid Statement - Identical tie bids, in accordance with Section 287.087, Florida Statutes, preference shall be given to businesses with drug-free workplace programs. Whenever two or more bids that are equal with respect to price, quality, and service are received by the City for the procurement of commodities or contractual services, a bid received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process. Please submit the form that is enclosed with your bid response.

1.20 Cooperative Purchasing Agreement - This bid may be expanded to include other governmental agencies provided a cooperative Purchasing Agreement exists or an Inter-local Agreement for joint purchasing exists between the City of Port St. Lucie and other public agencies. Bidders may agree to allow other public agencies to contract with them for the same items at the same terms and conditions as this bid, during the period of time that this bid is in effect. Each political entity will be responsible for execution of its own requirements with the Bidder.

1.21 Material Safety Data Sheets – The Bidder, if awarded the contract, shall provide MSDS's and description literature for each chemical/compound/mixture used in the performance of the Contract to the City before the commencement of any work. All MSDS's shall be of the latest version and comply with 29 CFR1910.1200. Hazardous products shall not be used except with prior approval of the City, and must be disposed of properly by the bidder in accordance with U.S. Environmental Protection Agency 40-CFR 260-265. The Bidder shall maintain and have readily accessible on-site a complete MSDS book of all chemicals, compounds/mixtures used in the execution of the contract.

1.22 Personal Protective Equipment (PPE) - All personnel are required to wear PPE in the process of the work including eye protection, hearing protection, respiratory protection as necessary, gloves, approved safety boots with steel or composite toes and any other PPE as necessary for the work.

1.23 Permits – The Bidder, if awarded the contract, shall be responsible for obtaining all permits, licenses, certifications, etc., required by federal, state, county, and municipal laws, regulations codes, and ordinances for the performance of the work required in these specifications and to conform to the requirements of said legislation.

> **1.23.1** The selected Bidder shall be required to complete a **W-9 Taxpayer Identification Form** provided with the City's contract and **return it with the contract and insurance documents**.

1.24 Familiarity with Laws – The Bidder is assumed to be familiar with all federal, state and local laws, ordinances, rules and regulations that may affect the work. Ignorance on the part of the Bidder will in no way relieve him from responsibility. Bidder will submit all proposals in compliance with the 28 C.F.R. § 35.151.

1.25 Damage to Property – The Bidder shall preserve from damage all property along the line of work, or which is in the vicinity of or is in any way affected by the work, the removal, or destruction of which is

not called for by the plans. This applies to public and private property, public and private utilities, trees, shrubs, crops, signs, monuments, fences, guardrail, pipe and underground structures, public highways, etc. Whenever such property is damaged due to the activities of the Bidder, it shall be immediately restored to a condition equal to or better than existing before such damage or injury was done by the Bidder, and at the Bidders expense. The Bidder's special attention is directed to protection of any geodetic monument, horizontal, vertical or property corner, located within the limits of construction.

National Geodetic Vertical Datum 1929 (NGVD '29) or North American Vertical Datum 1988 (NAVD '88) monuments shall be protected. If in danger of damage, notify:

Geodetic Information Center
6001 Executive Boulevard
Rockville, MD 20852
Attn: Mark Maintenance Center
(301) 443-8319

City of Port St. Lucie vertical or horizontal datum shall also be protected. In case of damage or if relocation is needed, notify:

City of Port St. Lucie
Engineering Department
121 SW Port St. Lucie Boulevard
Port St. Lucie, FL 34984-5099
(772) 871-5175

2. SPECIAL REQUIREMENTS

2.1 Implied Warranty of Merchantability - It is understood that the implied warranty of merchantability and fitness for the specified purpose are not disclaimed not withstanding any representation to the contrary.

2.2 Warranty and Guarantee – All products furnished by the selected Contractor shall be supplied with all warranties and guarantees of the manufacturer. All products must be warranted by the selected Contractor to be free of defects in workmanship and material for a period of not less than five (5) years; said period to commence upon the date products are installed. Or accepted by the City, whichever last occurs. **Also see Section 3.06 of Specifications.**

2.2.1 Repair or Replacement- Should any defect appear during this period, the Bidder(s) shall, at their expense, have repaired or replaced such item upon receipt of written notice from the City of said defect. Said repair or replacement must be accomplished within ten (10) days after receipt of notification from the City of the defect.

2.3 Samples - Samples of items, when required, must be furnished free of expense and, if not destroyed, will upon request, be returned at the Bidder's expense. Request for the return of samples must be made within 30 days following opening of bids. Each individual sample must be labeled with Bidder's name, bid number, and item number. Failure of Bidder to either deliver required samples or to clearly identify samples as indicated may be reason for rejection of the bid. Unless otherwise indicated, samples should be delivered to the Office of Management and Budget.

2.4 Delivery – See Part 1 – General; Section 1.05 *Delivery, Storage and Handling* on page 13.

2.5 Safety Precautions - The Contractor shall erect and maintain all necessary safeguards for the protection of the Contractor's employees and subcontractors, City personnel, and the general public; including, but not limited to, posting danger signs, and other warnings against hazards as is prudent and/or required by law to protect the public interest. All damage, injury or loss to persons and/or property caused, directly or indirectly, in whole or in part, by the Contractor's employees, or subcontractor(s), or anyone directly or indirectly employed by said parties shall be remedied by the Contractor.

2.6 Discrepancies - If, in the course of performing work resulting from an award under this specification, the Contractor finds any discrepancy between the area defined in these specifications and the actual area where work is being performed, the Contractor shall discontinue work on the subject area and inform the Contract Supervisor of the discrepancy. The Contractorr shall thereafter proceed as authorized by the Contract Supervisor who will document any modification to these specifications that he authorized in writing as soon as possible.

2.7 Suspension of Work - The City may at any time suspend work on the entire job or any part thereof by giving three (3) calendar days written notice, signed by the Contract Supervisor, to the Contractor. The Contractor shall resume the work within three (3) calendar days after a written notice to resume work, signed by the Contract Supervisor, and is issued to the Contractor.

2.8 Emergencies - In the event of emergencies affecting the safety of persons, the work, or property, at the site or adjacent thereto, the Contractor, or his designee, without special instruction or authorization from the City, is obligated to act, at his discretion, to prevent threatened damage, injury or loss. In the event such actions are taken, the Contractor shall promptly give to the Contract Supervisor written notice of any significant changes in work or deviations from the contract documents caused thereby, and if such action is deemed appropriate by the Contract Supervisor a written authorization signed by the Contract Supervisor covering the approved changes and deviations will be issued. Appropriate compensation adjustments will be approved, provided the cause of the emergency was beyond the control of the Contractor.

2.9 Standard Production Items - All products offered must be standard production items that have been available to the trade for a period of not less than two (2) years and are expected to remain available in future years.

2.10 Deductions - In the event the City deems it expedient to perform work which has not been done by the Contractor as required by these Specifications, or to correct work which has been improperly and/or inadequately performed by the Contractor as required in these Specifications, all expenses thus incurred by the City, at the City's option, will be invoiced to the Contractor and/or deducted from payments due to the Contractor. Deductions thus made will not excuse the Contractor from other penalties and conditions contained in the Contract.

3. SPECIFIC REQUIREMENTS – DUTIES TO BE PERFORMED:

3.1 Interpretation of the Approximate Quantities - The Bidder's attention is called to the fact that any estimate of quantities of work to be done and materials to be furnished under the specifications as shown on the proposed form, or elsewhere, is approximate only and not guaranteed. The City does not assume any responsibility that the final quantities shall remain in strict accordance with the estimated quantities, nor shall the Bidder plead misunderstanding or deception because of such estimate of quantities or of the character, location of the work, or other condition pertaining thereto.

3.2 Description - Listed below are the minimum requirements:

MEMBRANE ELEMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. The City of Port St. Lucie is preparing to replace aging reverse osmosis (RO) membrane elements in train 1 and/or train 2 at the Prineville Water Treatment Plant (WTP). Trains 1 and 2 each operate with a two-stage, 31:14 array configuration with the first stage consisting of thirty-one (31) pressure vessels and the second stage consisting of fourteen (14) pressure vessels. Each pressure vessel houses seven (7) membrane elements for a total of three hundred fifteen (315) membrane elements per train.

2. The Membrane Element Supplier (MES) shall provide all materials and services as required to manufacture, test, deliver, store as well as supervise installation and testing for six hundred thirty (630) new 8-inch diameter brackish water membrane elements (315 per train) for trains 1 and 2 at the Prineville Water Treatment Plant (WTP) in accordance with the requirements specified herein.

3. The City may elect to purchase replacement membranes for one or both trains. As such the MES shall provide the unit pricing accordingly.

4. If the City elects to purchase replacement membranes for both trains, only one membrane train will be allowed to be offline at a time. The train taken off line must be placed back into service prior to taking the second membrane train out of service. Each membrane train shall successfully complete all the testing requirements listed in **Part 3 of this specification** prior to being placed into service.

B. Scope of Supply

1. The Contractor shall be responsible for providing all materials and services associated with the project including but not limited to:

   a. Membrane Element Product Literature
   b. Membrane Software Performance Projections

   Submittals

c. Wet Testing and Report Data
d. Data Normalization Program
e. Delivery of Membranes
f. On-site Representative to Supervise Membrane Installation, Performance Testing and Start-Up
g. Performance Test Results Report
h. Warranty and Guarantees

C. Water Quality and Performance Requirements

1. Raw Water Quality

Parameter	Unit	Design Raw Water Quality
Alkalinity, Total	mg/L as $CaCO_3$	155
Aluminum	mg/L	< 0.05
Antimony	mg/L	< 0.0075
Barium	mg/L	0.031
Boron	mg/L	0.36
Bromide	mg/L	7.3
Calcium	mg/L as $CaCO_3$	114
Chloride	mg/L	1,490
Color	CPU	5
Fluoride	mg/L	4.9
Iron, dissolved	mg/L	< 0.02
Iron, total	mg/L	< 0.02
Magnesium	mg/L	104
Manganese, dissolved	mg/L	< 0.0025
Manganese, total	mg/L	< 0.0025
Nitrate (as N)	mg/L	< 0.5
Potassium	mg/L	25
Silica Dioxide	mg/L	22
Sodium	mg/L	695
Strontium	mg/L	14.6
Sulfate	mg/L	244
TOC	mg/L	2.5
Total Dissolved Solids (Gravimetric)	mg/L	2,860

2. **Performance Requirements**

Item	Unit	Quantity
Minimum Recovery	%	80
Permeate Production Capacity per Train	mgd	1.81
Maximum Feed Pressure to Produce Design Permeate	psi	220
Maximum 1st Stage Permeate Back Pressure	psi	50
Total Combined Permeate TDS Concentration (1st and 2nd stages)	mg/L	125
Maximum Average Flux Rate per Train	gfd	14.5
Maximum Total Combined Chloride	mg/L	50
Maximum Permeate Calcium	mg/L as $CaCO_3$	10
Maximum Permeate Sodium	mg/L	50

1.02 QUALITY ASSURANCE

A. The MES shall assume responsibility for all requirements within these specifications. The membrane elements shall be products of, and/or warranted by the MES. The MES shall be responsible for providing all required submittals and start-up assistance as detailed in Part 3 of these specifications.

1.03 BID SUBMITTALS

A. Each MES preparing a bid for the membrane replacement shall complete and submit each item listed within Part 1.03 of this specification. All items not submitted with the bid shall not be considered in the evaluation and MES selection.

B. Shop drawings and instrumentation requirements, including membrane projections for the membrane elements **shall be submitted** to establish compliance with these specifications.

C. All necessary instrumentation to maintain the membrane warranty **shall be listed in the submittals.** Any additional instrumentation equipment not currently being utilized on trains 1 and 2 shall be implemented at the Owner's discretion with the Owner's funds. The current monitored parameters include:

1) Feed Pressure
2) Interstage Pressure
3) Concentrate Pressure
4) First Stage Permeate Pressure (Manual Gauge)
5) Total Permeate Pressure
6) Feed Conductivity
7) Concentrate Conductivity

8) First Stage Permeate Conductivity (Manual Sample)
9) Total Permeate Conductivity
10) Concentrate Flow Rate
11) Second Stage Permeate Flow Rate
12) Total Permeate Flow Rate
13) Temperature

D. **Warranty and guarantees shall be submitted in accordance with Part 1.06 of this specification.**

E. **Complete product literature including design specifications for the membrane elements shall be submitted in accordance with Part 2.01 of this specification.**

F. **Performance test data on all membranes shall be submitted in accordance with Part 3.04 of this specification.**

1.04 POST-MANUFACTURING SUBMITTALS

A. The manufacturer shall submit wet test data on the manufactured individual membrane elements to be shipped for installation. All membrane elements shall be subject to approval prior to shipping from the factory.

B. The wet test data submitted shall contain performance chloride testing results as well as salt rejection rate, flux rate tested, serial numbers and other pertinent data to demonstrate membrane performance and compliance with these specifications.

C. Membranes shall not be shipped prior to approval and acceptance of wet test data by the Owner or Owner's Representative.

1.05 DELIVERY, STORAGE AND HANDLING

A. The MES shall provide delivery of the new membrane elements to the City's Prineville Reverse Osmosis Water Treatment Plant in Port St. Lucie, FL. The MES shall be solely responsible for the initial unloading and handling of the membrane elements. The City will provide for storage of one (1) set of 315 membrane elements for up to one (1) week prior to the installation. Any additional storage shall be provided by the MES. This cost shall be included in the price of the membrane elements.

1.06 WARRANTY AND GUARANTEES

A. The MES shall furnish a written guarantee for all work and materials against defects for a period of one (1) year from the date of formal acceptance by the Owner. All membrane replacements, including materials as well as all labor necessary to fully install and test replaced membranes required during the first year of operation shall be performed at no cost to the Owner.

B. In addition to the one-year warranty period described above, the MES shall provide a membrane performance guarantee from the membrane manufacturer for a period of five (5) years from the date of the Owners' formal acceptance of the membranes. The membrane elements shall be warranted to meet the design water quality criteria specified herein for a period of five (5) years from the date of formal acceptance by the Owner. The Owner shall notify the MES in writing of final acceptance of the installed materials via certified letter following successful completion of

the performance testing. Membrane repairs, including materials as well as all labor necessary to fully install and test repaired membranes, required during the five (5) year warranty period shall be performed at no cost to the Owner. Membrane replacements, including all materials, for claims made after one year shall be performed at the original element purchase price less a prorated refund as a linear function of cost-vs.-time over the total warranty period on the unrealized warranty life. All labor utilized for warranty repairs and/or replacements shall be the responsibility of the MES and shall be of no cost to the Owner.

1.07 BID EVALUATION

A. Bids will be evaluated by the Owner and Engineer prior to selection of a MES. The evaluation shall be based on several parameters to be provided within the Bid Submittals listed in Part 1.03 of this specification. Considerations for evaluation include the membrane projection based water quality performance, pressure requirements and energy consumption, bid price, and warranty.

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PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Membrane Elements

1. The brackish water membrane elements shall be manufactured by Toray Membrane USA model TMG20-400, Hydranautics model ESPA2-LD, or FilmTec BW30 and XLE hybrid configuration.

2. The membrane material shall be a thin film composite, polyamide complete with an integral anti-telescoping device. The membrane elements shall be nominally eight (8) inches in diameter and forty (40) inches in length and comply with the following parameters:

    a) Minimum Active Membrane Area: 400 ft2
    b) Minimum Salt Rejection: 99%
    c) Withstand a Maximum Cleaning Temperature: 105 °F (40.5 °C)
    d) Withstand a Cleaning pH Range: 1-13
    e) Withstand an Operating pH Range: 2-11
    f) Minimum Flow Spacer: 34 mil (0.864 mm)
    g) Minimum Flow Rate per Membrane Element: 8,200 gpd
    h) Maximum Pressure Drop per Membrane Element: 20 psi

3. All membrane elements shall be NSF 61 approved for drinking water application. The MES shall submit the NSF 61 approval for the respective membrane elements.

4. The **MES shall submit in writing complete software projections including: the membrane make/model, flux rates, recovery, and product water quality based on the raw water quality provided in Part 1.01.** The projections shall include simulations for 0-year, 3-year, and 5-year designs using a fouling factor of 0.75 at 5 years and using a salt passage of 5% per year. Design projections, calculations and other pertinent documentation shall be submitted to the Owner with the Manufacturer's bid.

5. The membrane elements shall be capable of meeting the performance requirements specified in Part 1.01. Failure to meet the performance requirements shall result in rejection of the membrane elements. The MES may elect to replace all the membranes or a portion of the membranes in order to meet the performance requirements. All replacement labor, equipment and testing shall be at the expense of the MES.

6. All brine seals, o-rings, inter-connectors, gaskets and other seals required for complete installation and operation of the membrane trains shall be provided by the MES.

B. End Adaptors

1. The MES shall provide all end adaptors for the existing pressure vessels as required to ensure proper installation and operation of the membrane elements.

2. Of the 45 pressure vessels currently installed on each train, the following are the model numbers for each vessel type:
    a) 38 Vessels are Code Line Model #80A30
    b) 7 Vessels are Pro-Tech Model #8-300-SP

3. All end adaptors shall be furnished complete with all necessary o-rings, seals and gaskets as required for complete installation of the membrane elements.

C. Spare Parts

1. The MES shall include sufficient spare seals, gaskets and inter-connectors per the Manufacturer's recommendation. At a minimum, the following spares shall be provided:

    a) Twenty-four (24) o-rings of each size needed for installation
    b) Ten (10) brine seals
    c) Twelve (12) inter-connectors
    d) Two (2) end adaptors for each vessel type

PART 3 – EXECUTION

3.01 INSTALLATION

A. The MES shall furnish the services of a competent and experienced representative to supervise and instruct the installation of the membrane elements by the Owner's selected Contractor. The MES representative shall have complete knowledge of proper installation and operation of brackish RO systems.

B. The Owner shall provide an experienced Contractor and adequate labor to load membrane elements for each skid. All serial numbers will be recorded in order of installation of the membrane train.

C. The MES shall furnish any materials and labor required for custom or special order loading of membrane elements. The Owner is responsible for loading the membranes only. Any sorting of membrane elements or special arrangement for loading the membranes shall be the responsibility of the MES.

3.02 INSTALLATION INSPECTION

A. At the completion of installation of the membrane elements, the MES representative shall inspect the installed membrane elements and perform the necessary testing to ensure that the membranes are ready for startup.

B. The MES shall give, in writing to the Owner, a written report certifying proper installation and provide three (3) days notice that the train is ready to undergo the performance test.

3.03 BACTERIOLOGICAL TESTING

A. At the completion of installation of the membrane elements, the membrane train shall begin bacteriological testing and clearance.

B. The membrane train shall have two consecutive acceptable bacteriological test reports taken at 24-hour intervals.

C. The Owner's selected Contractor shall be responsible for clearance of the membrane train including taking samples and disinfecting the unit. The Owner shall provide lab analysis of the bacteriological samples and distribute results to the MES.

3.04 MEMBRANE PERFORMANCE TESTING

A. Test Duration

1. A three (3) day (8 hours per day) performance demonstration test shall be conducted by the MES to monitor and demonstrate the performance of the new membrane elements and make minor adjustments to the equipment. The test shall be coordinated with the Owner.

2. If the plant is shut down for any reason, other than those listed below, the respective day's testing shall be restarted on the following day. If the test is interrupted for the following reasons, the period elapsed while the plant is not operating shall not penalize the MES performance test however, the downtime shall be added to the duration of the daily test.

    a) Loss of feed water delivered to the membrane elements for reasons beyond the control of the Owner.
    b) Loss of power to the membrane system for reasons beyond the control of the Owner.

3. The entire three (3) day test must be completed and accepted by the Owner and Engineer prior to placing the membrane train back into service.

B. Supervision of Performance Testing

1. The MES shall be responsible for the onsite supervision of the performance testing and all start-up activities as required, to ensure the equipment is operated in accordance with the manufacturer's recommendations.

2. A competent and knowledgeable MES representative will be required to be on-site approximately eight (8) hours for each of the three (3) days while each train is completing the performance testing.

C. Test Conditions

1. Each membrane train shall be tested for the duration listed above under the water quality and performance requirements within Part 1.01 of this specification. Each parameter shall be maintained throughout the entire performance test as demonstrated by the sample analysis.

2. Prior to starting the performance testing, the MES shall provide a temporary piping system to direct the test water to the domestic sewer system.

D. Water Quality Sampling

1. During the entire test duration, instrument readings and samples shall be taken every one (1) hour by the MES for the following parameters to demonstrate compliance with the performance requirements. The parameters to be sampled every hour include:

a) Feed Conductivity
b) Interstage Conductivity
c) Concentrate Conductivity
d) 1st Stage Permeate Conductivity
e) 2nd Stage Permeate Conductivity
f) Total Permeate Conductivity
g) Vessel Permeate Conductivity (all 45 vessels)
h) Feed Pressure
i) Interstage Pressure
j) Concentrate Pressure
k) 1st Stage Permeate Pressure
l) Total Permeate Pressure
m) Concentrate Flow Rate
n) 2nd Stage Permeate Flow Rate
o) Total Permeate Flow Rate

2. During each eight (8) hour test, the MES shall coordinate the collection of one suite of samples for the feed, permeate and concentrate streams. These samples shall be submitted to the Owner's preferred lab for analysis of the parameters identified in Part 1.01. The Owner shall provide for sampling and lab analysis of three sampling events per train. Additional sampling events required due to failure to maintain performance test parameters identified in Part 1.01, shall be the responsibility of the MES.

3. The Owner shall arrange for the collection of samples and laboratory analysis of these water samples at a state certified laboratory approved by the Owner. All sample analyses shall be completed and the results delivered to the Owner by the laboratory within twenty-one (21) days after sample collection. The Owner shall forward all lab results directly to the MES upon receipt. If necessary, all deficient parameters will be noted by the Owner/Engineer and the respective testing shall be repeated at the MES' expense until satisfactory results are obtained.

E. Test Report

1. At the completion of the performance testing of each train, the MES shall prepare a test report which shall include the following information for each element: membrane serial number, date of test, test conditions (temperature, pressure, feed water composition, recovery), water quality analyses and test results (salt rejection, membrane productivity).

2. The test report should include the normalized data as prepared by the MES' data normalization program. All data shall be presented in raw format as well as normalized data.

3. The test report shall be submitted to the Owner within twenty-one (21) days of the completion of the performance test and demonstrate compliance with the performance requirements specified in Part 1.01. The report shall also include a log of any operational events including membrane unit downtime and causes as well as operator observations.

F. Performance Test Acceptance Criteria

1. Acceptance of the performance test by the Owner shall be based on the demonstrated ability of the membrane elements to meet all of the performance requirements in Part 1.01 consistently throughout the duration of the test.

2. Following successful completion of the performance testing and submittal of the test report by the MES, the Owner shall notify the MES in writing of final acceptance of the installed materials via certified letter.

3. Performance testing that does not meet the performance requirements listed within this Specification shall be repeated by the MES at no cost to the Owner. All necessary labor, sampling and lab analyses shall be at the expense of the MES.

4. If the performance testing fails to demonstrate compliance with the specified performance requirements, the test shall be restarted. In the event any of the guarantees cannot be met, the MES shall be responsible for making any changes required in order to meet the guarantees. Following the completion of any required changes, the test shall be repeated.

5. All necessary labor required substituting membrane elements or custom load elements shall be at the expense of the MES and no cost to the Owner.

END OF SECTION

4. BID, PERFORMANCE AND PAYMENT BOND REQUIREMENTS

4.1 Proposal Guaranty - A Bid Bond, certified check, cashiers check, bank money order, bank draft on any national or state bank, or cash, in a sum of not less than 5% of the amount of the bid, made payable to the "City of Port St. Lucie", shall accompany each proposal as a guarantee that the Bidder will execute the required Contract and promptly deliver the required Insurance Certificates, and other documentation required by these Specifications. Company checks are not acceptable. Bid Bonds must be executed by a fully authorized Surety licensed by the State of Florida. The failure on the part of the Bidder to comply with this requirement will be cause for the rejection of the bid. The Payment and Performance Bonds will be subject to the provisions and limitations of Section 255.05 of the Florida Statutes.

4.2 Return of Proposal Guaranty - After the bids have been reviewed, the Purchasing Agent may, at his/her discretion, return the guaranty deposit accompanying such proposals as in his/her judgment would not likely be considered in making the award. All other proposal guaranties will be held until the Contract has been executed, after which the proposal guaranty will be returned to the respective Bidder's whose proposals they accompanied.

4.3 Execution of Contract - After the recipient of an award has been determined and necessary approvals obtained, the City will prepare a formal Contract to be executed by the parties. The Contract will be in substance the same as the Contract given to the Bidder with these Specifications. The Bidder shall execute the Contract, deliver the required Insurance Certificates and policies, and other documentation, and furnish an acceptable Performance and Payment Bond complying with the statutory requirements set forth in Section 255.05, Florida Statutes, in the amount of 100% of the Contract price. The City will execute the Contract. It is agreed and understood that the City will not be bound by the Contract unless and until it has been duly authorized by the City Council and has been executed by the City Manager and a purchase order or Visa order form has been issued. A fully authorized Surety, licensed by the State of Florida shall execute the Performance and Payment Bond. The Performance and Payment Bond shall remain in effect until one (1) year after work required has been completed and accepted by the City.

4.4 Failure to Execute - The failure on the part of the Bidder to execute the Contract and/or punctually deliver the required Insurance Certificates and other documentation may be cause for the annulment of

the award. In the event of the annulment of the award, the amount of guaranty deposited with the proposal will be retained or be paid upon demand to the City, not as a forfeiture, but rather as liquidated damages for the breach of the Contract, it being agreed to by each Bidder in advance that the City will sustain certain damages by reason of the failure of the Bidder to sign the Contract and/or deliver the required Insurance Certificates and other documentation and that such damages equal the amount of the bid security, or exceed the same, and in no event shall the Bidder thereafter be permitted to contest to the contrary and does waive such right upon submitting a bid.

5. INSURANCE REQUIREMENTS

The parties agree and recognize that it is not the intent of the City of Port St. Lucie that any insurance policy/coverage that it may obtain pursuant to any provision of this Contract will provide insurance coverage to any entity, corporation, business, person, or organization, other than the City of Port St. Lucie and the City shall not be obligated to provide any insurance coverage other than for the City of Port St. Lucie or extend its immunity pursuant to Florida Statutes, Section 768.28 under its self insured program. Any provision contained herein to the contrary shall be considered void and unenforceable by any party. This provision does not apply to any obligation imposed on any other party to obtain insurance coverage for this project, any obligation to name the City of Port St. Lucie as an additional insured under any other insurance policy, or otherwise protect the interests of the City of Port St. Lucie as specified in this Contract.

Bidders are required to submit a copy of their current insurance certificates with the Bid Reply Sheet. The Bidder including any and all independent contractors and subcontractors utilized must comply with the insurance requirements as outlined below. It shall be the responsibility of the Bidder to insure that all independent contractors and subcontractors comply with these requirements. All insurance policies shall be issued from a company or companies duly licensed by the State of Florida. All policies shall be on an occurrence made basis; the City shall not accept claims-made policies. Specific endorsements as well as increased limits of liability may be requested depending upon the type and scope of work to be performed. All insurance must be acceptable by and approved by the City as to form and types of coverage. Coverages outlined below shall apply on a primary and non-contributory basis.

5.1 Indemnification – The Bidder shall indemnify and hold harmless the City, and its Officers and their employees, from liabilities, damages, losses, and costs, including but not limited to, reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentionally wrongful conduct of the Bidder and all persons employed or utilized by the Bidder in the performance of the construction contract. As consideration for this indemnity provision, the Bidder shall be paid the sum of $10.00 (ten dollars), which will be added, to the Contract price and paid prior to commencement of work.

5.2 Workers Compensation - The Bidder shall agree to maintain Workers' Compensation Insurance & Employers' Liability in accordance with Section 440, Florida Statutes. Employers' Liability must include limits of at least $100,000 each accident, $100,000 each disease/employee, $500,000 each disease/maximum. A Waiver of Subrogation endorsement must be provided. Coverage should apply on a primary basis. Should scope of work performed by contractor qualify its employee for benefits under Federal Workers' Compensation Statute (example, U.S. Longshore & Harbor Workers Act or Merchant Marine Act), proof of appropriate Federal Act coverage must be provided.

5.3 Business Auto Policy - The Bidder shall agree to maintain Business Automobile Liability at a limit of liability not less than $500,000 each occurrence for any auto, owned, non-owned and hired automobiles. In the event, the Bidder does not own any automobiles; the Business Auto Liability requirement shall be amended allowing Bidder to agree to maintain only Hired & Non-Owned Auto Liability. This amended requirement may be satisfied by way of endorsement to the Commercial

General Liability, or separate Business Auto Coverage form. Certificate holder must list the City as additional insured. A waiver of subrogation must be provided. Coverage should apply on a primary basis.

5.4 Commercial General Liability - Commercial General Liability insurance issued under an Occurrence form basis, including Contractual liability, to cover the hold harmless agreement set forth herein, with limits of not less than:

Each occurrence	$1,000,000
Personal/advertising injury	$1,000,000
Products/completed operations aggregate	$2,000,000
General aggregate	$2,000,000
Fire damage	$100,000 any 1 fire
Medical expense	$10,000 any 1 person

An Additional Insured endorsement **must** be attached to the certificate of insurance and must include coverage for Completed Operations (should be ISO CG20101185 or CG20371001 & CG20100704) under the General Liability policy. Products & Completed Operations coverage to be provided for a minimum of five (5) years from the date of possession by owner or completion of contract. Coverage is to be written on an occurrence form basis and shall apply as primary. A per project aggregate limit endorsement should be attached. Defense costs are to be in addition to the limit of liability. A waiver of subrogation is to be provided in favor of the City. Coverage for the hazards of explosion, collapse and underground property damage (XCU) must also be included when applicable to the work performed. Coverage shall extend to independent contractors and fellow employees. Contractual Liability is to be included. Coverage is to include a cross liability or severability of interest's provision as provided under the standard ISO form separation of insurer's clause. There shall be no exclusion for Mold, Silica or Respirable Dust or Bodily Injury or Property Damage arising out of heat, smoke, fumes or ash from a hostile fire.

5.5 Additional Insured Requirements & Certificates of Insurance - Immediately following notification of the award of this Contract, Bidder shall agree to deliver to the City a Certificate(s) of Insurance evidencing that all types and amounts of insurance coverage required by this Bid have been obtained and are in full force and effect. Such Certificate(s) of Insurance and policy shall unequivocally provide a minimum thirty (30) day written notice to the City prior to cancellation, non-renewal or adverse change of coverage. In the "Description of Operations ..." Certificate shall list Contract **#20110120 for the Drinking Water RO Membrane Replacement.** The name for the Additional Insured endorsement issued by the insurer shall read "City of Port St. Lucie, political subdivision of the State of Florida, its officers, employees and agents and the **Utility Division Contract #20110120**". Copies of the Additional Insured endorsements including Completed Operations coverage should be attached to the Certificate of Insurance. All independent contractors and subcontractors utilized in this project must furnish a Certificate of Insurance to the City in accordance with the same requirements set forth herein.

5.6 Waiver of Subrogation - The Bidder shall agree by entering into this Contract to a Waiver of Subrogation for each required policy. When required by the insurer, or should a policy condition not permit an Insured to enter into a pre-loss agreement to waive subrogation without an endorsement then bidder shall agree to notify the insurer and request the policy be endorsed with a Waiver of Transfer of Rights of Recovery against Others, or its equivalent. This Waiver of Subrogation requirement shall not apply to any policy where a condition to the policy specifically prohibits such an endorsement, or voids coverage should bidder enter into such an agreement on a pre-loss basis.

5.7 Subcontractors - It shall be the responsibility of the Bidder to insure that all subcontractors comply with the same insurance requirements referenced above.

5.8 Deductible Amounts - All deductible amounts shall be paid for and be the responsibility of the Bidder for any and all claims under this Contract.

5.9 Certificate(s) of Insurance - Immediately following notification of the award of this Contract, Bidder shall agree to deliver to the City a Certificate(s) of Insurance evidencing that all types and amounts of insurance coverage required by this Bid have been obtained and are in full force and effect. Such Certificate(s) of Insurance and policy shall unequivocally provide a minimum thirty (30) day written notice to the City prior to cancellation, non-renewal or adverse change of coverage. In the "Description of Operations ..." Certificate shall list Contract #20110120 for the Drinking Water RO Membrane Replacement.

5.10 Umbrella or Excess Liability - The Bidder may satisfy the minimum limits required above for Commercial General Liability, Business Auto Liability, or Employers' Liability coverage under Umbrella or Excess Liability. The Umbrella or Excess Liability shall have an Aggregate limit not less than the highest "Each Occurrence" limit for Commercial General Liability, Business Auto Liability, or Employer's Liability. When required by the insurer, or when Umbrella or Excess Liability is written on 'Non-Follow Form," the City shall be endorsed as an "Additional Insured."

5.11 Product Liability – Contractor will be required to carry and show proof of Product Liability insurance with limits of $1,000,000 per occurrence, $2,000,000 aggregate.

6. ADDITIONAL INFORMATION

6.1 Brand Names - The use of any manufacturer's name, trade name, brand name, or catalog number in this specification is for the sole purpose of describing and establishing the minimum requirements for levels of quality, standards of performance and design required, and is in no way intended to prohibit the bidding of any other manufacturer's items of equal quality. The Utility Director and Engineer shall be the sole judge of the equality of alternate products proposed and his/her decision shall be final.

6.2 Collusion - The City reserves the right to disqualify bids, upon evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder. More than one (1) bid from an individual, partnership, corporation, association, firm, or other legal entity under the same or different names will not be considered. Reasonable grounds for believing that a Bidder is interested in more than one (1) proposal for the same work will be cause for rejection of all proposals in which such Bidders are believed to be interested. Any or all proposals will be rejected if there is any reason to believe that collusion exists among the Bidders.

6.3 Withdrawal of Bids - A Bidder may withdraw his bid without prejudice no later than the day and hour set in the "Invitation to Bid" by communicating his purpose in writing to the City at the address given in the "Invitation for Bid". When received, it will be returned to him unopened.

6.4 Bid Information - For information concerning procedures for responding to this bid, contact Helen Quintana, CPPB, at telephone. # (772) 871-5221, fax # 772-871-7337, e-mail - hquintana@cityofpsl.com. Such contact is to be for clarification purposes only. To ensure fair consideration for all Bidders, it must be clearly understood that Mrs. Quintana is the only individual who is authorized to represent the City. Questions submitted to any other person in any other department will not be addressed. Additionally, the City prohibits communications initiated by a Bidder to **any** City

Official or employee evaluating or considering the bids **(up to and including the Mayor and City Council)**, prior to the time an award decision has been made.

It is the responsibility of the Bidder to receive any and all bid information and documents. Material changes, if any, to the scope of services, or bidding procedures will be transmitted only by addendum by **Onvia.com**. The Bidder, in turn, shall acknowledge receipt of the addendum by marking the Bid Reply Sheet with the Addendum number and the date of issuance. The City will not be responsible for any interpretation, other than those transmitted by Addendum to the bid, made or given prior to the bid award. The Bidder is responsible for verifying it has received all Bid Addenda.

If you have obtained this document from a source other than directly from the City or from DemandStar by Onvia.com you are not on record as a plan holder. The Office of Management & Budget takes no responsibility to provide Addenda to parties not listed by the City as plan holders. It is the Bidder's responsibility to check with our office prior to submitting your proposal to ensure you have a complete, up-to-date package. The Bidder is responsible for verifying they have received all Bid Addenda.

Remainder of page intentionally left blank

Bid Reply Sheet
Bid # 20110120
Drinking Water RO Membranes Replacement

1. **COMPANY NAME**: _____

DIVISION OF: _____

PHYSICAL ADDRESS: _____

MAILING ADDRESS: _____

CITY, STATE, ZIP CODE: _____

TELEPHONE NUMBER: ( ) _____ FAX NO. ( )_____

CONTACT PERSON: _____ E-MAIL: _____

2. **ORGANIZATIONAL PROFILE**: (complete all appropriate information)

Is the firm incorporated? Yes--No If yes, in what state? _____

_____
President

_____
Vice President

_____
Treasurer

How long in present business: _____ How long at present location: _____

Is firm a minority business: Yes--No; . Does firm have a drug-free workplace program: Yes--No
If no, is your company planning to implement such a program? _____

3. **ADDENDUM ACKNOWLEDGMENT** - Bidder acknowledges that the following addenda have been received and are included in its proposal/bid:

Addendum Number	Date Issued

4. **VENDOR'S LIST** – If your company offers commodities other than the one specified for this bid, and you wish to be put on the vendor's list; please contact Onvia.com at (800) 711-1712. Bid Tabulation Reports are advertised on the City's Web Site at www.Cityofpsl.com.

5. **BID RESPONSE:**

5.1 Bidder will / will not accept the Purchasing Card (Visa). *(please circle one)*

5.2 Percentage of discount when payment is made with Visa: _____ %

5.3 Bidders quote for services in accordance with specifications:

Double click on the Excel Spread Sheet below to enter prices & Save.

Lump Sum Train 1	Lump Sum train 2	Total Lump Sumfor Trains 1 & 2
$0.00	$0.00	$0.00

6. **INSURANCE CERTIFICATES LICENSE** - Bidders are required, in accordance with Section 5, to submit a copy of their Insurance Certificate for the type and dollar amount of insurance they currently maintain. Bidders are required to submit all licenses and certifications required to perform this project.

7. **COMPLETION OF FORM** - An authorized representative of the firm offering this Bid must complete this form in its entirety. Prices entered herein shall not be subject to withdrawal or escalation by Bidder. The City reserves the right to hold proposals and bid guarantees for a period not to exceed ninety (90) days after the date of the bid opening stated in the Invitation to Bid before awarding the Contract. Contract award constitutes the date that City Council executes the motion to award the bid.

8. **CONTRACT** - Bidder agrees to comply with all requirements stated in the specifications for this bid.

9. **CERTIFICATION**

This bid is submitted by: Name (print) _____ who is an officer of the above firm duly authorized to sign bids and enter into Contracts. I certify that this bid is made without prior understanding, Contract, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and Federal law and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this bid.

_____ _____

Signature Date

11. Is Bidder related to any City Employee? _____

10. **Bidder has read and accepts the terms and conditions of the City's standard Contract**:

_____ _____

Signature Title

If a corporation renders this Bid, the corporate seal attested by the secretary shall be affixed below. Any agent signing this Bid shall attach to this form evidence of legal authority.

(seal)

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM

Bidder Instructions: Fill out top portion only. (Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: _____

Reference: _____ Fax #: _____
Email: _____ Telephone #: _____
Person to contact: _____

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.

Was the project completed on time and within budget?

What was the project completion date?

How many projects has this vendor completed for you within the past 5 years?

What problems were encountered (claims)?

How many change orders were requested by this Contractor?

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism _____ Final Product _____
Qualifications _____ Cooperation _____
Budget Control _____ Reliability _____

Would you contract with this Contractor again? Yes [ ] No [ ] Maybe [ ]
Comments:

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

***** *(THIS IS A SAMPLE ONLY - DO NOT EXECUTE)* *****

CITY OF PORT SAINT LUCIE
CONTRACT FORM

This CONTRACT, executed this _____ day of _____, 20__, by and between the CITY OF PORT ST. LUCIE, FLORIDA, a municipal corporation, duly organized under the laws of the State of Florida, hereinafter called "City" party of the first part, and *name of Contractor* (Contractor), a Florida (or the state where they are) Corporation, *address,* Telephone No. ( ) ____ Fax No. ( ) _____, hereinafter called "Contractor", party of the second part.

RECITALS

In consideration of the below agreements and covenants set forth herein, the parties agree as follows:

CONTRACT SUPERVISOR

As used herein the Contract Supervisor shall mean _____, at (772) _____, or his designee.

SECTION I
DESCRIPTION OF SERVICES TO BE PROVIDED

The specific work that the Contractor has agreed to perform pursuant to the Bid Specifications #_____, **Title,** including all addenda, drawings, sheets number _ thru _ are hereby incorporated by this reference.

SECTION II
TIME OF PERFORMANCE

Contract period shall commence _____ and terminate _____ unless otherwise extended by written agreement or change order. In the event all work required in the bid specifications has not been completed by the end of the Contract period, the Contractor agrees to provide work as authorized by the Contract Supervisor until all work specified in the bid specifications has been rendered.

SECTION III
COMPENSATION

The total amount to be paid by the City to the Contractor is _____, which amount includes the ten-dollar ($10.00) payment for indemnification as provided in Section V herein. Payments will be disbursed in the following manner

The Contractor shall not be paid additional compensation for any loss or damage, arising out of the nature of the work, from the action of the elements, or from any delay or unforeseen obstruction or difficulties encountered in the performance of the work, or for any expenses incurred by, or as a consequence of the suspension or discontinuance of the work.

Invoices for services shall be submitted once a month, by the 10th day of the month, and payments shall be made within thirty (30) days unless Contractor has chosen to take advantage of the Purchasing Card Program, which guarantees payment within several days. Payments shall be made provided the submitted invoice is accompanied by adequate supporting documentation and approved by Contract Supervisor as provided in Section XII.

All invoices and correspondence relative to this Contract must contain the Purchase Order number and Contract number.

SECTION IV
CONFORMANCE WITH BID

It is understood that the materials and/or work required herein are in accordance with the bid made by the Contractor pursuant to the Invitation to Bid and Specifications on file in the Office of Management and Budget of the City. All documents submitted by the Contractor in relation to said bid, and all documents promulgated by the City for inviting bids are, by reference, made a part hereof as if set forth herein in full.

SECTION V
INDEMNIFICATION / INSURANCE

Pursuant to Section 725.06, Florida Statutes, CONTRACTOR agrees to indemnify, defend, and hold harmless the CITY, its officers and employees, from liabilities, damages, losses and costs, including but not limited to, reasonable attorney's fees, to the extent caused by the negligent act, recklessness, or intentional wrongful misconduct of the CONTRACTOR and persons employed or utilized by the CONTRACTOR in the performance of the construction contract. As consideration for this indemnity provision the CONTRACTOR shall be paid the sum of ten dollars ($10.00), which will be added to the contract price, and paid prior to commencement of work.

The CONTRACTOR shall, on a primary basis and at its sole expense, agree to maintain in full force and effect at all times during the life of this Contract, insurance coverage, limits, including endorsements, as described herein. The requirements contained herein, as well as City's review or acceptance of insurance maintained by CONTRACTOR are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by CONTRACTOR under the Contract.

The parties agree and recognize that it is not the intent of the City of Port St. Lucie that any insurance policy/coverage that it may obtain pursuant to any provision of this Contract will provide insurance coverage to any entity, corporation, business, person, or organization, other than the City of Port St. Lucie and the CITY shall not be obligated to provide any insurance coverage other than for the City of Port St. Lucie or extend its immunity pursuant to Section 768.28, Florida Statutes, under its self insured program. Any provision contained herein to the contrary shall be considered void and unenforceable by any party. This provision does not apply to any obligation imposed on any other party to obtain insurance coverage for this project, any obligation to name the City of Port St. Lucie as an additional insured under any other insurance policy, or otherwise protect the interests of the City of Port St. Lucie as specified in this Contract.

The CONTRACTOR shall agree to maintain Workers' Compensation Insurance & Employers' Liability in accordance with Section 440, Florida Statutes. Employers' Liability must include limits of at least $100,000 each accident, $100,000 each disease/employee, $500,000 each disease/maximum. A Waiver of Subrogation endorsement must be provided. Coverage should apply on a primary basis. Should scope of work performed by CONTRACTOR qualify its employee for benefits under Federal Workers' Compensation Statute (example, U.S. Longshore & Harbor Workers Act or Merchant Marine Act), proof of appropriate Federal Act coverage must be provided.

Commercial General Liability insurance issued under an Occurrence form basis, including Contractual liability, to cover the hold harmless agreement set forth herein, with limits of not less than:

Each occurrence	$1,000,000
Personal/advertising injury	$1,000,000
Products/completed operations aggregate	$2,000,000

General aggregate	$2,000,000
Fire damage	$100,000 any 1 fire
Medical expense	$10,000 any 1 person

An Additional Insured endorsement **must** be attached to the certificate of insurance and must include coverage for Completed Operations (should be ISO CG20101185 or CG20371001 & CG20100704) under the General Liability policy. Products & Completed Operations coverage to be provided for a minimum of ten (10) years from the date of possession by owner or completion of contract. Coverage is to be written on an occurrence form basis and shall apply as primary. A per project aggregate limit endorsement should be attached. Defense costs are to be in addition to the limit of liability. A waiver of subrogation is to be provided in favor of the City. Coverage for the hazards of explosion, collapse and underground property damage (XCU) must also be included when applicable to the work performed. Coverage shall extend to independent contractors and fellow employees. Contractual Liability is to be included. Coverage is to include a cross liability or severability of interest's provision as provided under the standard ISO form separation of insurer's clause. There shall be no exclusion for Mold, Silica or Respirable Dust or Bodily Injury or Property Damage arising out of heat, smoke, fumes or ash from a hostile fire.

Except as to Workers' Compensation and Employers' Liability, said Certificate(s) and policies shall clearly state that coverage required by the Contract has been endorsed to include the City of Port St. Lucie, a political subdivision of the State of Florida, its officers, agents and employees as Additional Insured with a CG 2026-Designated Person or Organization endorsement, or similar endorsement, added to its Commercial General Liability policy and Business Auto policy. The name for the Additional Insured endorsement issued by the insurer shall read **"City of Port St. Lucie, political subdivision of the State of Florida, its officers, employees and agents, and Contract #20110120 for Drinking Water RO Membrane Replacement** shall be listed as additionally insured". The Certificate of Insurance and policy shall unequivocally provide thirty (30) day written notice to the City prior to any adverse changes, cancellation, or non-renewal of coverage there under. Said liability insurance must be acceptable by and approved by the City as to form and types of coverage. In the event that the statutory liability of the City is amended during the term of this Contract to exceed the above limits, the Contractor shall be required, upon thirty (30) days written notice by the City, to provide coverage at least equal to the amended statutory limit of liability of the City. Copies of the Additional Insured endorsements including Completed Operations coverage should be attached to the Certificate of Insurance. All independent contractors and subcontractors utilized in this project must furnish a Certificate of Insurance to the City in accordance with the same requirements set forth herein.

The CONTRACTOR agrees to maintain Business Automobile Liability at a limit of liability not less than $500,000 each accident covering any auto, owned, non-owned and hired automobiles. In the event, the CONTRACTOR does not own any automobiles; the Business Auto Liability requirement shall be amended allowing CONTRACTOR to agree to maintain only Hired & Non-Owned Auto Liability. This amended requirement may be satisfied by way of endorsement to the Commercial General Liability, or separate Business Auto Coverage form. Certificate holder must be listed as additional insured. A waiver of subrogation must be provided. Coverage should apply on a primary basis.

The CONTRACTOR agrees by entering into this Contract to a Waiver of Subrogation for each required policy. When required by the insurer, or should a policy condition not permit an Insured to enter into a pre-loss Contract to waive subrogation without an endorsement then CONTRACTOR shall agree to notify the insurer and request the policy be endorsed with a Waiver of Transfer of Rights of Recovery against Others, or its equivalent. This Waiver of Subrogation requirement shall not apply to any policy where a condition to the policy specifically prohibits such an endorsement, or voids coverage should CONTRACTOR enter into such a Contract on a pre-loss basis.

It shall be the responsibility of the CONTRACTOR to ensure that all subcontractors comply with the same insurance requirements referenced above.

All deductible amounts shall be paid for and be the responsibility of the CONTRACTOR for any and all claims under this Contract.

The CONTRACTOR may satisfy the minimum limits required above for Commercial General Liability, Business Auto Liability, and Employers' Liability coverage under Umbrella or Excess Liability. The Umbrella or Excess Liability shall have an Aggregate limit not less than the highest "Each Occurrence" limit for Commercial General Liability, Business Auto Liability, or Employers' Liability. When required by the insurer, or when Umbrella or Excess Liability is written on Non-Follow Form," the City shall be endorsed as an "Additional Insured."

All deductible amounts shall be paid for and be the responsibility of the CONTRACTOR and/or any subcontractor for any and all claims under this Contract.

SECTION VII
PROHIBITION AGAINST FILING OR MAINTAINING LIENS AND SUITS

Subject to the laws of the State of Florida and of the United States, neither Contractor nor any Subcontractor, supplier of materials, laborer or other person shall file or maintain any lien for labor or materials delivered in the performance of this Contract against the City. The right to maintain such lien for any or all of the above parties is hereby expressly waived.

SECTION VIII
WORK CHANGES

The City reserves the right to order work changes in the nature of additions, deletions or modifications without invalidating the Contract, and agrees to make corresponding adjustments in the Contract price and time for completion. Any and all changes must be authorized by a written change order signed by the City Manager or his designee as representing the City. Work shall be changed and the Contract price and completion time shall be modified only as set out in the written change order. Any adjustment in the Contract price resulting in a credit or a charge to the City shall be determined by mutual agreement of the parties.

SECTION IX
COMPLIANCE WITH LAWS

The Contractor shall give and otherwise comply with all notices required by all applicable laws, ordinances and codes. Further, Contractor shall, at Contractor's sole cost and expense, secure and pay the fees and charges for all permits required for the performance of the Contract. All materials furnished and work performed pursuant to the Contract, and any other amendments or change orders thereto to comply with all local, state and federal laws and regulations. Contractor will comply with the requirements of 28 C.F.R. § 35.151.

SECTION X
CLEANING UP

Contractor shall, during the performance of this Contract, remove and properly dispose of resulting dirt and debris, and keep the work area reasonably clear. Upon completion of the work, Contractor shall remove all of Contractors' equipment and all excess materials, and put the work area in a neat, clean, sanitary and safe condition.

SECTION XI
NOTICE OF PERFORMANCE

Following the delivery of materials and Contractor's performance of work required under this Contract, Contractor shall submit a written request for inspection to the Contract Supervisor. Such written request for inspection is the Contractor's Notice of Performance, which is further addressed in Section **XIII** of this Contract.

SECTION XII
DELIVERY DOCUMENTATION

Where Contract provides in whole or in part, for the sale and purchase of materials Contractor shall prepare a delivery ticket in triplicate for each shipment of material delivered to the City. One copy of the delivery ticket (packing list) shall be contained in the shipment. One copy shall be retained by the Contractor, and one copy shall accompany the Contractor's invoice.

SECTION XIII
INSPECTION AND CORRECTION OF DEFECTS

In order to determine whether the required material has been delivered or the required work performed in accordance with the terms and conditions of the Contract documents, the Contract Supervisor shall conduct the inspection as soon as practicable after receipt of the Contractor's Notice of Performance or delivery ticket. If such inspection shows that the required material has been delivered and required work performed in accordance with the terms and conditions of the Contract documents and that the material and work is entirely satisfactory, the Contract Supervisor shall approve the invoice when it is received. Thereafter the Contractor shall be entitled to payment, as described in Section III of this Contract. If the inspection conducted by the Contract Supervisor reveals that the work performed is not satisfactory, or substandard, then the Contract Supervisor shall, as soon as practical, inform the representative or contact person of the respective parties hereto, of the specific findings of the inspection. The City shall provide the Contractor with the opportunity to correct, remedy or fix within a reasonable time frame but no longer than ten (10) days from the date of being informed of the unfavorable inspection the items deemed unsatisfactory or substandard, at no additional charge to the City. Such examination, inspection, or tests made by the Contract Supervisor, shall not relieve Contractor of the responsibility or obligation to remedy any deviation, deficiency, or defect in the materials used or work performed.

SECTION XIV
ADDITIONAL REQUIREMENTS

In the event of any conflict between the terms and conditions, appearing on any purchase order issued relative to this Contract, and those contained in this Contract and the Specifications herein referenced, the terms of this Contract and Specifications herein referenced shall apply. If there is a conflict between the Contract and specifications, the Contract will control.

SECTION XV
LICENSING

Contractor warrants that he possesses all licenses and certificates necessary to perform required work and is not in violation of any laws. Contractor warrants that his license and certificates are current and will be maintained throughout the duration of the Contract.

SECTION XVI
SAFETY PRECAUTIONS

Precaution shall be exercised at all times for the protection of persons, including employees, member of the public and property. The safety provisions of all applicable laws and building and construction codes shall be observed.

SECTION XVII
ASSIGNMENT

Contractor shall not delegate, assign or subcontract any part of the work required to be performed under this Contract or assign any monies due Contractor hereunder without first obtaining the written consent of the City.

SECTION XVIII
TERMINATION, DELAYS AND LIQUIDATED DAMAGES

A. Termination of Contract. If the Contractor refuses or fails to deliver material as required and/or prosecute the work with such diligence as will insure its completion within the time specified in this Contract, the City by written notice to the Contractor, may terminate Contractor's rights to proceed. Upon such termination, the City may take over the work and prosecute the same to completion, by Contract or otherwise, and the Contractor and his sureties shall be liable to the City for any additional costs incurred by the City in its completion of the work. The City may also, in the event of termination, obtain undelivered materials, by Contract or otherwise, and the Contractor and his sureties shall be liable to the City for any additional cost incurred for such material. Contractor and his sureties shall also be liable to the City for liquidated damages for any delay in the completion of the work as provided below. If the Contractor's right to proceed is so terminated, the City may take possession of and utilize in completing the work such materials, tools, equipment and facilities as may be on the site of the work, and therefore necessary to accomplish the work.

B. Liquidated Damages for Delays. If material is not provided or work is not completed within the time specified in this Contract, including any extensions of time for excusable delays as herein provided, (it being impossible to determine the actual damages occasioned by the delay) the Contractor shall provide to the City one hundred dollars ($100.00) as fixed, agreed and liquidated damages for each calendar day of delay until the work is completed. The Contractor and his sureties shall be jointly and severally liable to the City for the total amount that is due to the City as a result f said delay of work completion.

C. The City may terminate this Contract with or without cause by giving the vendor/Contractor thirty (30) days notice in writing. Upon delivery of said notice and upon expiration of the thirty (30) day period, the vendor/Contractor shall discontinue all services in connection with the performance of this Contract and shall proceed to cancel promptly all related existing third party Contracts. Termination of the Contract by the City pursuant to this paragraph shall terminate all of the City's obligations hereunder and no charges, penalties or other costs shall be due Contractor except for work timely completed. All design work performed will become the property of the City at termination of contract and submitted to City in the format the City dictates.

SECTION XIX
LAW AND VENUE

This Contract is to be construed as though made in and to be performed in the State of Florida and is to be governed by the laws of Florida in all respects without reference to the laws of any other state or nation. The venue of any action taken to enforce this Contract shall be in St. Lucie County, Florida.

SECTION XX
REIMBURSEMENT FOR INSPECTION

The Contractor agrees to reimburse the City for any expenditures incurred by the City in the process of testing materials supplied by the Contractor against the specifications under which said materials were procured, if said materials prove to be defective, improperly applied, and/or in other manners not in compliance with specifications. Expenditures as defined herein shall include, but not be limited to, the replacement value of materials destroyed in testing, the cost paid by the City to testing laboratories and other entities utilized to provide tests, and the value of labor and materials expended by the City in the process of conducting the testing. Reimbursement of charges as specified herein shall not relieve the Contractor from other remedies provided in the Contract.

SECTION XXI
APPROPRIATION APPROVAL

The Contractor acknowledges that the City of Port Saint Lucie's performance and obligation to pay under this Contract is contingent upon an annual appropriation by the City Council. The Contractor agrees that, in the event such appropriation is not forthcoming, the City may terminate this Contract and that no charges, penalties or other costs shall be assessed.

SECTION XXII
RENEWAL OPTION

"Not Applicable"

SECTION XXIII
ENTIRE CONTRACT

The written terms and provisions of this Contract take precedence over any and all prior and contemporaneous verbal or written statements of any official or other representative of the City. Any such statements shall not be effective or be construed as entering into, or forming a part of, or altering in any manner whatsoever, this Contract or Contract documents.

(Remainder of page left blank)

IN WITNESS WHEREOF, the parties have executed this Contract at Port St. Lucie, Florida, the day and year first above written.

CITY OF PORT ST. LUCIE FLORIDA
By: _____
City Manager

ATTEST:
By: _____
City Clerk

By: _____
Authorized Representative of (company name)

State of: _____

County of: _____

Before me personally appeared: _____)
(please print)

Please check one:

Personally known _____

Produced Identification: _____
(type of identification)

Identification No.: _____

and known to me to be the person described in and who executed the foregoing instrument, and acknowledged to and before me that _____ executed said instrument for the purposes therein expressed.
(he/she)

WITNESS my hand and official seal, this _____ day of _____, 200_.

_____
Notary Signature

Notary Public: State of _____ at Large.

My Commission Expires: _____.

(*seal*)

DRUG-FREE WORKPLACE FORM

The undersigned vendor in accordance with Section 287.087, Florida Statutes hereby certifies that _____ does:
(Name of Business)

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or Contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or Contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

_____
Bidder's Signature

_____
Date

STATEMENT OF NO BID

To: City of Port St. Lucie
Office of Management & Budget
121 S.W. Port St. Lucie Boulevard
Port St. Lucie, FL 34984-5099

Bid: #_____

Bid Title: _____

We, the undersigned have declined to bid on the subject bid for the following reasons:

[ ] Insufficient time to respond to the Invitation to Bid

[ ] We do not offer this product or service.

[ ] Our schedule would not permit us to perform.

[ ] We are unable to meet specifications.

[ ] We are unable to meet bond requirements.

[ ] Specifications are unclear (Explain below).

[ ] We are unable to meet insurance requirements.

[ ] Other (Specify below).

Remarks: _____

_____

Company Name: _____ Telephone: ( ) _____

Division: _____

Address: _____

_____

Signature: _____ Date: _____

CHECKLIST
Bid #20110120
Drinking Water RO Membrane Replacement

Name of Bidder: _____

This checklist is provided to assist Bidders in the preparation of their bid response. Included in this checklist are important requirements that are the responsibility of each Bidder to submit with their response in order to make their bid response fully compliant. This checklist is only a guideline -- it is the responsibility of each Bidder to read and comply with the Invitation to Bid in its entirety.

_____ Bid Reply Sheet with proper signature.
_____ Mailing envelope has been addressed to:
City of Port St. Lucie
Office of Management & Budget
121 SW Port St. Lucie Boulevard
Port St. Lucie, FL 34984

_____ Mailing envelope must be sealed and identified on the front with:

- Bidders Name and Address
- Bid Number
- Bid Title
- Bid Opening Date & Time

_____ Drug-Free Workplace Form

_____ All pricing has been mathematically reviewed and all corrections have been initialed.

_____ All price extensions and totals have been thoroughly checked.

_____ Each Bid Addendum (when issued) is acknowledged.

_____ Copy of Insurance Certificate in accordance with 2nd Paragraph, Section 5.

_____ Copy or all required licenses and certification.

_____ MSDS in accordance with Specifications.

_____ Has reviewed the Contract and accept all City Terms and Conditions.

_____ One (1) original and three (3) copies of required documents **(NO RINGED BINDERS).**

Special Items (Applicable to this bid only)

_____ List of Projects
_____ Warranty Documentation
_____ Product Literature
_____ Membrane Projections
_____ At least 5 completed reference sheets returned with bid

THIS FORM SHOULD BE RETURNED WITH YOUR BID REPLY SHEET

[redacted]

22DEC PM 1:40 55s
RECEIVED

Bidder's Name: **Hydranautics**

Bid Number: **20110120**

Bid Title: **Drinking Water RO Membrane Replacement**

Bid Opening Date and Time: **December 27, 2011 at 3:00 p.m.**

ORIGINAL

Bid Reply Sheet
Bid # 20110120
Drinking Water RO Membranes Replacement

1. **COMPANY NAME**: Hydranautics

DIVISION OF: Nitto Denko

PHYSICAL ADDRESS: 401 Jones Road

MAILING ADDRESS: 401 Jones Road

CITY, STATE, ZIP CODE: Oceanside, CA 92058

TELEPHONE NUMBER: (760) 901-2500 FAX NO. (760) 901-2578

CONTACT PERSON: Gil Turner E-MAIL: gturner@hydranautics.com

2. **ORGANIZATIONAL PROFILE**: (complete all appropriate information)

Is the firm incorporated? (Yes)-No If yes, in what state? California

Brett Andrews
President
Bhasker Dave
Vice President
Greg Byers
Treasurer

How long in present business: Over 25 years How long at present location: Over 15 years

Is firm a minority business: Yes-(No) Does firm have a drug-free workplace program (Yes)-No
If no, is your company planning to implement such a program? _____

3. **ADDENDUM ACKNOWLEDGMENT** - Bidder acknowledges that the following addenda have been received and are included in its proposal/bid:

Addendum Number	Date Issued
1	12-12-11
2	12-16-11

4. **VENDOR'S LIST** – If your company offers commodities other than the one specified for this bid, and you wish to be put on the vendor's list, please contact Onvia.com at (800) 711-1712. Bid Tabulation Reports are advertised on the City's Web Site at www.Cityofpsl.com.

5. **BID RESPONSE:**

5.1 Bidder will /(will not) accept the Purchasing Card (Visa). *(please circle one)*

5.2 Percentage of discount when payment is made with Visa: N/A %

5.3 Bidders quote for services in accordance with specifications:

Double click on the Excel Spread Sheet below to enter prices & Save.

Lump Sum Train 1	Lump Sum train 2	Total Lump Sumfor Trains 1 & 2
$121,275.00	$121,275.00	$242,550.00

6. INSURANCE CERTIFICATES LICENSE - Bidders are required, in accordance with Section 5, to submit a copy of their Insurance Certificate for the type and dollar amount of insurance they currently maintain. Bidders are required to submit all licenses and certifications required to perform this project.

7. COMPLETION OF FORM - An authorized representative of the firm offering this Bid must complete this form in its entirety. Prices entered herein shall not be subject to withdrawal or escalation by Bidder. The City reserves the right to hold proposals and bid guarantees for a period not to exceed ninety (90) days after the date of the bid opening stated in the Invitation to Bid before awarding the Contract. Contract award constitutes the date that City Council executes the motion to award the bid.

8. CONTRACT - Bidder agrees to comply with all requirements stated in the specifications for this bid.

9. CERTIFICATION

This bid is submitted by: Name (print) Bhasker Dave who is an officer of the above firm duly authorized to sign bids and enter into Contracts. I certify that this bid is made without prior understanding, Contract, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and Federal law and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this bid.

Signature 12/21/2011
Date

11. Is Bidder related to any City Employee? NO

10. Bidder has read and accepts the terms and conditions of the City's standard Contract:

Signature VP, SALES & MARKETING
Title

If a corporation renders this Bid, the corporate seal attested by the secretary shall be affixed below. Any agent signing this Bid shall attach to this form evidence of legal authority.

(seal)

NITTO DENKO

HYDRANAUTICS
www.membranes.com
A Nitto Denko Company

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ORIGINAL

CHECKLIST
Bid #20110120
Drinking Water RO Membrane Replacement

Name of Bidder: Hydranautics

This checklist is provided to assist Bidders in the preparation of their bid response. Included in this checklist are important requirements that are the responsibility of each Bidder to submit with their response in order to make their bid response fully compliant. This checklist is only a guideline -- it is the responsibility of each Bidder to read and comply with the Invitation to Bid in its entirety.

__X__ Bid Reply Sheet with proper signature. ✓
__X__ Mailing envelope has been addressed to: ✓
City of Port St. Lucie
Office of Management & Budget
121 SW Port St. Lucie Boulevard
Port St. Lucie, FL 34984

__X__ Mailing envelope must be sealed and identified on the front with: ✓

- Bidders Name and Address
- Bid Number
- Bid Title
- Bid Opening Date & Time

__X__ Drug-Free Workplace Form ✓

__X__ All pricing has been mathematically reviewed and all corrections have been initialed.

__X__ All price extensions and totals have been thoroughly checked.

__X__ Each Bid Addendum (when issued) is acknowledged.

__X__ Copy of Insurance Certificate in accordance with 2nd Paragraph, Section 5. ✓

__X__ Copy or all required licenses and certification. ✓

__X__ MSDS in accordance with Specifications. ✓

__X__ Has reviewed the Contract and accept all City Terms and Conditions. ✓

__X__ One (1) original and three (3) copies of required documents **(NO RINGED BINDERS).**

Special Items (Applicable to this bid only)

__X__ List of Projects ✓
__X__ Warranty Documentation ✓
__X__ Product Literature ✓
__X__ Membrane Projections ✓
__X__ At least 5 completed reference sheets returned with bid ✓

THIS FORM SHOULD BE RETURNED WITH YOUR BID REPLY SHEET

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 12/13/2011

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Marsh USA, Inc.
1166 Avenue of the Americas
New York, NY 10036

005004-HYDRA-CAS-10-11

CONTACT NAME:
PHONE (A/C, No, Ext):
FAX (A/C, No):
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A :	Sompo Japan Insurance Co. Of America	11126
INSURER B :	Mitsui Sumitomo Insurance Company Of America	20362
INSURER C :	ACE American Insurance Company	22667
INSURER D :		
INSURER E :		
INSURER F :		

INSURED
Hydranautics
401 Jones Road
Oceanside, CA 92058

COVERAGES **CERTIFICATE NUMBER:** NYC-006313331-01 **REVISION NUMBER:** 39

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
C	GENERAL LIABILITY	X	X	*CPL40097T0	04/01/2011	04/01/2012	EACH OCCURRENCE	$ 1,000,000
	[X] COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
	[ ] CLAIMS-MADE [X] OCCUR						MED EXP (Any one person)	$ 25,000
							PERSONAL & ADV INJURY	$ 1,000,000
							GENERAL AGGREGATE	$ 3,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$ 1,000,000
	[X] POLICY [ ] PRO-JECT [ ] LOC							$
A	AUTOMOBILE LIABILITY	X	X	*ACV40214O0	04/01/2011	04/01/2012	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	[X] ANY AUTO						BODILY INJURY (Per person)	$
	[ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	[ ] HIRED AUTOS [ ] NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
B	[X] UMBRELLA LIAB [X] OCCUR	X	X	*UMB5500132	04/01/2011	04/01/2012	EACH OCCURRENCE	$ 1,000,000
	[ ] EXCESS LIAB [ ] CLAIMS-MADE						AGGREGATE	$ 1,000,000
	[ ] DED [X] RETENTION $ 10,000							$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N			*WCD40020U0	04/01/2011	04/01/2012	[X] WC STATU-TORY LIMITS [ ] OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [N] (Mandatory in NH)	N / A					E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000
	Comp/Coll $500/$1000 Hvy							

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, If more space is required)

Re: Contract #20110120 for the drinking water RO Membrane Replacement

City of Port St. Lucie, political subdivision of the state of Florida, its officers, employees, and agents and the Utility Division Contract #20110120 are included as additional insured (except workers' compensation) where required by written contract. Waiver of subrogation is applicable where required by written contract and the General Liability waiver of subrogation is in favor of the certificate holder.

CERTIFICATE HOLDER

City of Port St. Lucie
121 SW Port St. Lucie Blvd.
Port St. Lucie, FL 34984-5099

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
of Marsh USA Inc.

John J. Lyons

I. **ADDITIONAL INSUREDS – BY CONTRACT, AGREEMENT OR PERMIT**
Item 4. is added as follows:

4. Any person or organization not otherwise identified as an insured in this coverage or by endorsement to this coverage that you are required by written contract, written agreement or written permit to name as an insured is an insured but only with respect to "bodily injury", "property damage" or "personal and advertising injury" caused in whole or in part by:

   1. Your acts or omissions; or
   2. The acts or omissions of those acting on your behalf;

   in the performance of your ongoing operations for the additional insured(s) at the location(s) designated in the written contract, written agreement or written permit or premises leased or used by you.

With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply:

a. To "bodily injury" or "property damage" occurring after all work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed;

b. To "bodily injury" or "property damage" occurring after that portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project;

c. Unless the written contract or written agreement has been executed or the written permit has been issued prior to the "bodily injury", "property damage" or "personal and advertising injury";

d. To any owners or other interests from whom land has been leased for "occurrences" that take place after the lease for that land expires or to structural alterations, new construction or demolition operations performed by or on behalf of any additional insured; or

e. To the rendering or failure to render any professional service.

The insurance provided under item I. above applies on a primary basis if that is required by the written contract, written agreement or written permit. Coverage under this provision is limited to the minimum limits of liability stipulated in that written contract, written agreement or written permit or the amount of loss not to exceed the Limit of Liability shown in the Declarations, whichever is less.

7. **MOBILE EQUIPMENT REDEFINED**

Under **SECTION V - DEFINITIONS,** paragraph **f.(1)** of the definition of "mobile equipment" does not apply to self-propelled vehicles of less than 1,000 pounds gross vehicle weight and unlicensed vehicles that are not designed for use on the highway.

8. **KNOWLEDGE AND NOTICE OF OCCURRENCE**

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM
Bidder Instructions: Fill out top portion only.
(Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: Hydranautics

Reference: City of Lake Worth Fax #: ~~561-533-7373~~ None
Email: dlovelace@lakeworth.org Telephone #: ~~561-248-0623~~ 561-586-1710
Person to contact: Doug Lovelace

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.
Reynolds Construction was primary contractor for new 4.5MGD RO plant. Hydranautics provided Aerer Industries membrane elements for this project.

Was the project completed on time and within budget? Yes

What was the project completion date? 10/1/11

How many projects has this vendor completed for you within the past 5 years? N/A

What problems were encountered (claims)? N/A

How many change orders were requested by this Contractor? N/A

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism	9	Final Product	9
Qualifications	9	Cooperation	9
Budget Control	N/A	Reliability	9

Would you contract with this Contractor again? Yes [X] No [ ] Maybe [ ]
Comments: DCROO 1/9/12

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM
Bidder Instructions: Fill out top portion only. (Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: Hydranautics

Reference: City of Lake Worth Fax #: ~~561-533-7372~~
Email: dlovelace@lakeworth.org Telephone #: 561-248-0623
Person to contact: Doug Lovelace

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.

Was the project completed on time and within budget?

What was the project completion date?

How many projects has this vendor completed for you within the pa

Emailed No fax Number

What problems were encountered (claims)?

How many change orders were requested by this Contractor?

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism _____ Final Product _____
Qualifications _____ Cooperation _____
Budget Control _____ Reliability _____

Would you contract with this Contractor again? Yes [ ] No [ ] Maybe [ ]
Comments:

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM
Bidder Instructions: Fill out top portion only.
(Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: Hydranautics

Reference: Town of Manalapan Fax #: 561-586-8827
Email: cshugar@manalapan.org Telephone #: 561-586-2487
Person to contact: Craig Shugar

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.

Was the project completed on time and within budget?

What was the project completion date?

How many projects has this vendor completed for you within the past 5 years?

What problems were encountered (claims)?

How many change orders were requested by this Contractor?

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism _____ Final Product _____
Qualifications _____ Cooperation _____
Budget Control _____ Reliability _____

Would you contract with this Contractor again? Yes [ ] No [ ] Maybe [ ]
Comments:

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM

Bidder Instructions: Fill out top portion only.
(Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: Hydranautics

Reference: City of Rio Rancho Fax #: 505-892-1386
Email: pgallegos@ci.rio-rancho.nm.us Telephone #: 505-896-8812
Person to contact: Pat Gallegos

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.

Was the project completed on time and within budget?

What was the project completion date?

How many projects has this vendor completed for you within the past 5 years?

What problems were encountered (claims)?

How many change orders were requested by this Contractor?

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism _____ Final Product _____
Qualifications _____ Cooperation _____
Budget Control _____ Reliability _____

Would you contract with this Contractor again? Yes [ ] No [ ] Maybe [ ]
Comments:

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM
Bidder Instructions: Fill out top portion only.
(Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: Hydranautics

Reference: City of Cape Coral Fax #: 239-574-0882
Email: rwoods@caprecoral.net Telephone #: 239-574-0877
Person to contact: Robert Woods

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.

Was the project completed on time and within budget?

What was the project completion date?

How many projects has this vendor completed for you within the past 5 years?

What problems were encountered (claims)?

How many change orders were requested by this Contractor?

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism _____ Final Product _____
Qualifications _____ Cooperation _____
Budget Control _____ Reliability _____

Would you contract with this Contractor again? Yes [ ] No [ ] Maybe [ ]
Comments:

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

CITY OF PORT ST LUCIE
121 SW Port St. Lucie Boulevard
Port St. Lucie, Florida, 34984
772-871-5223

REFERENCE CHECK FORM

Bidder Instructions: Fill out top portion only. (Please print or type)

Bid Number: 20110120

Title: Drinking Water RO Membrane Replacement

Bidder/Respondent: Hydranautics

Reference: City of Hutchinson Fax #: 620-694-2628
Email: donk@hutchgov.com Telephone #: 620-694-1900
Person to contact: Donald Koci

Reference Instructions: The above Bidder has given your name to the City of Port St. Lucie as a reference. Please complete the information below and fax within five (5) days to 772-871-7337.

Describe the scope of work of the contract awarded by your firm to this Contractor.

Was the project completed on time and within budget?

What was the project completion date?

How many projects has this vendor completed for you within the past 5 years?

What problems were encountered (claims)?

How many change orders were requested by this Contractor?

How would you rate the contractor on a scale of low (1) to high (10) for the following?

Professionalism _____ Final Product _____
Qualifications _____ Cooperation _____
Budget Control _____ Reliability _____

Would you contract with this Contractor again? Yes [ ] No [ ] Maybe [ ]
Comments:

Thank you.

For OMB Use Only	
Reference Checked	
Clerk Checked	

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Partial ESPA Plant Reference List

Project Name/ End User	City	Region/Province	Country	Membrane Type	Year Comm.	Capacity (MGD)
Adelaide	Adelaide		Australia	SWC5MAX/SWC6/ESPA2+	2010 and 2011(startup pending)	79.2-158.4
Chennai, India	Chennai		India	SWC4+/ESPAB	2009	26
Barka 2			Oman	SWC5/ESPAB+	2009	33
Barcelona	Barcelona		Spain	SWC4+/SWC5/ESPAB	2009	53
Eren Enerji, Turkey			Turkey	SWC5 / ESPA2+	2009 (startup pending)	4.5
SUR, Oman	Sur		Oman	SWC5/ESPAB+	2009	21
Gibson Island AWTP		SE Queensland	Australia	ESPA2	2008	26
Orange County Water District / Groundwater Replenishment System / Fountain Valley CA USA	Fountain Valley	CA	USA	ESPA2	2008	70.00
Aluminium Sohar	Sohar		Oman	SWC4+/ESPA2	2008	1
Dhekelia, Cyprus	Dhekelia		Cyprus	SWC5/ESPAB	2007	11
Andover, NJ	Andover	NJ	USA	ESPA1	2006	0.72
Charles County, MD		MD	USA	ESPA2/ESPA1	2006	0.11
Ft Lauderdale, FL*	Fort Lauderdale	FL	USA	ESPA4/ ESNA1-LF2	2006	12
Orange County Water Destrict, CA	Fountain Valley	CA	USA	ESPA2+	2006	70
Tropical Farms WTP, Stuart FL	Stuart	GFL	USA	ESPA2	2006	8
Ulu Pandan, Singapore		Ulu Pandan	Singapore	ESPA2+	2006	44
Vall D'Uxo, Spain	Vall D'Uxo		Spain	ESPA4/ ESNA1-LF2	2006	12
Wichita Falls, TX - City of / no project name / Wichita Falls, TX USA	Wichita Falls	TX	USA	ESPA2/ESPA4	2006	12.00

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Partial ESPA Plant Reference List

Project Name/ End User	City	Region/Province	Country	Membrane Type	Year Comm.	Capacity (MGD)
Kindasa Water Services, Saudi Arabia			KSA	SWC3/HYDRAcap/ ESPA2	2006	7
Manalapan, Florida	Manalapan	FL	USA	CPA3/ESPA4	2005	1.76
North Miami Beach, FL - City of / Norwood-Oeffler Water Treatment Plant Expansion - Phase 1 / North	North Miami Beach	FL	USA	ESPA2/ ESPA1	2005	6.00
Valley Municipal Utilities Auth, TX		TX	USA	ESPA2	2005	0.35
Village of Minster, Ohio	Minster	OH	USA	ESPA3	2005	2.5
Village of Royal Palm Beach, Florida	Palm Beach	FL	USA	ESPA3	2005	1.5
West Basin Municipal Water District / ES RO Trains 6, 7 & 8 / El Segundo, CA USA	El Segundo	CA	USA	ESPA2	2005	6.00
West Basin Municipal Water District, California	El Segundo	CA	USA	ESPA2/ ESPA1	2005	6
Highland Beach, Florida	Highland Beach	Florida	USA	CPA3/ESPA2	2004	2.25
Kewanee, Illinois	Kewaneeq	IL	USA	ESPA2/ESPA4	2004	3.4
LaSara Texas	La Sara	TX	USA	ESPA2	2004	1
North Cameron County, TX		TX	USA	ESPA2	2004	2.00
North Martin County, FL		FL	USA	ESPA4	2004	1.8
Orange County Water Destrict, CA		CA	USA	ESPA2	2004	5
Pharmacosmos, Denmark			Denmark	ESPA4	2004	0.2
Seward, NE - Town of / no project name / Seward, NE USA	Seward	NE	USA	ESPA4	2004	2.00
Toulon, IL	Toulon	IL	USA	ESPA2/ESPA1	2004	0.22
Tyrrell,NC	Tyrrell	NC	USA	ESPA2/ESPA1	2004	0.43

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HYDRANAUTICS
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Partial ESPA Plant Reference List

Project Name/ End User	City	Region/Province	Country	Membrane Type	Year Comm.	Capacity (MGD)
Volussia County, Fl		FL	USa	ESPA3	2004	2.00
West Basin	El Segundo	CA	USA	ESPA4	2004	1.8
West Basin Municipal Water District / ES RO Trains 4 & 5 / El Segundo, CA USA	El Segundo	CA	USA	ESPA2	2004	4.6
Carlsbad, CA	Carlsbad	CA	USA	ESPA2	2003	0.35
Fujairah, U.A.E.	Fujairah		UAE	SWC3/ESPA1	2003	45
North Alamo, Texas	North Alamo	TX	USA	ESPA2	2003	0.50
North Martin County, Florida		FL	USA	ESPA4	2003	1.80
Southmost Regional, Tx (Brownsville)	Brownsville	TX	USA	ESPA2	2003	6
Taiyuan Steel Plant, Shanxi, China		Shanxi	China	ESPA4	2003	2
Alameda County Water District / Newark Desalination Facility / Newark, CA USA	Newark	CA	USA	ESPA1 / ESPA2	2002	4.23
Alameda County Water District, CA	Newark	CA	USA	ESPA1/ESPA2	2002	8
Alva School District,FL		FL	USA	ESPA2/ESNA1	2002	0.02
Brimfield, IL	Brimfield	IL	USA	ESPA2/ESPA1	2002	0.25
Mt Pleasant SC	Mount Pleasant	SC	USA	ESPA2/ESPA1	2002	1.00
Pompano Beach, FL*	Pompano Beach	CA	USA	ESPA1/ESNA1 365	2002	10
Port St Lucie, Florida	Port St. Lucie	FL	USA	ESPA1	2002	4
Universidad Alicante, Spain			Spain	ESPA2	2002	1.9
Water Authority of Jordan-Irshaidat			Jordan	ESPA2	2002	1.9

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Partial ESPA Plant Reference List

Project Name/ End User	City	Region/Province	Country	Membrane Type	Year Comm.	Capacity (MGD)
Aledo, IL	Aleda	IL	USA	ESPA2/ESPA1	2001	6.49
Glouster County, VA		VA	USA	CPA3/ESPA2	2001	10
Indian River Florida	Indian River	FL	USA	ESPA3	2001	6
Infineon Technologies, Dresden, Germany	Dresden		Germany	ESPA2	2001	0.5
Jenson Beach,FL	Jenson Beach	FL	USA	ESPA1	2001	1.50
Mt Pleasant, SC	Mt. Pleasant	SC	USA	ESPA2/ESPA1	2001	1.1
West Basin	El Segundo	CA	USA	ESPA2	2001	5
West Basin Municipal Water District / ES RO Trains 3 / El Segundo, CA USA	El Segundo	CA	USA	ESPA2	2001	3
1st Silicon, Kuching Malaysia			Malaysia	ESPA1	2000	1.4
Jupiter, Florida	Jupiter	FL	USA	ESPA2	2000	6.00
Mexicana de Cobre, Mexico			Mexico	ESPA2	2000	4.8
Mitsubishi, Alstorf, Germany	Alstorf		Germany	ES20-U8	2000	1.1

DRUG-FREE WORKPLACE FORM

ORIGINAL

The undersigned vendor in accordance with Section 287.087, Florida Statutes hereby certifies that Hydranautics does:
(Name of Business)

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or Contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or Contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Bidder's Signature

12-21-2011
Date

NITTO DENKO

HYDRANAUTICS
www.membranes.com
A Nitto Denko Company

Membrane Element ESPA2-LD
(Low Fouling Technology)

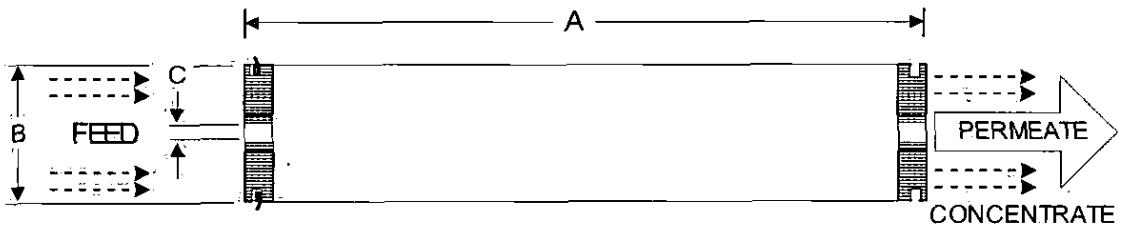
Performance:	Permeate Flow:	10,000 gpd (37.9 m^3/d)
	Salt Rejection:	99.6 % (99.5 % minimum)
Type	Configuration:	Low Fouling Spiral Wound
	Membrane Polymer:	Composite Polyamide
	Membrane Active Area:	400 ft^2 (37.1m^2)
	Feed Spacer:	34 mil (0.864 mm) with biostatic agent
Application Data*	Maximum Applied Pressure:	600 psig (4.16 MPa)
	Maximum Chlorine Concentration:	< 0.1 PPM
	Maximum Operating Temperature:	113 °F (45 °C)
	pH Range, Continuous (Cleaning):	2-11 (1-13)*
	Maximum Feedwater Turbidity:	1.0 NTU
	Maximum Feedwater SDI (15 mins):	5.0
	Maximum Feed Flow:	75 GPM (17.0 m^3/h)
	Minimum Ratio of Concentrate to Permeate Flow for any Element:	5:1
	Maximum Pressure Drop for Each Element:	10 psi

* The limitations shown here are for general use. For specific projects, operating at more conservative values may ensure the best performance and longest life of the membrane. See Hydranautics Technical Bulletins for more detail on operation limits, cleaning pH, and cleaning temperatures.

Test Conditions

The stated performance is initial (data taken after 30 minutes of operation), based on the following conditions:

1500 PPM NaCl solution
150 psi (1.05 MPa) Applied Pressure
77 °F (25 °C) Operating Temperature
15% Permeate Recovery
6.5 - 7.0 pH Range



A, inches (mm)	B, inches (mm)	C, inches (mm)	Weight, lbs. (kg)
40.0 (1016)	7.89 (200)	1.125 (28.6)	36 (16.4)

Notice: Permeate flow for individual elements may vary + or - 15 percent. Membrane active area may vary +/-4%. All membrane elements are supplied with a brine seal, interconnector, and o-rings. Elements are enclosed in a sealed polyethylene bag containing less than 1.0% sodium meta-bisulfite solution, and then packaged in a cardboard box.

Hydranautics Corporate: 401 Jones Road, Oceanside, CA 92058
1-800-CPA-PURE Phone: 760-901-2500 Fax: 760-901-2578 info@hydranautics.com

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:	173.8	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	0.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	1.00	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	1093.0	50.7	15.4	18.1	1.18	163.3	15.0	ESPA2-LD	217	31x7
1-2	163.9	34.2	22.4	6.0	1.03	151.9	0.0	ESPA2-LD	98	14x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	114.0	284.3	114.0	284.3	0.850	2.1	566.6	1413.0
Mg	104.0	428.0	104.0	428.0	0.776	3.2	516.9	2127.2
Na	705.0	1532.6	705.0	1532.6	24.934	54.2	3425.3	7446.2
K	25.0	32.1	25.0	32.1	1.101	1.4	120.6	154.6
NH4	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0
Ba	0.031	0.0	0.031	0.0	0.000	0.0	0.154	0.1
Sr	14.600	16.7	14.600	16.7	0.109	0.1	72.564	82.8
CO3	0.6	1.0	0.6	1.0	0.000	0.0	3.1	5.2
HCO3	189.1	155.0	189.1	155.0	8.333	6.8	912.2	747.7
SO4	244.0	254.2	244.0	254.2	1.521	1.6	1213.9	1264.5
Cl	1490.0	2101.6	1490.0	2101.6	36.823	51.9	7302.7	10300.0
F	4.9	12.9	4.9	12.9	0.239	0.6	23.5	62.0
NO3	0.5	0.4	0.5	0.4	0.086	0.1	2.2	1.7
B	0.36		0.36		0.305		0.58	
SiO2	22.0		22.0		0.52		107.9	
CO2	8.48		8.48		8.48		8.48	
TDS	2914.1		2914.1		75.6		14268.2	
pH	7.50		7.50		6.19		8.12	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	3%	3%	25%
SrSO4 / Ksp * 100:	28%	28%	205%
BaSO4 / Ksp * 100:	95%	95%	596%
SiO2 saturation:	17%	17%	74%
Langelier Saturation Index	0.18	0.18	2.13
Stiff & Davis Saturation Index	0.10	0.10	1.51
Ionic strength	0.06	0.06	0.29
Osmotic pressure	29.0 psi	29.0 psi	141.6 psi

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates					
Calculation created by:	*Bates					
Project name:	Port St Lucie 1111			Permeate flow:	1810000.0	gpd
					0	
HP Pump flow:	1571.2	gpm		Raw water flow:	2262500.0	gpd
Feed pressure:	173.8	psi		Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)				
Feed water pH:	7.50			Element age:	0.0	years
Chem dose, ppm (100%):	0.0	none		Flux decline % per year:	5.6	
				Fouling Factor	1.00	
				Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd		Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Conc	Flux	Beta	Conc.&Throt. Pressures		Perm. TDS	Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi				
1-1	1093.0	50.7	15.4	18.1	1.18	163.3	15.0	42.1	ESPA2-LD	217	31x7
1-2	163.9	34.2	22.4	6.0	1.03	151.9	0.0	312.2	ESPA2-LD	98	14x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Cumulative Perm Ion levels Ca	Mg	Cl	B	SiO2
1-1	1	173.8	2.7	6.5	23.5	1.13	14.2	33.3	0.14	0.13	7	0.16	0.10
1-1	2	171.2	2.2	6.2	22.2	1.10	16.3	38.6	0.16	0.15	8	0.18	0.11
1-1	3	169.0	1.8	5.7	20.6	1.16	19.1	45.4	0.19	0.17	10	0.19	0.13
1-1	4	167.2	1.4	5.2	18.8	1.17	22.9	54.1	0.23	0.21	12	0.20	0.16
1-1	5	165.9	1.1	4.6	16.6	1.19	28.0	65.1	0.28	0.26	15	0.22	0.19
1-1	6	164.8	0.8	3.9	14.0	1.19	34.0	78.6	0.34	0.31	18	0.24	0.23
1-1	7	164.0	0.6	3.1	11.1	1.10	41.3	94.0	0.42	0.38	22	0.26	0.28
1-2	1	160.4	1.6	3.0	10.7	1.08	44.8	103.9	0.36	0.33	19	0.23	0.24
1-2	2	158.8	1.4	2.4	8.7	1.07	49.0	112.4	0.40	0.37	21	0.24	0.27
1-2	3	157.4	1.3	1.9	7.0	1.06	53.7	120.3	0.45	0.41	23	0.25	0.30
1-2	4	156.1	1.2	1.5	5.5	1.05	58.8	127.3	0.51	0.47	27	0.26	0.34
1-2	5	154.9	1.1	1.2	4.2	1.04	64.2	133.2	0.59	0.53	30	0.27	0.39
1-2	6	153.9	1.0	0.9	3.1	1.03	70.0	137.8	0.67	0.61	35	0.29	0.45
1-2	7	152.8	1.0	0.6	2.3	1.02	76.1	141.4	0.77	0.71	40	0.30	0.52

Stage	NDP psi
1-1	92.8
1-2	41.1

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow::	2262500.0	gpd
Feed pressure:	173.8	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	0.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	1.00	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate Langelier Saturation Index too high (2.13)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor. Without scale inhibitor, concentrate saturation should not exceed 100%.

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:	182.9	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	3.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	0.84	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	1069.8	50.7	16.2	17.7	1.10	172.0	10.0	ESPA2-LD	217	31x7
1-2	187.2	35.8	22.4	6.9	1.04	160.2	0.0	ESPA2-LD	98	14x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	114.0	284.3	114.0	284.3	0.941	2.3	566.2	1412.1
Mg	104.0	428.0	104.0	428.0	0.858	3.5	516.6	2125.8
Na	705.0	1532.6	705.0	1532.6	27.552	59.9	3414.8	7423.5
K	25.0	32.1	25.0	32.1	1.216	1.6	120.1	154.0
NH4	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0
Ba	0.031	0.0	0.031	0.0	0.000	0.0	0.154	0.1
Sr	14.600	16.7	14.600	16.7	0.120	0.1	72.518	82.8
CO3	0.6	1.0	0.6	1.0	0.000	0.0	3.1	5.2
HCO3	189.1	155.0	189.1	155.0	9.200	7.5	908.7	744.8
SO4	244.0	254.2	244.0	254.2	1.683	1.8	1213.3	1263.8
Cl	1490.0	2101.6	1490.0	2101.6	40.699	57.4	7287.2	10278.2
F	4.9	12.9	4.9	12.9	0.264	0.7	23.4	61.7
NO3	0.5	0.4	0.5	0.4	0.094	0.1	2.1	1.7
B	0.36		0.36		0.319		0.52	
SiO2	22.0		22.0		0.58		107.7	
CO2	8.48		8.48		8.48		8.48	
TDS	2914.1		2914.1		83.5		14236.5	
pH	7.50		7.50		6.23		8.12	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	3%	3%	25%
SrSO4 / Ksp * 100:	28%	28%	205%
BaSO4 / Ksp * 100:	95%	95%	597%
SiO2 saturation:	17%	17%	74%
Langelier Saturation Index	0.18	0.18	2.13
Stiff & Davis Saturation Index	0.10	0.10	1.51
Ionic strength	0.06	0.06	0.29
Osmotic pressure	29.0 psi	29.0 psi	141.3 psi

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates					
Calculation created by:	*Bates					
Project name:	Port St Lucie 1111					
Permeate flow:			1810000.0	gpd		
			0			
HP Pump flow:		1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:		182.9	psi	Permeate recovery:	80.0	%
Feedwater Temperature:		24.5	C(76F)			
Feed water pH:		7.50		Element age:	3.0	years
Chem dose, ppm (100%):		0.0	none	Flux decline % per year:	5.6	
				Fouling Factor	0.84	
				Salt passage increase, %/yr:	5.0	
Average flux rate:		14.4	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Conc	Flux	Beta	Conc.&Throt. Pressures		Perm. TDS	Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi				
1-1	1069.8	50.7	16.2	17.7	1.10	172.0	10.0	47.2	ESPA2-LD	217	31x7
1-2	187.2	35.8	22.4	6.9	1.04	160.2	0.0	304.1	ESPA2-LD	98	14x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Cumulative Perm Ion levels Ca	Mg	Cl	B	SiO2
1-1	1	182.9	2.7	6.1	22.0	1.12	17.4	32.9	0.17	0.16	9	0.20	0.12
1-1	2	180.2	2.2	5.8	20.9	1.10	19.6	37.8	0.20	0.18	10	0.21	0.13
1-1	3	178.0	1.8	5.5	19.7	1.15	22.7	44.0	0.23	0.21	12	0.22	0.15
1-1	4	176.2	1.5	5.1	18.2	1.16	26.7	51.8	0.27	0.25	14	0.23	0.18
1-1	5	174.7	1.1	4.6	16.6	1.18	32.2	61.8	0.32	0.30	17	0.25	0.22
1-1	6	173.6	0.9	4.0	14.5	1.19	38.6	74.4	0.39	0.36	20	0.26	0.26
1-1	7	172.7	0.7	3.4	12.1	1.19	46.3	89.6	0.47	0.43	24	0.28	0.32
1-2	1	169.0	1.7	3.1	11.0	1.08	50.1	98.9	0.42	0.38	22	0.26	0.28
1-2	2	167.3	1.5	2.6	9.3	1.08	54.6	107.3	0.46	0.42	24	0.26	0.31
1-2	3	165.8	1.3	2.2	7.9	1.07	59.6	115.4	0.52	0.47	27	0.27	0.35
1-2	4	164.5	1.2	1.8	6.5	1.06	65.1	123.1	0.58	0.53	30	0.28	0.39
1-2	5	163.2	1.1	1.5	5.2	1.05	71.0	130.1	0.66	0.60	34	0.29	0.44
1-2	6	162.1	1.0	1.2	4.1	1.04	77.4	136.1	0.75	0.68	39	0.30	0.50
1-2	7	161.1	1.0	0.9	3.2	1.04	84.1	141.1	0.86	0.78	45	0.32	0.58

Stage	NDP psi
1-1	109.0
1-2	52.1

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:	182.9	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	3.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	0.84	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate Langelier Saturation Index too high (2.13)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor. Without scale inhibitor, concentrate saturation should not exceed 100%.

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:	189.8	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	5.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	0.75	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi			
1-1	1059.7	50.7	16.5	17.6	1.19	178.7	5.0	ESPA2-LD	217	31x7
1-2	197.3	36.5	22.4	7.2	1.04	166.7	0.0	ESPA2-LD	98	14x7

	Raw water		Feed water		Permeate		Concentrate	
Ion	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3	mg/l	CaCO3
Ca	114.0	284.3	114.0	284.3	1.003	2.5	566.0	1411.4
Mg	104.0	428.0	104.0	428.0	0.915	3.8	516.3	2124.9
Na	705.0	1532.6	705.0	1532.6	29.355	63.8	3407.6	7407.8
K	25.0	32.1	25.0	32.1	1.295	1.7	119.8	153.6
NH4	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0
Ba	0.031	0.0	0.031	0.0	0.000	0.0	0.154	0.1
Sr	14.600	16.7	14.600	16.7	0.128	0.1	72.486	82.7
CO3	0.6	1.0	0.6	1.0	0.000	0.0	3.1	5.2
HCO3	189.1	155.0	189.1	155.0	9.796	8.0	906.3	742.9
SO4	244.0	254.2	244.0	254.2	1.795	1.9	1212.8	1263.4
Cl	1490.0	2101.6	1490.0	2101.6	43.369	61.2	7276.5	10263.1
F	4.9	12.9	4.9	12.9	0.281	0.7	23.4	61.5
NO3	0.5	0.4	0.5	0.4	0.100	0.1	2.1	1.7
B	0.36		0.36		0.326		0.49	
SiO2	22.0		22.0		0.61		107.5	
CO2	8.48		8.48		8.48		8.48	
TDS	2914.1		2914.1		89.0		14214.7	
pH	7.50		7.50		6.26		8.12	

	Raw water	Feed water	Concentrate
CaSO4 / Ksp * 100:	3%	3%	25%
SrSO4 / Ksp * 100:	28%	28%	205%
BaSO4 / Ksp * 100:	95%	95%	597%
SiO2 saturation:	17%	17%	74%
Langelier Saturation Index	0.18	0.18	2.13
Stiff & Davis Saturation Index	0.10	0.10	1.51
Ionic strength	0.06	0.06	0.28
Osmotic pressure	29.0 psi	29.0 psi	141.1 psi

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:	189.8	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	5.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	0.75	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

Stage	Perm. Flow	Flow/Vessel Feed	Flow/Vessel Conc	Flux	Beta	Conc.&Throt. Pressures		Perm. TDS	Element Type	Elem. No.	Array
	gpm	gpm	gpm	gfd		psi	psi				
1-1	1059.7	50.7	16.5	17.6	1.19	178.7	5.0	50.6	ESPA2-LD	217	31x7
1-2	197.3	36.5	22.4	7.2	1.04	166.7	0.0	308.3	ESPA2-LD	98	14x7

Stg	Elem no.	Feed pres psi	Pres drop psi	Perm flow gpm	Perm Flux gfd	Beta	Perm sal TDS	Conc osm pres	Cumulative Perm Ion levels Ca	Mg	Cl	B	SiO2
1-1	1	189.8	2.7	5.9	21.3	1.12	19.5	32.8	0.19	0.18	10	0.22	0.13
1-1	2	187.1	2.2	5.7	20.3	1.10	21.9	37.5	0.22	0.20	11	0.23	0.15
1-1	3	184.8	1.8	5.3	19.2	1.14	25.1	43.4	0.25	0.23	13	0.24	0.17
1-1	4	183.0	1.5	5.0	18.0	1.15	29.3	50.8	0.29	0.27	15	0.25	0.20
1-1	5	181.5	1.2	4.6	16.5	1.17	35.0	60.4	0.35	0.32	18	0.26	0.24
1-1	6	180.3	0.9	4.1	14.8	1.18	41.7	72.5	0.42	0.38	22	0.28	0.28
1-1	7	179.4	0.7	3.5	12.7	1.19	49.6	87.7	0.50	0.46	26	0.30	0.34
1-2	1	175.7	1.7	3.1	11.0	1.08	53.7	96.7	0.46	0.42	24	0.27	0.31
1-2	2	174.0	1.6	2.6	9.5	1.08	58.5	104.8	0.51	0.46	26	0.28	0.34
1-2	3	172.4	1.4	2.3	8.2	1.07	63.8	112.9	0.56	0.51	29	0.28	0.38
1-2	4	171.0	1.3	1.9	7.0	1.06	69.5	120.8	0.63	0.57	33	0.29	0.42
1-2	5	169.8	1.1	1.6	5.8	1.06	75.8	128.3	0.71	0.65	37	0.30	0.48
1-2	6	168.6	1.1	1.3	4.7	1.05	82.5	135.0	0.80	0.73	42	0.31	0.54
1-2	7	167.6	1.0	1.0	3.8	1.04	89.7	140.9	0.91	0.83	48	0.33	0.61

Stage	NDP psi
1-1	121.8
1-2	59.9

Permeate THROTTLING(VARIABLE)

RO program licensed to:	*Bates				
Calculation created by:	*Bates				
Project name:	Port St Lucie 1111		Permeate flow:	1810000.0	gpd
				0	
HP Pump flow:	1571.2	gpm	Raw water flow:	2262500.0	gpd
Feed pressure:	189.8	psi	Permeate recovery:	80.0	%
Feedwater Temperature:	24.5	C(76F)			
Feed water pH:	7.50		Element age:	5.0	years
Chem dose, ppm (100%):	0.0	none	Flux decline % per year:	5.6	
			Fouling Factor	0.75	
			Salt passage increase, %/yr:	5.0	
Average flux rate:	14.4	gfd	Feed type:	Well Water	

****
**** THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS: ***
****

Concentrate Langelier Saturation Index too high (2.13)

The following are recommended general guidelines for designing a reverse osmosis system using Hydranautics membrane elements. Please consult Hydranautics for specific recommendations for operation beyond the specified guidelines.

Feed and Concentrate flow rate limits

Element diameter	Maximum feed flow rate	Minimum concentrate rate
8.0 inches	75 gpm (283.9 lpm)	12 gpm (45.4 lpm)
8.0 inches(Full Fit)	75 gpm (283.9 lpm)	30 gpm (113.6 lpm)

Concentrate polarization factor (beta) should not exceed 1.2 for standard elements

Saturation limits for sparingly soluble salts in concentrate

Soluble salt	Saturation
BaSO4	6000%
CaSO4	230%
SrSO4	800%
SiO2	100%

Langelier Saturation Index for concentrate should not exceed 1.8

The above saturation limits only apply when using effective scale inhibitor. Without scale inhibitor, concentrate saturation should not exceed 100%.

ORIGINAL

NITTO DENKO HYDRANAUTICS www.membranes.com A Nitto Denko Company

HYDRANAUTICS 5-Year LIMITED PERFORMANCE WARRANTY
for Spiral-Wound Reverse Osmosis and Nanofiltration Membrane Elements
Issued for **City of Port St. Lucie**
Reload for RO Trains 1 and/or 2 for Prineville WTP

This Limited Integrated Membrane System Performance Warranty is provided to **city of Port St. Lucie** (the "Buyer") and is made by HYDRANAUTICS ("Hydranautics"), a California corporation, in connection with the Buyer's purchase of Hydranautics product(s) and the component parts thereof, as more fully described and defined in that certain sales contract ("Contract") of even date herewith. This Warranty is made and executed by Hydranautics and the Buyer as of the date set forth hereinbelow, and is effective as of the date of execution by the last to sign of the parties hereto (the "Effective Date"), subject to the terms, conditions and limitations set forth herein.

I. ACRONYMS AND DEFINITIONS.

The following acronyms as used herein shall mean:

ASTM:	ATSM International
AWWA:	American Water Works Association
Feedwater:	The flow entering the pressure vessels that contain Covered Product.
NTU:	Nephelometric Turbidity Units
RO:	Reverse Osmosis
NF:	Nanofiltration
$SDI_{(15)}$:	Silt Density Index, fifteen $_{(15)}$ minute test with Millipore AAWP pads
TDS:	Total Dissolved Solids as measured using the American Water Works Association ("AWWA") standard methods.
TSB:	Technical Service Bulletin. TSBs referenced in this Warranty may be viewed and downloaded at http://www.membranes.com. TSBs specifically incorporated into this Warranty by reference are attached hereto as Attachment "B."

II. ACKNOWLEDGEMENTS OF BUYER.

By executing and accepting this Warranty, Buyer acknowledges to Hydranautics the following:

A. Buyer understands and agrees that it is Buyer's sole responsibility to ensure that the RO system in which Covered Product is installed, is capable of being operated in a manner that satisfies the: (i) Feedwater Quality; (ii) Operating; and (iii) Design Conditions as set forth herein;

B. Buyer has read and understands the terms, conditions, and limitations of this Warranty;

C. Buyer has read and understands the Technical Service Bulletins ("TSBs") attached hereto as Attachment "B," and will comply with the procedures, recommendations and good use practices described therein. Buyer agrees to conform with all reasonable diligence to the requirements set forth in TSBs 105, 107, 108 and 118, and hereby acknowledges that in the event that Buyer's failure to reasonably comply with the requirements and recommendations set forth therein cause damage to Covered Product(s), to the extent that

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Covered Product(s) performance is permanently impaired or operational life is substantially shortened; then Hydranautics will be relieved of its obligations to perform the remedies set forth herein and this Warranty will be voided.

D. Buyer understands that this Warranty is ***not*** effective unless an authorized representative of both Hydranautics and Buyer have affixed their respective signatures in the place provided below, signifying their mutual acceptance of the provisions, terms, conditions and limitations of this Warranty.

III. LIMITED WARRANTY ON WORKMANSHIP AND MATERIALS.

Hydranautics warrants Covered Product as free from defects in workmanship and materials for a period not to exceed **sixty (60)** months from the date of delivery to Buyer; provided however, that Covered Product are used and maintained in accordance with this Warranty. Covered Product which are not free from defects, will be repaired or replaced, at Hydranautics sole option, in accordance with the provisions of this Warranty. The 1st 12 month replacement rate is no charge and is then evenly pro-rated for month 13 to 60.

IV. LIMITED PERFORMANCE WARRANTY.

Hydranautics warrants Covered Product shall produce the permeate output and the permeate quality as set forth in Attachment "A," subject to the terms, conditions and limitations of this Limited Performance Warranty (the "Warranty").

V. WARRANTY TERM.

This Warranty shall commence on whichever of the following events occurs first: (i) Beneficial Use (by train); or (ii) six (6) months following last delivery; or (iii) plant acceptance whichever occurs first; and shall terminate **sixty (60)** months following commencement (the "Warranty Term"). Buyer shall record the date of the warranty start date as set forth in this Article V., maintain such records, and make such records available to Hydranautics in the event of a warranty claim. For purposes of this Article V., the above terms shall have the following meaning:

A. "Beneficial Use" means – The Owner is being enriched from the installed RO membrane elements by operating the plant or individual trains in which the membrane elements are installed for the purpose producing water and where the water produced is being sold or otherwise produced or consumed for the benefit of either the Buyer or the Owner, whether within specification or not.

B. "six (6) months following last delivery" means – six months following the last date of delivery to Buyer under the delivery terms (Incoterms) set forth in the main purchase contract, as evidenced by the shipping documents.

C. "plant acceptance" means – the date on which the plant or system in which Covered Product are installed successfully completed acceptance testing and the Buyer received or the Owner issued a written acceptance certificate.

VI. WARRANTY TERMS AND CONDITIONS.

This Warranty is expressly conditioned on Buyer's compliance with the following terms and conditions.

A. **FEEDWATER QUALITY CONDITIONS.** Feedwater quality shall be measured after all pre-treatment chemicals have been added and following cartridge filtration.

Buyer's Initials _____

1) Turbidity must be below the value specified in Attachment A.

2) Feedwater $SDI_{(15)}$ must be below the value specified in Attachment A.

3) Covered Product whose performance is impared due to scale formation are not covered under this Warranty.

4) Feedwater temperature shall not exceed 113°F (45°C).

5) The feedwater shall contain no oil or grease. Total hydrocarbons shall be below 100 ppb.

6) Feedwater shall contain no chlorine, hypochlorous, hypochlorite ion or other oxidizing agents.

B. RECORDS.

As a condition precedent for enforcement of Hydranautics' obligations under this warranty, Buyer agrees to maintain records in accordance with the following requirements, hereinafter collectively "Records":

1) Buyer shall maintain records of SDI measurements at a frequency of not less than three (3) measurements per day while Covered Product is in operation for the term of this Warranty. SDI pads should be maintained for three (3) months for reference and shall be made available to Hydranautics on request in the event a warranty claim is filed. Turbidity records shall be continuous for the term of this Warranty.

2) Buyer shall enter one (1) set of operating data, per operating train, per day, into the Hydranautics' RO Data Normalization Program, which may be downloaded at http://www.membranes.com. Data may be entered on working days only, however, data must be entered for each day of operation. Buyer agrees to enter all data and information required by ROData including, but not necessarily limited to: feed water temperature, feed water pH, feed water conductivity, permeate conductivity, concentrate flow, permeate flow, feed pressure, permate pressure, concentrate pressure, feed water SDI and feed water turbidity.

3) Additionally, Buyer shall maintain a daily operations log for the system or trains, in the event the system is not operated at full capacity, in which Covered Products are installed and operating. The operations log shall record any and all plant operational events, including but not limited to: (i) system or train start-up dates and times; (ii) system or train shut-down dates and times; (iii) changes in the type, brand or concentration of chemicals used; (iv) the dates when Covered Products were cleaned as well as the type and brand of cleaning chemicals used and the procedures employed.

4) Additionally, Buyer shall maintain records showing the serial number of each RO Covered Product and the location and position of each Covered Product in the pressure tubes. If RO Covered Products are installed in the system by a party other than the Buyer, it is the Buyer's responsibility to obtain the loading records from the party loading Covered Products.

5) Upon reasonable advance notice, Buyer agrees to grant Hydranautics' employees access to the system and the operating records required herein at any time during

normal business hours. Hydranautics' representative(s) shall be notified of any membrane cleanings and replacement element loading within a reasonable timeframe. An up-to-date copy of the data disc(s) produced by the Data Normalization Program, or other plant operating data, shall be provided to Hydranautics upon request. An up-to-date copy of the data disc(s) produced by Hydranautics' RO Data Normalization Program shall be sent to Hydranautics with seven (7) business days of request.

C. OTHER WARRANTY CONDITIONS.

As a condition precedent for the enforcement of this Warranty, Buyer acknowledges and agrees to the following provisions:

1) Hydranautics shall have the right to review the system design, operating instructions, and the operation of Covered Products, including pre-treatment and cleaning procedures and chemicals used to validate Buyer's compliance with the terms and conditions of this Warranty.

2) This Warranty shall not be assigned or transferred by the Buyer without the prior written consent of Hydranautics, such consent to not be unreasonably withheld.

Buyer's failure to strictly adhere to the express conditions set forth in Article VI, Warranty Terms and Conditions, will void this Warranty.

VII. ENFORCEMENT OF WARRANTY.

A. In the event that Covered Product fails to perform to warranted values, Buyer shall notify Hydranautics within ten (10) days of the discovery of such failure by contacting a local Hydranautics representative.

B. Upon request, Buyer shall forward to Hydranautics the Records required by paragraph VI.B, within seven (7) business days of receipt of such request. Buyer's failure to provide Hydranautics with Records will prohibit Hydranautics from validating Buyer's warranty claim. In such event, Hydranautics shall be relieved of all of its obligations under this Warranty.

C. If the performance issue cannot be resolved during the site visit or over the telephone, Hydranautics may request Buyer to return Covered Product(s) for performance evaluation, under TSB 116 Returned Goods Authorization, to validate Buyer's warranty claim and to confirm that the conditions of this Warranty have been satisfied. Except as may otherwise be specifically required under the terms set forth in this Warranty, Buyer shall enforce the Warranty in accordance with the procedures set forth in TSB 116, Returned Goods Autorization. Failure to comply with the procedures set forth in TSB 116 shall relieve Hydranautics of its obligations to perform under this Warranty.

D. Buyer is solely responsible for all packing and shipment costs and risk of loss for all Covered Product shipped by Buyer to Hydranautics. Hydranautics is solely responsible for all packing and shipments costs and risk of loss for Covered Product shipped to Buyer until delivery to Buyer's facility.

VIII. BUYER'S EXCLUSIVE REMEDY.

The sole obligation of Hydranautics and the sole and exclusive remedy of Buyer is limited to and is

fully discharged by Hydranautics repairing or replacing Covered Product; or adding new Covered Product to achieve Warranted Performance, subject to the limitation that Hydranautics is only responsible for a replacement or repair value based on the terms provided in Attachment A, Section V.

IX. LIMITATIONS ON HYDRANAUTICS LIABILITY.

Hydranautics' total liability under this Warranty shall not exceed the replacement value, based on the pro-rata balance of the unrealized warranty term, of one set of membrane elements per train; excluding any Covered Product or portions thereof that are replaced due to defects in material or workmanship. Covered Product, or portions thereof, that are replaced due to defects in material or workmanship will be covered as new Covered Product, although all warranty obligations will expire at the end of the Warranty Term, as set forth herein, including any remaining term of the workmanship and material warranty.

IN NO EVENT SHALL HYDRANAUTICS BE LIABLE FOR PROSPECTIVE PROFITS OR SPECIAL, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING BUT NOT LIMITED TO, LOST TIME, LOST PROFITS, LOST SALES, OPERATING COSTS, PLANT DOWNTIME, OR DAMAGES RESULTING FROM DELAYED SHIPMENT OR MAILING, OR THIRD PARTY CLAIMS, ARISING FROM A WARRANTY CLAIM, SALE OF A COVERED PRODUCT, OR FOR ANY DELAY OR FAILURE TO PERFORM DUE TO CAUSES BEYOND ITS REASONABLE CONTROL, INCLUDING, BUT NOT LIMITED TO, ACTS OF GOD, STRIKES, RIOTS, ACTS OF WAR, EPIDEMICS, FAILURE OF SUPPLIERS TO PERFORM, GOVERNMENTAL REGULATIONS, POWER FAILURES, EARTHQUAKES, OR OTHER DISASTERS), OR FROM ANY BREACH OF WARRANTY OR CONTRACT BY HYDRANAUTICS IN CONNECTION WITH AN WARRANTY CLAIM OR THE SALE OF A COVERED PRODUCT TO BUYER, EVEN IF HYDRANAUTICS HAS BEEN PREVIOUSLY ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. HYDRANAUTICS' TOTAL LIABILITY, WHETHER IN CONTRACT OR TORT OR OTHERWISE, ARISING OUT OF ITS SALE OF COVERED PRODUCT, OR ANY WARRANTY CLAIM SHALL NOT EXCEED THE REPLACEMENT VALUE OF ONE SET OF COVERED PRODUCT PER TRAIN, EXCLUDING ANY COVERED PRODUCT OR PORTIONS THEREOF THAT ARE REPLACED DUE TO DEFECTS IN MATERIAL OR WORKMANSHIP.

X. WARRANTY DISCLAIMERS.

THIS WARRANTY SUPERSEDES AND REPLACES ANY PREVIOUS WARRANTY MADE OR OFFERED TO THE BUYER BY HYDRANAUTICS, EXCEPT FOR THOSE SET FORTH IN THE CONTRACT FOR SALE TO WHICH THIS LIMITED SYSTEM PERFORMANCE WARRANTY IS ATTACHED. HYDRANAUTICS DISCLAIMS ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ANY GOODS PURCHASED BY YOU FROM HYDRANAUTICS. BUYER ASSUMES ALL RISKS AND LIABILITIES RESULTING FROM THE USE OF ANY COVERED PRODUCT DELIVERED HEREUNDER. EXCEPT AS SPECIFICALLY SET FORTH HEREIN, NO WARRANTY IS MADE FOR THE FITNESS OF ANY COVERED PRODUCT FOR ANY PARTICULAR PURPOSE.

XI. MISCELLANEOUS.

A. Unless otherwise provided for in this Warranty, no agent, employee, or representative of Hydranautics has any authority to bind Hydranautics to any other affirmation, representation, or warranty concerning Covered Products. Unless an affirmation, representation or warranty is specifically included in this Warranty, it shall not be

Buyer's Initials _____

enforceable by Buyer.

B. To the extent that ANY term set forth in this Warranty is in conflict with any other agreement between the parties, the terms of this Warranty shall control, particularly regarding, but not limited to, the Limitations on Hydranautics Liability set forth in Section IX hereof.

C. This Warranty shall be governed by and construed according to the laws of California, USA.

The EFFECTIVE DATE OF THIS WARRANTY shall be the latest date of execution by the last to sign of the parties hereto.

FOR HYDRANAUTICS:	**FOR BUYER:**
Signature: Craig R Bartels	Signature:
Name: Craig R. Bartels	Name:
Title: Vice President - Technology	Title:
Date: 12-21-11	Date:

Buyer's Initials_____

NITTO DENKO HYDRANAUTICS www.membranes.com A Nitto Denko Company

Attachment "A"
to
HYDRANAUTICS LIMITED SYSTEM PERFORMANCE WARRANTY
Issued to: City of Port St. Lucie
Project Name: Reload for RO Trains 1 and/or 2 for Prineville WTP

I. WARRANTED PERFORMANCE.

The following parameters, and *only the following parameters*, are guaranteed under this Warranty.

PARAMETER	WARRANTED VALUE
a. Permeate Output (Capacity):	**1.81 mgd per train**
b. Permeate Quality:	
Chloride	**< 50 mg/l as Cl**
Calcium	**< 10 mg/l Ca as CaCO3**
Sodium	**< 50 mg/l Na as Na**

II. DESIGN CONDITIONS.

Warranted Performance as defined in Section I. is expressly conditioned on Covered Product being operated under the Design Conditions provided below. Buyer understands and hereby agrees that operation of Covered Product under conditions other than the Design Conditions will result in performance that is different from Warranted Performance and that such different result does not indicate a defect in Covered Product.

The Design Conditions are:

a.	Maximum design feedwater ion concentrations are as follows:								
Calcium	Ca^{2+}	**114**	mg/l	[redacted]	Bicarbonate	HCO_3^-	**189.1**	mg/l
Magnesium	Mg^{2+}	**104**	mg/l	[redacted]	Carbonate	CO_3^{2-}	**0.6**	mg/l
Sodium	Na^+	**705**	mg/l	[redacted]	Sulfate	SO_4^{2-}	**244**	mg/l
Potassium	K^+	**25**	mg/l	[redacted]	Chloride	$C1^-$	**1490**	mg/l
Barium	Ba^{2+}	**0.031**	mg/l	[redacted]	Fluoride	F^-	**4.9**	mg/l
Strontium	Sr^{2+}	**14.6**	mg/l	[redacted]	Nitrate	NO_3^-	**0.5**	mg/l
Ammonium	NH_4^+	**0**	mg/l	[redacted]	Silica	SiO_2	**22**	mg/l
Boron	B	**0.36**	mg/l	[redacted]	Iron	Fe^{2+}	**<0.02**	mg/l
b.	Feedwater TDS		**2914** mg/l Total dissolved solids as sum of the ions					
c.	Feedwater pH		**7.5**					
d.	Feedwater TOC		**2.5** mg/L					
e.	Feedwater Temperature Range		**24.5** Degrees Celsius					

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III. SYSTEM DESCRIPTION.

Each train of the reverse osmosis system consists of:

First pass:

a.	31 Pressure Vessels, each Pressure Vessel houses 7 membrane elements – First Stage
b.	14 Pressure Vessels, each Pressure Vessel houses 7 membrane elements – Second Stage

Please refer to applicable IMSDesign projection for additional details.

Total Number of trains: two (train 1 and/or 2)

Model and Total number of Covered Product Installed:

Membrane Model	Total Quantity
ESPA2-LD	**315 Train 1**
ESPA2-LD	**315 Train 2**

IV. OPERATING PARAMETERS.

A. The system and single train element flux rate shall not exceed the design value at any time during RO operation.

B. Maximum recovery shall not exceed **eighty** percent **(80%)** in the first pass.

C. Pressure drop across a pressure vessel shall never exceed 60 psig (4.1bar).

D. Feedwater $SDI_{(15)}$ shall be maintained at less than or equal to $SDI_{(15)}$ **< 2.5 95% of the time** .

E. Feedwater Turbidity shall be maintained at less than or equal to **< 0.1 NTU 95% of the time** .

F. The applied operating pressure shall at no time exceed the maximum pressure rating of the Covered Product as set forth in TSB105.

G. The membrane element shall not, at any time, be exposed to permeate back pressure (where permeate static pressure exceeds feed static pressure) including during shut-down, greater than 0.35 bar (5 psig.)

H. At no time shall Covered Product be subjected to pressurization/depressurization at a rate greater than zero point seven (0.7) bar (10 psig) per second.

I. Covered Product which experience structural or mechanical damaged as a result of Buyer's failure to meet these operating conditions are not covered under this warranty.

Buyer's Initials _____

V. **BUYER'S EXCLUSIVE REMEDY.** The sole obligation of Hydranautics (and the sole and exclusive remedy of Buyer) is limited to and is fully discharged by Hydranautics repairing or replacing existing Covered Product, or portions thereof, or adding new Covered Product, to achieve Warranted Performance. Hydranautics obligation to repair, replace or add is subject to the limitation that Hydranautics is only responsible for replacement on a pro rata adjusted basis; meaning that Buyer shall be required to pay an amount equal to the amount of the then current selling price multiplied by a factor equal to the number of completed months of the Warranty Period which have elapsed since the Warranty Start Date, divided by the total number of months of the Warranty Period. For example, if the Warranty Term is thirty-six (36) months and the Buyer seeks enforcement of the Warranty in the sixth (6^{th}) month, the Buyer shall be responsible for replacement valued at up to 16.66% of the then-current price of Covered Product and Hydranautics shall be responsible for the remaining balance. The decision to repair or replace Covered Product or any portion thereof shall be made by Hydranautics in its sole and absolute discretion.

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Attachment "B"

to Hydranautics Limited Performance Warranty
Project Name: **City of Port. St. Lucie – Reload for RO Trains 1 and/or 2 for Prineville WTP**
Bid No: 20110120

Technical Service Bulletins (TSBs)

- TSB 105 – Reverse Osmosis and Nanofiltration Membrane Element Precautions
- TSB 107 –Foulants and Cleaning Procedures for Composite Polyamide RO Membrane Elements (ESPA, ESNA, CPA, LFC, and SWC)
- TSB 108 – General Storage Procedures for Composite Polyamide (ESPA, ESNA, CPA, LFC, and SWC) and Polyvinyl Derivative (PVD) RO Membrane Elements
- TSB 116 – Returned Goods Authorization (RGA) Procedure
- TSB 118 – Membrane Start-up, Shutdown, and Preservative Flushing Guidelines

Technical Service Bulletins specifically incorporated into the Hydranautics Limited Performance Warranty are herein and may also be viewed and downloaded at http://www.membranes.com.

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Technical Service Bulletin

November 2011 TSB 105.08

REVERSE OSMOSIS AND NANOFILTRATION MEMBRANE ELEMENT PRECAUTIONS

PERMEATE VALVE OPERATION

The membrane element shall not, at any time, be exposed to permeate back pressure (where permeate static pressure exceeds feed static pressure). There shall be no permeate back pressure at shutdown.

At no time during operation of a membrane element system should the permeate valve(s) be closed. This includes pre-start up flushing, pre-shutdown flushing, cleaning(s) and standard operation.

Closing the permeate valve during any phase of operation causes a pressure differential across the tail end of the system and will likely result in irreparable damage to the glue lines of the tail element(s). This damage will cause immediate increase in salt passage of the system.

NOTE: Permeate valve(s) may be closed during shutdown after the system has been flushed and/or when input of the feed water is stopped. In many cases this is necessary to prevent an aerobic environment in the pressure vessels. The permeate valve (as well as the concentrate) should be fully re-opened prior to re-introducing feed water.

Reference also Technical Service Bulletin 118.

CONCENTRATE VALVE OPERATION TO SET RECOVERY RATE

During start up of any system, the concentrate valve should be in the fully open position. This valve should be moved towards the closed position after start up in order to obtain the desired system recovery. NEVER START A SYSTEM WITH THE CONCENTRATE VALVE CLOSED AND THEN OPENING IT UNTIL THE SYSTEM RECOVERY IS ACHIEVED.

NOTE: System recovery should be set to the design setpoint as recommended by Hydranautics' Rodesign© Software.

PRESENCE OF FREE CHLORINE OR OTHER OXIDANTS IN FEED WATER OF THIN FILM (POLYAMIDE) MEMBRANE ELEMENTS

At no time should there be a Free Chlorine or oxidant residual in the feed water. Even very low levels of chlorine or other oxidants in the feed stream can result in irreparable oxidation damage of the membrane. Therefore, operators should ensure that oxidant does not enter the RO system. To ensure that membranes are not harmed by oxidant, Hydranautics

recommends that the feed to the RO/NF system is equipped with an ORP (Oxidation-Reduction Potential) meter. The feedwater can then be continuously monitored for the presence of oxidant. Except in wastewater applications where chloramines are used and allowed up to a concentration of 5 ppm, the ORP meter reading should always be below 300 mV. If it exceeds 300 mV, the plant operator should receive a warning that a dangerous level of oxidant is getting to the membrane and should take action, such as adding or increasing the dose of SBS, to reduce the oxidant concentration. If the ORP value reaches 350 mV, the plant should be shut down until the oxidant concentration can be reduced to a safe value (ORP < 300 mV). Please contact your system provider for various methods of removing Free Chlorine prior to the membrane system.

NOTE: The oxidative effects of Free Chlorine are strongly catalyzed in the presence of transition metals such as iron and manganese. If transition metals are present, it is recommended that there be NO Free Chlorine in the feed water.

LUBRICATION OF O-RINGS AND BRINE SEALS

At no time should petroleum based lubricants be used when lubricating interconnector o-rings, end adapter o-rings or the membrane element brine seal. Acceptable lubricants include glycerin, silicon-based Molykote III, or other silicone-based lubricants which contain no hydrocarbons.

PARTICULATE FREE FEEDWATER

At no time should the membrane be exposed to particulate matter that can accumulate on the surface of the membrane and mechanically damage the polyamide surface. There are many sources of unwanted particulate matter, including insufficient flushing of pipework before start-up, corrosion of metal pumps, pipes, values or sensors in the feedline, poorly operating pretreatment, and by-pass of the typical 5 micron cartridge filters. Studies have shown that such particles can become lodged between the feed spacer and the membrane. Vibration of the spacer can then cause the particle to be pushed into the membrane and abrade the surface of the membrane (Figure 1). This often leads to mechanical defects which leak feedwater into the permeate side of the element. These particles may be 6 to 100 microns in size. An example of the damage they cause is shown in Figure 2. It is common for such damage to only slightly increase water flow, but greatly increase the salinity of the permeate, because raw feedwater, nearly 1000 times saltier than product water, will leak into the permeate. Users should follow Hydranautics' recommendations for Pre-commissioning and Commissioning, listed in our technical documents or available from Technical Support Personnel.

Figure 1 Schematic Representation of Particulate Damage to RO Membranes

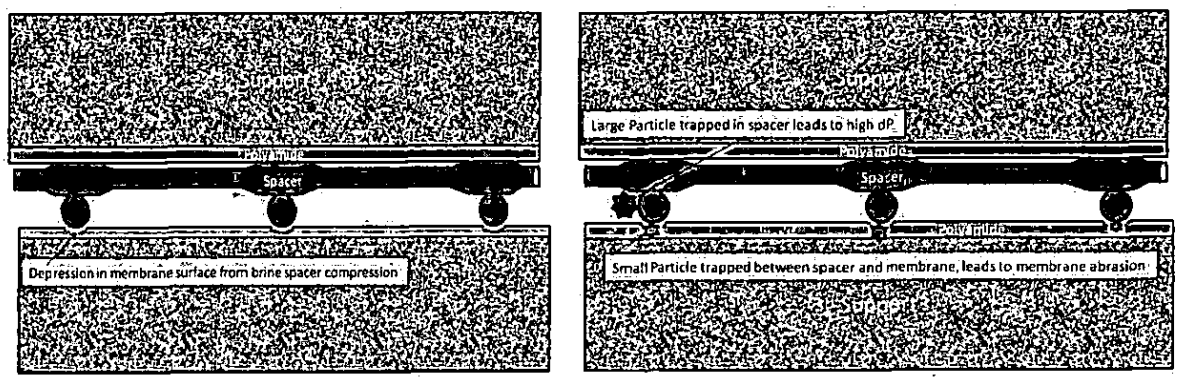
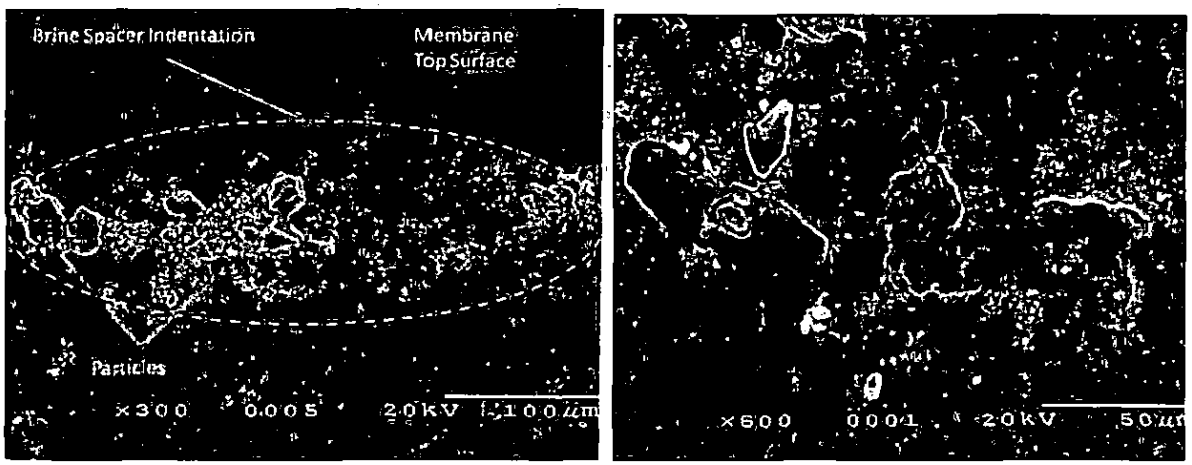


Figure 2 Membrane Surface Abraded by Particles



SYSTEM PRESSURIZATION RATE

Pressurization of an RO system must be done at a controlled rate. If the system is pressurized too quickly it can result in mechanical damage to the RO membrane elements. Damage to the RO elements can include cracking of the resin outerwrap and/or telescoping of the membrane due to axial stresses caused by the high rate of pressurization. Also, it can cause the resin outerwrap to burst due to momentary pressure differences between the inside of the element and outside of the element shell. Hydranautics recommends that the RO system be pressurized at no more than 10 psi (0.69 bar) per second to ensure no damage is done to the membrane element.

SAFE OPERATION AT HIGH TEMPERATURE AND PRESSURE

Since membranes are made from plastic materials, they are subject to plastic creep under certain high temperature and high pressure operating conditions. For reverse osmosis membranes, the primary concern is that the porous polysulfone support (Figure 3) may undergo compression at these conditions, which decreases the porosity of the intermediate layer. This results in greater resistance to water flow through this layer. The end result is that the apparent permeability of the composite membrane will decrease and the pressure required to achieve permeation rates at the reference temperature of 25 C will thus increase. Hydranautics recommends that customers operate their systems in accordance to the Temperature-Pressure limitations given in Figure 4. This chart gives the maximum pressure that is allowed for a given feed temperature. The RO elements are designed to run at up to 45 C. If the operator desires to run at temperatures in excess of 40C, they should first contact the Hydranautics Technical Department for advice on safe operation.

Figure 3 Magnified Cross-Section of a Typical Composite Polyamide Membrane

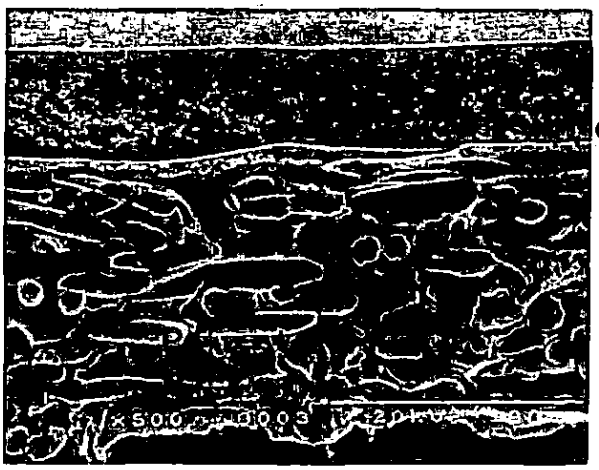


Figure 4a Temperature versus Pressure Operation Limits for Seawater Membranes * English Values:

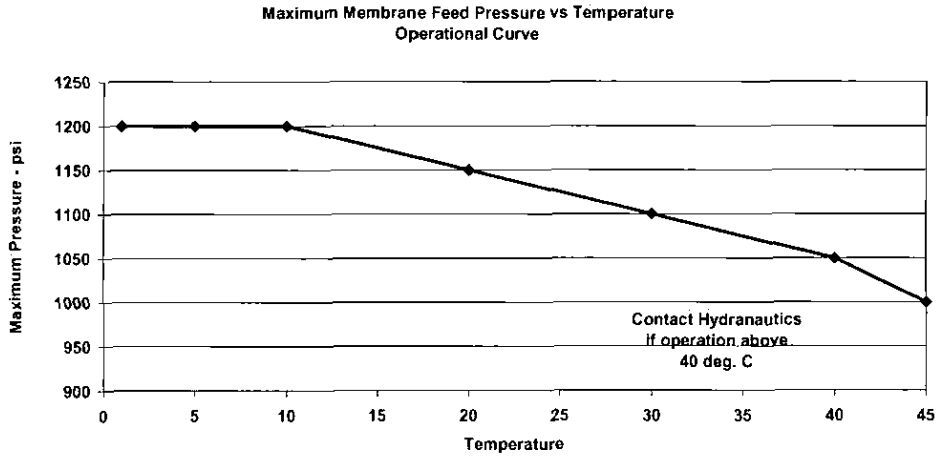
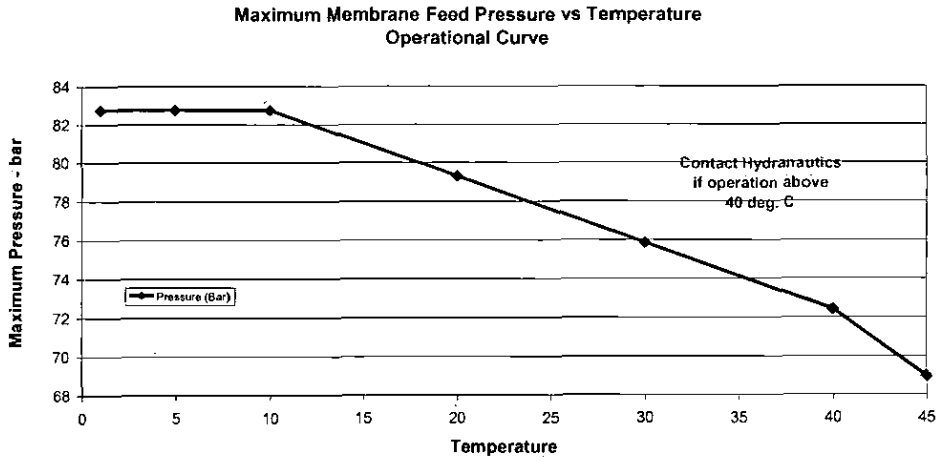


Figure 4b Temperature versus Pressure Operation Limits for Seawater Membranes- * Metric Values:



* Brackish water elements shall not be operated above 600 psi (41.4 bar).

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Technical Service Bulletin

October 2011 TSB107.21

Foulants and Cleaning Procedures for composite polyamide RO Membrane Elements (ESPA, ESNA, CPA, LFC, NANO and SWC)

This bulletin provides general information about the usual foulants affecting the performance of Hydranautics' Composite Polyamide Reverse Osmosis (RO) membrane elements and the removal of these foulants. The information in this bulletin applies to 4-inch, 6-inch, 8-inch, 8.5-inch, and 16-inch diameter RO membrane elements.

Note: The Composite Polyamide type of RO membrane elements may not be exposed to chlorinated water under any circumstances. Any such exposure will cause irreparable damage to the membrane. Absolute care must be taken following any disinfection of piping or equipment or the preparation of cleaning or storage solutions to ensure that no trace of chlorine is present in the feedwater to the RO membrane elements. If there is any doubt about the presence of chlorine, perform chemical testing to make sure. Neutralize any chlorine residual with a sodium bisulfite solution, and ensure adequate mixing and contact time to accomplish complete dechlorination. Dosing rate is 1.8 to 3.0 ppm sodium bisulfite per 1.0 ppm of free chlorine.

Note: It is recommended that all RO membrane cleaning operations should be closely coordinated with Hydranautics during the RO membrane element warranty period. Hydranautics field service personnel are available to be on site for cleaning assistance, should the need arise. Please contact Hydranautics for current charges for this service.

Note: The use of cationic surfactant should be avoided in cleaning solutions, since irreversible fouling of the membrane elements may occur.

If additional information is needed, please contact the Technical Services Department at:

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Oceanside, CA 92058

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Internet: www.membranes.com

RO Membrane Fouling and Cleaning

During normal operation over a period of time, RO membrane elements are subject to fouling by suspended or sparingly soluble materials that may be present in the feedwater. Common examples of foulants are:

- Calcium carbonate scale
- Sulfate scale of calcium, barium or strontium
- Metal oxides (iron, manganese, copper, nickel, aluminum, etc.)
- Polymerized silica scale
- Inorganic colloidal deposits
- Mixed inorganic/organic colloidal deposits
- NOM organic material (Natural Organic Matter)
- Man-made organic material (e.g. antiscalant/dispersants, cationic polyelectrolytes)
- Biological (bacterial bioslime, algae, mold, or fungi)

The nature and rapidity of fouling depends on a number of factors, such as the quality of the feedwater and the system recovery rate. Typically, fouling is progressive, and if not controlled early, will impair the RO membrane element performance in a relatively short time. Cleaning should occur when the RO shows evidence of fouling, just prior to a long-term shutdown, or as a matter of scheduled routine maintenance. The elements shall be maintained in a clean or "nearly clean" condition to prevent excessive fouling by the foulants listed above. Some fouling is allowed as long as:

- normalized permeate flow decrease is less than 10%

- normalized permeate quality decrease is less than 10%

- normalized pressure drop, as measured between the feed and concentrate headers, increase is less than 15%.

Cleaning should be carried out before these values are exceeded to maintain the elements in a clean or "nearly clean" condition. Effective cleaning is evidenced by the return of the normalized parameters to their initial, Start-up, value. In the event you do not normalize your operating data, the above values still apply if you do not have major changes in critical operating parameters. The operating parameters that have to stay constant are permeate flow, permeate back-pressure, recovery, temperature, and feed TDS. If these operating parameters fluctuate, then it is highly recommended that you normalize the data to determine if fouling is occurring or if the RO is actually operating normally based on the change in a critical operating parameter. Hydranautics offers a free normalization software program called RAData, which can be downloaded from our web site at www.membranes.com.

Monitoring overall plant performance on a regular basis is an essential step in recognizing when membrane elements are becoming fouled. Performance is affected progressively and in varying degrees, depending on the nature of the foulants. Table 1 "RO Troubleshooting Matrix" provides a summary of the expected effects that common foulants have on performance.

RO cleaning frequency due to fouling will vary by site. A rough rule of thumb as to an acceptable cleaning frequency is once every 3 to 12 months. If you have to clean more than once a month, you should be able to justify further capital expenditures for improved RO pretreatment or a re-design of the RO operation. If the cleaning frequency is every one to three months, you may want to focus on improving the operation of your existing equipment but further capital expenditure may be harder to justify.

It is important to clean the membranes when they are only lightly fouled, not heavily fouled. Heavy fouling can impair the effectiveness of the cleaning chemical by impeding the penetration of the chemical deep into the foulant and in the flushing of the foulant out of the elements. If normalized membrane performance drops 30 to 50%, it may be impossible to fully restore the performance back to baseline conditions.

When inorganic or polyelectrolyte coagulants are used in the pretreatment process, there can often be incomplete reaction of the coagulant and thus insufficient formation of a filterable floc. The user should ensure that excessive amounts of coagulant are not fed to the RO system, as it can lead to fouling. Polyelectrolyte fouling can often be very difficult to remove and result in higher than expected feed pressure. Excessive amounts of inorganic coagulant can be measured by using SDI filter equipment. In the case of iron, the iron on the SDI filter pad should typically be 3 µg/pad and never above 5 µg/pad. In regards to polymer coagulants, the user should discuss the concern with their chemical supplier and have them ensure that the chemical will not adversely affect the membrane.

In addition to the use of turbidity and SDI, particle counters are also very effective to accurately measure the suitability of the feedwater for NF/RO elements. The measure of particles greater than 2 microns in size should be < 100 particles per millilitre.

One RO design feature that is commonly over-looked in reducing RO cleaning frequency is the use of RO permeate water for flushing foulants from the system. Soaking the RO elements during standby with permeate can help dissolve scale and loosen precipitates, reducing the frequency of chemical cleaning.

What you clean for can vary site by site depending on the foulant. Complicating the situation frequently is that more than one foulant can be present, which explains why cleanings frequently require a low pH and high pH cleaning regiment.

Note: The membrane elements shall not be exposed to feed water containing oil, grease, or other foreign matter which proves to chemically or physically damage the integrity of the membrane.

Table 1: RO Troubleshooting Matrix

(Pressure Drop is defined as the Feed pressure minus the Concentrate pressure)

Possible Cause	Possible Location	Pressure Drop	Feed Pressure	Salt Passage
Metal Oxide Fouling (e.g. Fe,Mn,Cu,Ni,Zn)	1st stage lead elements	Rapid increase	Rapid increase	Rapid increase
Colloidal Fouling (organic and/or inorganic complexes)	1st stage lead elements	Gradual increase	Gradual increase	Slight increase
Mineral Scaling (e.g. Ca, Mg, Ba, Sr)	Last stage tail elements	Moderate Increase	Slight increase	Marked increase
Polymerized Silica	Last stage tail elements	Normal to increased	Increased	Normal to increased
Biological Fouling	Any stage, usually lead elements	Marked increase	Marked increase	Normal to increased
Organic Fouling (dissolved NOM)	All stages	Gradual increase	Increased	Decreased
Antiscalant Fouling	2nd stage most severe	Normal to increased	Increased	Normal to increased
Oxidant damage (e.g Cl_2, ozone, $KMnO_4$)	1st stage most severe	Normal to decreased	Decreased	Increased
Hydrolysis damage (out of range pH)	All stages	Normal to decreased	Decreased	Increased
Abrasion damage (carbon fines, etc)	1st stage most severe	Normal to decreased	Decreased	Increased
O-ring leaks (at interconnectors or adapters)	Random (typically at feed adapter)	Normal to decreased	Normal to decreased	Increased
Glue line leaks (due to permeate back-pressure in service or standby)	1st stage most severe	Normal to decreased	Normal to decreased	Increased
Glue line leaks (due to closed permeate valve while cleaning or flushing)	Tail element of a stage	Increased (based on prior fouling & high delta P)	Increased (based on prior fouling & and high delta P)	Increased

Discussion on Foulants

Calcium Carbonate Scale: Calcium carbonate is a mineral scale and may be deposited from almost any feedwater if there is a failure in the antiscalant/dispersant addition system or in the acid injection pH control system that results in a high feedwater pH. An early detection of the resulting calcium carbonate scaling is absolutely essential to prevent the damage that crystals can cause on the active membrane layers. Calcium carbonate scale that has been detected early can be removed by lowering the feedwater pH to between 3.0 and 5.0 for one or two hours. Longer resident accumulations of calcium carbonate scale can be removed by a low pH cleaning with a citric acid solution.

Calcium, Barium & Strontium Sulfate Scale: Sulfate scale is a much "harder" mineral scale than calcium carbonate and is harder to remove. Sulfate scale may be deposited if there is a failure in the antiscalant/dispersant feed system or if there is an over feed of sulfuric acid in pH adjustment. Early detection of the resulting sulfate scaling is absolutely essential to prevent the damage that crystals can cause on the active membrane layers. Barium and strontium sulfate scales are particularly difficult to remove as they are insoluble in almost all cleaning solutions, so special care should be taken to prevent their formation.

Calcium Phosphate Scale: This scale is particularly common in municipal waste waters and polluted water supplies which may contain high levels of phosphate. This scale can generally be removed with acidic pH cleaners. At this time, phosphate scaling calculations are not performed by the Hydranautics RO Design software. As a rule of thumb, contact Hydranautics technical department if phosphate levels in the feed are 5 ppm or higher.

Metal Oxide/Hydroxide Foulants: Typical metal oxide and metal hydroxide foulants are iron, zinc, manganese, copper, aluminum, etc. They can be the result of corrosion products from unlined pipes and tanks, or result from the oxidation of the soluble metal ion with air, chlorine, ozone, potassium permanganate, or they can be the result of a pretreatment filter system upset that utilizes iron or aluminum-based coagulant aids.

Polymerized Silica Coating: A silica gel coating resulting from the super-saturation and polymerization of soluble silica can be very difficult to remove. It should be noted that this type of silica fouling is different from silica-based colloidal foulants, which may be associated with either metal hydroxides or organic matter. Silica scale can be very difficult to remove by traditional chemical cleaning methods. Contact Hydranautics technical department if the traditional methods are unsuccessful. There does exist harsher cleaning chemicals, like ammonium biflouride, that have been used successfully at some sites but are considered rather hazardous to handle and can damage equipment.

Colloidal Foulants: Colloids are inorganic or mixed inorganic/organic based particles that are suspended in water and will not settle out due to gravity. Colloidal matter typically contains one or more of the following major components: iron, aluminum, silica, sulfur, or organic matter.

Dissolved NOM Organic Foulants: The sources of dissolved NOM (Natural Organic Matter) foulants are typically derived from the decomposition of vegetative material into surface waters or shallow wells. The chemistry of organic foulants is very complex, with the major organic components being either humic acid or fulvic acid. Dissolved NOMs can quickly foul RO membranes by being absorbed onto the membrane surface. Once absorption has occurred, then a slower fouling process of gel or cake formation starts. It should be noted that the mechanism of fouling with dissolved NOM should not be confused with the mechanism of fouling created by NOM organic material that is bound up with colloidal particles.

Microbiological Deposits: Organic-based deposits resulting from bacterial slimes, fungi, molds, etc. can be difficult to remove, particularly if the feed path is plugged. Plugging of the feed path makes it difficult to

introduce and distribute the cleaning solutions. To inhibit additional growth, it is important to clean and sanitize not only the RO system, but also the pretreatment, piping, dead-legs, etc. The membranes, once chemically cleaned, will require the use of a Hydranautics approved biocide and an extended exposure requirement to be effective. For further information on biocides, refer to Hydranautics Technical Service Bulletin TSB-110 "Biocides for Disinfection and Storage of Hydranautics Membrane Elements".

Selection and Use of Cleaning Chemicals

There are a number of factors involved in the selection of a suitable cleaning chemical (or chemicals) and proper cleaning protocol. The first time you have to perform a cleaning, it is recommended to contact the manufacturer of the equipment, the RO element manufacturer, or a RO specialty chemical and service supplier. Once the suspected foulant(s) are identified, one or more cleaning chemicals will be recommended. These cleaning chemical(s) can be generic or can be private-labeled proprietary chemicals. Typically, the generic chemicals can be of technical grades and are available from local chemical supply companies. The proprietary RO cleaning chemicals can be more expensive, but may be easier to use and you cannot rule out the advantage of the intellectual knowledge supplied by these companies. Some independent RO service companies can determine the proper chemicals and cleaning protocol for your situation by testing at their facility a fouled element pulled from your system.

It is not unusual to use a number of different cleaning chemicals in a specific sequence to achieve the optimum cleaning. Typically, a high pH cleaning is used first to remove foulants like oil or biological matter, followed by a low pH cleaning to remove foulants like mineral scale or metal oxides/hydroxides fouling. There are times that order of high and low pH cleaning solutions is reversed or one solution only is required to clean the membranes. Some cleaning solutions have detergents added to aid in the removal of heavy biological and organic debris, while others have a chelating agent like EDTA added to aid in the removal of colloidal material, organic and biological material, and sulfate scale. An important thing to remember is that the improper selection of a cleaning chemical, or the sequence of chemical introduction, can make the foulant worse.

Hydranautics recommends that the membrane system operator thoroughly investigate the signs of fouling before they select a cleaning chemical and a cleaning protocol. Some forms of fouling (iron deposits and scaling commonly associated with well waters) may require only a simple low pH cleaning. However, for most complex fouling phenomena, Hydranautics recommends the following sequence:

1. Flushing with permeate with addition of non oxidizing biocide (DBNPA or similar type) at the end of the flushing.
2. High pH CIP – Temperature versus pH as per recommendations in this TSB
3. Flushing with permeate until pH on the brine side is below pH 8.5
4. Low pH CIP
5. Acid flushing with permeate and non oxidizing biocide (DBNPA or similar type)

General Precautions in Cleaning Chemical Selection and Usage

- If you are using a proprietary chemical, make sure the chemical has been qualified for use with your Hydranautics membrane by the chemical supplier. The chemical supplier's instructions should not be in conflict with Hydranautics recommended cleaning parameters and limits listed in this Technical Service Bulletin.
- If you are using generic chemicals, make sure the chemical has been qualified for use with your Hydranautics membrane in this Technical Service Bulletin.
- Use the least harshest cleaning regiment to get the job done. This includes the cleaning parameters of pH, temperature, and contact time. This will optimize the useful life of the membrane.
- Clean at the recommended target temperatures to optimize cleaning efficiency and membrane life.
- Use the minimal amount of chemical contact time to optimize membrane life.

- Be prudent in the adjustment of pH at the low and high pH range to extend the useful life of the membrane. A "gentle" pH range is 4 to 10, while the harshest is 2 to 12.
- Oil and biologically -fouled membranes should not use a low pH clean-up first as the oil and biological matter will congeal.
- Cleaning and flushing flows should be in the same direction as the normal feed flow to avoid potential telescoping and element damage.
- When cleaning a multi-stage RO, the most effective cleaning is one stage at a time so cleaning flow velocities can be optimized and foulants from upstream stages don't have to pass through down-stream stages.
- Flushing out detergents with higher pH permeate can reduce foaming problems.
- Verify that proper disposal requirements for the cleaning solution are followed.
- If your system has been fouled biologically, you may want to consider the extra step of introducing a sanitizing biocide chemical before and after a successful cleaning. Biocides can be introduced before and immediately after cleaning, periodically (e.g. once a week), or continuously during service. You must be sure that the biocide is compatible with the membrane, does not create any health risks, is effective in controlling biological activity, and is not cost prohibitive.
- For safety reasons, make sure all hoses and piping can handle the temperatures, pressures and pH's encountered during a cleaning.
- For safety reasons, always add chemicals slowly to an agitated batch of make-up water.
- For safety reason, always wear safety glasses and protective gear when working with chemicals.
- For safety reasons, don't mix acids with caustics. Thoroughly rinse the 1st cleaning solution from the RO system before introducing the next solution.

Selecting a Cleaning Solution

Table 2 lists the recommended generic chemical solutions for cleaning an RO membrane element based on the foulant to be removed.

Important: It is recommended that the MSDS of the cleaning chemicals be procured from the chemical supplier and that all safety precautions be utilized in the handling and storage of all chemicals.

Table 2: Hydranautics Recommended Chemical Cleaning Solutions

Foulant	Gentle Cleaning Solution	Harsher Cleaning Solution
Calcium carbonate scale	1	4
Calcium, barium or strontium sulfate scale	2	4
Metal oxides/hydroxides (Fe, Mn, Zn, Cu, Al)	1	5
Inorganic colloidal foulants	1	4
Mixed Inorganic/organic colloidal foulants	2	6
Polymerized silica coating	None	7
Biological matter	2 or 3	6
NOM organic matter (naturally occurring)	2 or 3	6

Table 3 "Hydranautics Recipes for Cleaning Solutions" offers instructions on the volumes of bulk chemical to be added to 100 U.S. gallons (379 liters) of make-up water. Prepare the solutions by proportioning the amount of chemicals to the amount of make-up water to be used. Make-up water quality should be of RO permeate or deionized (DI) quality, and be free of chlorine and hardness. Before forwarding the cleaning solution to the membranes, it is important to thoroughly mix it, adjust the pH according to the target pH, and stabilize the temperature at the target temperature. Unless otherwise instructed, the cleaning design parameters are based on a chemical recirculation flow period of one hour and an optional chemical soak period of one hour.

Table 4 "Hydranautics Maximum pH and Temperature Limits for Cleaning" highlights the maximum pH and temperature limits for specific membranes, after which irreparable membrane damage can occur. A suggested minimum temperature limit is 70 F (21 C), but cleaning effectiveness and the solubility of the cleaning chemical is significantly improved at higher temperatures.

Description of Cleaning Solutions

Note: The notation (w) denotes that the diluted chemical solution strength is based on the actual weight of the 100% pure chemical or active ingredient.

Solution 1: This is a low pH cleaning solution of 2.0% (w) citric acid ($C_6H_8O_7$). It is useful in removing inorganic scale (e.g. calcium carbonate, calcium sulfate, barium sulfate, strontium sulfate) and metal oxides/hydroxides (e.g. iron, manganese, nickel, copper, zinc), and inorganic-based colloidal material. Note: Citric acid is available as a powder.

Solution 2: This is a high pH cleaning solution (target pH of 10.0) of 2.0% (w) of STPP (sodium tripolyphosphate) ($Na_5P_3O_{10}$) and 0.8% (w) of Na-EDTA (sodium salt of ethylaminediaminetetraacetic acid). It is specifically recommended for removing calcium sulfate scale and light to moderate levels of organic foulants of natural origin. STPP functions as an inorganic-based chelating agent and detergent. Na-EDTA is an organic-based chelating cleaning agent that aids in the sequestering and removal of divalent and trivalent cations and metal ions. STPP and Na-EDTA are available as powders.

Solution 3: This is a high pH cleaning solution (target pH of 10.0) of 2.0% % (w) of STPP (sodium tripolyphosphate) ($Na_5P_3O_{10}$) and 0.025% (w) Na-DDBS ($C_6H_5(CH_2)_{12}$-SO_3Na) (sodium salt of dodecylbenzene sulfonate). It is specifically recommended for removing heavier levels of organic foulants of natural origin. STPP functions as an inorganic-based chelating agent and detergent. Na-DDBS functions as an anionic detergent.

Solution 4: This is a low pH cleaning solution (target pH of 2.5) of 0.5% (w) of HCL (hydrochloric) acid. It is useful in removing inorganic scale (e.g. calcium carbonate, calcium sulfate, barium sulfate, strontium sulfate and metal oxides/hydroxides (e.g. iron, manganese, nickel, copper, zinc) and inorganic-based colloidal material. This cleaning solution is considered to be harsher than Solution 1. HCL acid, a strong mineral acid, is also known as muriatic acid. HCL acid is available in a number of concentrations: (18 ^{0} Baume = 27.9%), (20 ^{0} Baume = 31.4%), (22 ^{0} Baume = 36.0%).

Solution 5: This is a lower pH cleaning solution (natural pH is between pH 4 and 6. No pH adjustment is required) 1.0% (w) of $Na_2S_2O_4$ (sodium hydrosulfite). It is useful in the removal of metal oxides and hydroxides (especially iron fouling), and to a lesser extent calcium sulfate, barium sulfate and strontium sulfate. Sodium hydrosulfite is strong reducing agent and is also known as sodium dithionite. The solution will have a very strong odor so proper ventilation is required. Sodium hydrosulfite is available as a powder.

Solution 6: This is a high pH cleaning solution (target pH of 11.5) of 0.1% (w) of NaOH (sodium hydroxide) and 0.03% (w) of SDS (sodium dodecylsulfate). It is useful in the removal of organic foulants of natural origin, colloidal foulants of mixed organic/inorganic origin, and biological material (fungi, mold, slimes and biofilm). SDS is a detergent that is an anionic surfactant that will cause some foaming. This is considered to be a harsh cleaning regiment. ***Note: Do not exceed maximum pH and temp limits for specific elements. See Table4.***

Solution 7: This is a high pH cleaning solution (target pH of 11.5) of 0.1% (w) of NaOH (sodium hydroxide). It is useful in the removal of polymerized silica. This is considered to be a harsh cleaning regiment. *Note: Do not exceed maximum pH and temp limits for specific elements. See Table4.*

Important: It is recommended that the MSDS of the cleaning chemicals be procured from the chemical supplier and that all safety precautions be utilized in the handling and storage of all chemicals.

Table 3: Hydranautics Recipes for Cleaning Solutions

The quantities listed below are to be added to 100 U.S.gallons (379 liters) of dilution water.

Cleaning Solution	Bulk Ingredients	Quantity	Target [1] pH Adjustment	Target [1] Temp.
1	**Citric acid** (as 100% powder)	17.0 pounds (7.7 kg)	No pH adjustment is Required.	104 F (40 C)
2	**STPP** (sodium tripolyphosphate) (as 100% powder) **Na-EDTA** (Versene 220 or equal) (as 100% powder)	17.0 pounds (7.7 kg) 7.0 pounds (3.18 kg)	Adjust to pH 10.0 with sulfuric or hydrochloric acid.	104 F (40 C)
3	**STPP** (sodium tripolyphosphate) (as 100% powder) **Na-DDBS** Na-dodecylbenzene sulfonate	17 pounds (7.7 kg) 0.21 pounds (0.1 kg)	Adjust down to pH 10.0 with sulfuric or hydrochloric acid.	104 F (40 C)
4	**HCl acid** (hydrochloric acid (as 22^0 Baume or 36% HCL)	0.47 gallons (1.78 liters)	Slowly adjust pH down to 2.5 with HCL acid. Adjust pH up with sodium hydroxide.	95 F (35 C)
5	**Sodium hydrosulfite** (as 100% powder)	8.5 pounds (3.86 kg)	No pH adjustment is required.	95 F (35 C)
6	**NaOH** (sodium hydroxide) (as 100% powder) (or as 50% liquid) **SDS** (sodium dodecylsulfate)	 0.83 pounds (0.38 kg) 0.13 gallons (0.49 liters) 0.25 pounds (0.11 kg)	Slowly adjust pH up to 11.5 with sodium hydroxide. Adjust pH down to 11.5 by adding HCL acid.	86 F (30 C)
7	**NaOH** (sodium hydroxide) (as 100% powder) (or as 50% liquid)	 0.83 pounds (0.38 kg) 0.13 gallons (0.49 liters)	Slowly adjust pH up to 11.5 with sodium hydroxide. Adjust pH down to 11.5 by adding HCL acid.	86 F (30 C)

[1] - *Note: These pH and temperature targets are recommendations only. For maximum pH and temperature limits for specific elements. See Table 4.*

Table 4: Hydranautics pH and Temperature Limits for Cleaning

(See Table 3 for target pH and temperatures)

Membrane	Continuous Operation		Maximum Cleaning Temp			
	<45 C	≤ 36 C	50 C	≤45 C	≤35 C	≤25 C
NANO-SW, NANO-BW	3 to 8.5	3 to 9	Contact Hydranautics Technical Department	Contact Hyd Tech Dept	1 to 10.5	1 to 11.5
ESNA1-LF, ESNA1-LF2, ESNA1-K1	3 to 9.5	2 to 10	Contact Hydranautics Technical Department	2 to 10.5	1 to 11	1 to 12
ESPA1, ESPA3, ESPA4	3 to 9.5	2 to 10	Contact Hydranautics Technical Department	2 to 10.5	1 to 11	1 to 12
ESPA2	3 to 10	2 to 10.6	Contact Hydranautics Technical Department	2 to 10.5	1 to 11	1 to 12
ESPAB	3 to 10.5	2 to 11	Contact Hydranautics Technical Department	2 to 11	1 to 11.5	1 to 12.5
LFC3, LFC3-LD	3 to 9.5	2 to 10	Contact Hydranautics Technical Department	2 to 10.5	1 to 11	1 to 12
CPA3	3 to 10	2 to 10.8	Contact Hydranautics Technical Department	2 to 11	1 to 11.5	1 to 12.5
CPA5-LD, ESPA2-LD	3 to 10.5	2 to 11	Contact Hydranautics Technical Department	2 to 11.5	1 to 12	1 to 13
SWC4+, SWC5, SWC5-LD, SWC6	3 to 10.5	2 to 11	Contact Hydranautics Technical Department	2 to 11	1 to 12	1 to 13

Note: The above cleaning parameters denote the maximum temperature limits for a corresponding range of pH. Cleaning operations performed at the extremes may result in a more effective cleaning, but can shorten the useful life of the membrane due to hydrolysis. To optimize the useful life of a membrane, it is recommended to use the least harsh cleaning solutions and minimize the contact time whenever possible. The pH of the feed stream or cleaning solution should be closely monitored and controlled. The pH meters used to measure and control pH should be regularly calibrated to ensure accuracy. It is typical to re-circulate cleaning chemicals through the RO for 1 hour. At the pH limits shown above, cleaning exposure at temperatures less than 40 C is limited to 60 minutes, at temperatures greater than 40 C exposure is limited to 30 minutes. Extended soaking is possible, but at less aggressive pH levels. See page 14 for more information on cleaning and flushing procedures.

Table 5: Cleaning and Flushing Flow Rates per RO Pressure Tube
(Pressures are not to exceed 60 psi (4 bar) at inlet to tubes.)

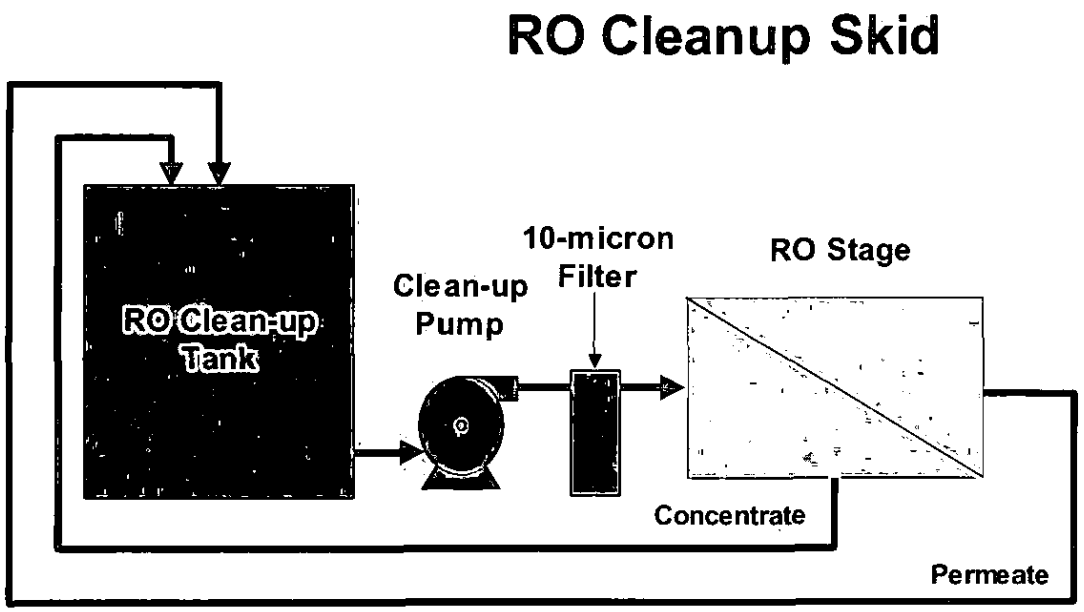
Element Diameter	GPM	LPM
4-inches	6 to 10	23 to 38
6-inches	12 to 20	46 to 76
8-inches	24 to 40	91 to 151
8.5-inches	27 to 45	102 to 170
16-inches	96 to 160	360 to 600

Table 6: Cleaning Solution Volume Requirement per RO Element
(these volumes do not include volumes required for piping, filters, etc)
(these volumes do not include initial 20% of volume dumped to drain)

Element Size	Normal Fouling (Gallons)	Heavy Fouling (Gallons)	Normal Fouling (Liters)	Heavy Fouling (Liters)
4 x 40 inches	2.5	5	9.5	19
6 x 40 inches	5	10	19	38
8 x 40 inches	9	18	34	68
8.5 x 40 inches	10	20	38	76
16 x 40 inches	36	72	136	272

RO Cleaning Skid

The successful cleaning of an RO on-site requires a well designed RO cleaning skid. Normally this skid is not hard piped to the RO skid and uses temporary hosing for connections. It is recommended to clean a multi-stage RO one stage at a time to optimize cross-flow cleaning velocity. The source water for chemical solution make-up and rinsing should be clean RO permeate or DI water and be free of hardness, transition metals (e.g. iron), and chlorine. Components must be corrosion proof. Major cleaning system components are:



- RO Cleaning Tank: This tank needs to be sized properly to accommodate the displacement of water in the hose, piping, and RO elements. The table below denotes the amount of chemical solution that needs to be made for a single RO element. The tank should be designed to allow 100 % drainage, easy access for chemical introduction and mixing, a recirculation line from the RO Cleaning Pump, proper venting, overflow, and a return line located near the bottom to minimize foam formation when using a surfactant.
- RO Cleaning Pump: This pump needs to be sized to develop the proper cross-flow velocity to scrub the membrane clean. The maximum recommended pressure is 60 psi (4 bar) at the inlet to the pressure vessels to minimize the production of permeate during cleaning and reduce the convective redeposition of foulant back on to the membrane surface. The table below denotes the flow rate ranges for each pressure tube.
- RO Cleaning Cartridge Filter: Normally 5 to 10-micron and is designed to remove foulants that have been displaced from the cleaning process.
- RO Tank Heater or Cooler: The maximum design temperature for cleaning is 113^0 F (45^0 C). It should be noted that heat is generated and imparted by the RO Cleaning Pump during recirculation.
- RO Tank Mixer: This is recommended to get optimal mixing of chemical, though some designers rely solely on the slow introduction of chemical while maintaining a recirculation through the RO Cleaning Pump back to the tank.
- Instrumentation: Cleaning system instrumentation should be included to monitor flow, temperature, pressure, and tank level.
- Sample Points: Sample valves should be located to allow pH and TDS measurements off the RO Cleaning Pump discharge and the concentrate side recirculation return line.

- Permeate Return Line: A small amount of the cleaning solution can permeate through the membranes and so a permeate-side return line back to the RO Cleaning Tank is required.

  Important: The permeate line and any permeate valves must always be open to atmospheric pressure during the cleaning and flushing steps or damage to RO elements can occur. If the permeate line is closed, the permeate pressure can build up and become higher than the feed-side pressure of the tail elements. This can result in excessive permeate back-pressure which can damage the membrane glue lines in the tail elements.

RO Membrane Element Cleaning and Flushing Procedures

The RO membrane elements can be cleaned in place in the pressure tubes by recirculating the cleaning solution across the high-pressure side of the membrane at low pressure and relatively high flow. A cleaning unit is needed to do this. RO cleaning procedures may vary dependent on the situation. The time required to clean a stage can take from 4 to 8 hours.

A general procedure for cleaning the RO membrane elements is as follows:

1. Perform a low pressure flush at 60 psi (4 bar) or less of the pressure tubes by pumping clean water from the cleaning tank (or equivalent source) through the pressure tubes to drain for several minutes. Flush water should be clean water of RO permeate or DI quality and be free of hardness, transition metals, and chlorine.

2. Mix a fresh batch of the selected cleaning solution in the cleaning tank. The dilution water should be clean water of RO permeate or DI quality and be free of hardness, transition metals, and chlorine. The temperature and pH should be adjusted to their target levels.

3. Circulate the cleaning solution through the pressure tubes for approximately one hour or the desired period of time. At the start, send the displaced water to drain so you don't dilute the cleaning chemical and then divert up to 20% of the most highly fouled cleaning solution to drain before returning the cleaning solution back to the RO Cleaning Tank. For the first 5 minutes, slowly throttle the flow rate to 1/3 of the maximum design flow rate. This is to minimize the potential plugging of the feed path with a large amount of dislodged foulant.. For the second 5 minutes, increase the flow rate to 2/3 of the maximum design flow rate, and then increase the flow rate to the maximum design flow rate. If required, readjust the pH back to the target when it changes more than 0.5 pH units.

4. An optional soak and recirculation sequence can be used, if required. The soak time can be from 1 to 8 hours depending on the manufacturer's recommendations. Caution should be used to maintain the proper temperature and pH. *Do not exceed maximum pH and temperature limits for specific elements. See Table 4.* Also note that this does increase the chemical exposure time of the membrane.

5. Upon completion of the chemical cleaning steps, a low pressure Cleaning Rinse with clean water (RO permeate or DI quality and free of hardness, transition metals, and chlorine) is required to remove all traces of chemical from the Cleaning Skid and the RO Skid. Drain and flush the cleaning tank; then completely refill the Cleaning Tank with clean water for the Cleaning Rinse. Rinse the pressure tubes by pumping all of the rinse water from the Cleaning Tank through the pressure tubes to drain. A second cleaning can be started at this point, if required.

5. Once the RO system is fully rinsed of cleaning chemical with clean water from the Cleaning Tank, a Final Low Pressure Clean-up Flush can be performed using pretreated feed water. The permeate line should remain open to drain. Feed pressure should be less than 60 psi (4 bar). This final flush continues until the flush water flows clean and is free of any foam or residues of cleaning agents. This usually takes 15 to 60 minutes. The operator can sample the flush water going to the drain for detergent removal and lack of foaming by using a clear flask and shaking it. A conductivity meter can be used to test for removal of cleaning chemicals, such that the flush water to drain is within 10-20% of the feed water conductivity. A pH meter can also be used to compare the flush water to drain to the feed pH.

7. Once all the stages of a train are cleaned, and the chemicals flushed out, the RO can be restarted and placed into a Service Rinse. The RO permeate should be diverted to drain until it meets the quality requirements of the process (e.g. conductivity, pH, etc.). It is not unusual for it to take from a few hours to a few days for the RO permeate quality to stabilize, especially after high pH cleanings.

Alternative Cleaning Procedures

Other methods of recovering membrane performance are available and may be considered. Hydranautics does not guarantee the effectiveness of these alternative procedures nor does Hydranautics accept responsibility for any adverse effect such procedures may have on membrane performance. However, Hydranautics is aware of instances where these procedures have proven to be very effective.

1. Electro Magnetic Fields (EMF). Claims have been made that the introduction of a continuous electromagnetic field (EMF) around the RO membranes during operation will reduce the tendency for the membranes to foul and will particularly reduce their tendency toward scaling. (Reference : Ng, H. Y. and Winters, H., *A Novel 16-Inch RO System for Water Reuse and Desalination*. Israel Desalination Society Annual Conference, 19-20 December, 2006.)

2. Direct Osmosis at High Salinities (DO-HS) is a process of daily backwashing of SWRO during normal operation of desalination plant in which about 7% NaCl pulse is intentionally introduced for 6-12 seconds into the suction stream of high pressure pump without stopping the pump. As the high salinity plug proceeds through the RO system, the reverse osmosis flow is momentarily changed to a direct osmosis flow and permeate is sucked back through to the feed side of the membrane. This process, if conducted regularly, may lift foulants, dehydrate bacteria, and sweep out debris by increased flow velocity from the membrane surface to the brine outlet. (Reference: USA Patent 7658852, Pat. Singapore, Australia, Israel WEB: www.membrane-recovery.com.)

3. Proprietary Cleaning Chemicals. There exist several RO cleaning chemical suppliers with a number of proprietary formulations designed to address specific types of fouling. These formulations are typically based on generic chemical formulations that have been enhanced or

modified through the suppliers' own research and development. (see web sites for specific chemical companies)

4. Air Scouring. It is known that two-phase (air bubbles and water) can increase shear forces and improve the removal of foulants from a membrane surface. This has been used more in the cleaning of individual elements.

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Technical Service Bulletin

March 2011 TSB108.11

General Storage Procedures for Composite Polyamide (ESPA, ESNA, CPA, LFC, SWC) and Polyvinyl Derivative (PVD) RO Membrane Elements

This bulletin provides guidelines for storing Hydranautics' Composite Polyamide Reverse Osmosis (RO) membrane elements.

Note: Before undertaking any long-term or short-term storage operation, contact Hydranautics for specific instructions related to the local environment.

Scope

The general storage procedures included in this bulletin are as follows:

1. Short-term storage of RO membrane elements in place in pressure tubes.
2. Long-term storage of RO membrane elements in place in pressure tubes.
3. Dry storage of RO membrane elements as spares or before start-up of an RO plant.

Note: The composite polyamide type of RO membrane elements may not be exposed to chlorinated water under any circumstances. Any such exposure will cause irreparable damage to the membrane. Absolute care must be taken following any disinfection of piping or equipment or the preparation of cleaning or storage solutions to ensure that no trace of chlorine is present in feedwater to the RO membrane elements. If there is any doubt about the presence of chlorine, perform chemical testing to make sure. Neutralize any chlorine residual with a sodium bisulfite solution, and ensure adequate contact time to accomplish complete dechlorination.

Short-Term Storage

Short-term storage is for periods where an RO plant must remain out of operation for more than five days, but fewer than thirty days, with the RO elements in place. Prepare each RO train as follows:

1. Flush the RO section with feedwater, while simultaneously venting any gas from the system. Flushing with RO permeate water instead of feedwater has added benefits, and may help remove build up of foulants (reference TSB 107).

2. When the pressure tubes are filled, close the appropriate valves to prevent air from entering the system.

3. Reflush as described above at 5-day intervals.

Long-Term Storage

Long-term storage is for periods where an RO plant must remain out of operation for more than thirty days with the RO elements in place. Prepare each RO train as follows:

1. Clean the RO membrane elements in place.
2. Flush the RO section with an approved biocide (see TSB110 or check with Hydranautics for recommendations and approvals of currently available products) prepared from permeate.
3. When the RO section is filled with this solution (make sure that it is completely filled), close the valves to retain the solution in the RO section.
4. Repeat Steps 2 and 3 with fresh solution every thirty days if the temperature is below 80°F (27°C), or every fifteen days if the temperature is above 80°F (27°C).
5. When the RO system is ready to be returned to service, flush the system for approximately one hour using low-pressure feedwater with the product dump valve open to drain; then flush it at high pressure for 5 to 10 minutes with the product dump valve open to drain. Before returning the RO system to service, check for any residual biocide in the product.

Prior To Installation

When RO elements are stored prior to installation, they should be protected from direct sunlight and stored in a cool, dry place with an ambient temperature range of 40°F to 95°F (4.4°C to 35°C). During the period of transit between the factory and the plant site, the elements should not be exposed to temperatures below freezing, 32°F (0°C), or above 113°F (45°C). New Elements are enclosed in a sealed polyethylene bag containing a storage solution, and then packaged in a cardboard box. Large shipments may come packaged in crates strapped to pallets containing 25 single elements. When storing the pallets of elements, they may be stacked 2 high. Pallets should NOT exceed 2 high.

Length of Storage

RO and NF elements are typically stored with a preservative solution and enclosed in a vacuum sealed bag. The preservative is generally sodium bisulfite (SBS) with or without propylene glycol.

Hydranautics will only accept *unused* elements for return credit no later than 6 months after purchase, per the guidelines in TSB 116 Returned Goods Authorization (RGA) Procedure. Though Hydranautics acceptance for unused elements is limited to 6 months, elements could be stored for an extended period of time and still perform as expected. If the storage conditions listed within this bulletin are followed and the vacuum in the bag is maintained, it may be possible to successfully store elements in excess of three years.

Installation of elements which are stored for such long periods may result in lower flow rates or higher operating pressures than expected. In such instances, it is recommendable to clean the elements using a caustic solution, as outlined in TSB 107 (Solution 7), in order to improve flux.

Hydranautics Storage Bags (for customers requesting spares)

HYD P/N: 83060.5000 (7"x48") for 4"x40" elements
HYD P/N: 83060.9000 (14"x55") for 8"x40" elements

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Technical Service Bulletin

September 2011 TSB 116.12

Returned Goods Authorization (RGA) Procedure

This bulletin provides information and instructions for the return of membrane elements and other products purchased from Hydranautics for examination, credit, or exchange.

Membrane Element /Module Evaluation Return Procedure

The following steps apply for all membrane element(s) and modules that are to be returned to Hydranautics for evaluation:

1. **FM-9102** The customer/OEM must complete Hydranautics Returned Goods Information Sheet, **Form FM-9102**. This form provides Hydranautics with background information such as how long the elements have been in use, the operating conditions, serial numbers of elements, and their relative positions in the vessels.

   Note Hazard information:
   If there are hazards associated with the return, the customer must list these specifically in FM-9102 line item 19. Hydranautics reserves the right to deny any RGA application based on the associated hazards.

2. **FM-9090** The customer/OEM must complete Returned Goods Authorization Form, **FM-9090**. This form communicates the customer claim and what action is requested of Hydranautics.

3. **Purchase Order** The customer/OEM must issue a **purchase order** for membrane elements returned for examination and/or evaluation. Credit card is also acceptable for customers who do not have an account with Hydranautics. Hydranautics will not conduct an element evaluation without a P.O. number or credit card number from the customer/OEM.

4. Customer/OEM submits Forms FM-9102, FM-9090 and PO/Credit Card information to the RGA Coordinator.

5. **RGA number & RGA Shipper** The RGA Coordinator provides customer an RGA number and an RGA shipper.

6. **Pre-pay Shipment** The elements / modules must be **shipped freight prepaid**, unless otherwise authorized by the RGA Coordinator.

7. The shipment must be labeled with the RGA number, and include the RGA shipper obtained from Hydranautics.

NOTE! Products returned without Hydranautics' authorization will be refused or returned to customer/OEM freight collect.

Packaging and Storage

1. Prior to shipment, the membrane elements should be flushed with feed water in the pH range of 6-8, as a safety precaution for all persons handling the membranes upon arrival. Elements filled with acids or high pH cleaning solutions pose a danger for material handlers without appropriate protective gear.

2. Prior to shipment, membrane element(s) should be preserved and stored according to storage procedures described in Hydranautics Technical Service Bulletin (TSB) 108 depending on membrane composition.

3. For shipping purposes, membrane element(s) should be packaged in a sealed polyethylene bag and placed in a cardboard box to protect element(s) from physical damage and to prevent drying and exposure to light. Hydracap modules should be returned in original crate or similar protective packaging.

NOTE!

After return authorization has been received from the RGA Coordinator, membrane element(s) should be sent as soon as possible. This helps to ensure that element condition will not change as a result of prolonged storage, and enables complete element evaluation within the stated period of time.

Examination Procedure of Returned RO Elements

Hydranautics will perform 1 or more of the following evaluations depending on the nature of the failure.

A. Element Inspection and Retest (non-destructive test)

ELEMENT INSPECTION: The objective of the element inspection is to evaluate the mechanical integrity of the membrane element components (i.e. core tube, anti-telescoping device, outerwrap, etc.) and to test for large mechanical leaks.
This procedure also includes:

- Visual inspection
- Weighing
- Vacuum and/or air test (as necessary)

RETEST: The objective of the Retest is to verify current element performance data at standard test conditions as compared to ex-factory data.

PRICING OF ELEMENT INSPECTION AND RETEST

2" to 4" diameter membrane element - **$200.00** per element.
6" to 8" diameter membrane element - **$400.00** per element.

B. Element Autopsy (destructive test)

FULL AUTOPSY: The objective of element autopsy and the following tests is to examine internal components of the membrane element, and to check the integrity of the glue lines and the condition of the membrane surface with regard to fouling deposits and some chemical damages.

This procedure may include:

- SEM/EDAX
- Element disassembly
- Visual inspection of element components
- Visual inspection of membrane surface
- Inspection of glue lines
- Optical Microscope
- Cell test analysis to determine and/or verify flow and salt rejection of membrane samples (if necessary)
- Dye test (if necessary)
- Fujiwara (if necessary)
- WLOI (if necessary)

PRICING OF ELEMENT AUTOPSY:

$2000.00 per element (The full autopsy includes Inspection and Retest outlined in Section A, as well as the tests outlined in Section B. SEM/EDAX services cost $1000, which are included in the $2000 per element price).

C. Element Dissection (destructive test)

Disassembly of the element in order to obtain samples for further testing to include SEM, EDX, Cell Test and/or any other test found to be necessary in order to complete evaluation.

Pricing of Element Dissection:

$300.00 per element, not including analytical costs outlined in Section D.

(The element dissection does not include the inspection and retest. Pricing of the Dissection does NOT include costs of analytical tests requested).

D. In House Analysis

In House Analysis: The objective is to analyze the condition of the membrane surface and composition of possible deposit layer.

This may include:

- Optical Microscopy examination of membrane surface **($100/sample)**
- Dye Test **($300/element)**
- Scanning Electron Microscopy (SEM) examination of membrane surface **(EDAX included $1000/sample)**
- Electron Dispersive X-Ray analysis (EDX) of surface deposits **(SEM included $1000/sample)**
- Cell Test analysis to determine flow and salt rejection of membrane samples **($200/sample)**
- Carbonate Testing **($100/sample)**
- Fujiwara Oxidation Test **($300/sample)**
- Weight Loss On Ignition Test **($300/sample)**

Tests performed by outside laboratories

- Infrared Spectrum (IR) of membrane surface and deposits
- X-Ray Fluorescence (XRF) analysis of foulant deposits

Outside laboratory analysis: Actual charges plus shipping and handling.

E. Water Sample Analysis

The objective is to obtain the chemical composition of water samples collected from the system.

Pricing of Laboratory Analysis:

In house analysis: **$300.00** per procedure.

$2000 for full ion spectrum of IMS Design Software

Ca	CO2
Mg	CO3
Na	HCO3
K	SO4
NH4	Cl
Ba	F
Sr	NO3
H2S	B
Fe	SiO2

F. Element Deshell and Reshell

The objective is to replace damaged element housings before return to customer. In most cases the warranty will be void following reshelling.

Element Deshell & Reshell:

4" diameter membrane element - **$250.00** per element.

6" to 8" diameter membrane element - **$500.00** per element.

NOTE!

Customer/OEM should be aware that in some cases, even after applying the most advanced analytical methods available, it might not be possible to identify the exact cause of membrane degradation. This could be the result of inadequate analytical techniques presently available, or that the membrane degradation was a result of transient conditions which are difficult to identify.

NOTE!

Except for membrane element inspection and performance testing at standard conditions, the majority of analytical procedures are both destructive and expensive. Hydranautics personnel will advise what tests may be applicable in specific cases, but will not conduct them without authorization from the customer/OEM.

Examination Procedure of Returned UF (Hydracap) Modules

Hydranautics will perform one or more of the following evaluations depending on the nature of the failure.

A. Element Inspection and Performance Evaluation (non-destructive test)

Objective of the inspection is to evaluate the integrity of the Hydracap module components (i.e. shell, clamps, endcaps, ports, o-rings, core tube, etc.). Objective of the Performance Test is to verify current module performance data at standard test conditions. Integrity and bubble testing provide information on the integrity of the module and fibers.

This procedure includes:
1) Visual inspection
2) Performance Test
3) Integrity test
4) Bubble / leak detection test

Pricing of Inspection and Performance test (includes report):

$900.00 for first module
$500.00 per each additional module

CHARGES FOR INSPECTION AND PERFORMANCE TEST WILL BE WAIVED IF A MODULE AUTOPSY IS PERFORMED.

B. Module Autopsy (destructive test)

Objective of module autopsy and the following tests is to examine internal components of the module and to check for chemical deposits, debris and any materials that may cause fouling or other damage to the fibers. Also, individual fibers may be removed for further inspection, testing and analyses.

This procedure consists of:
1) Module dis-assembly
2) Module dissection
3) Visual inspection of module components
4) Visual inspection of fibers and interior surface of shell and epoxy beds
5) When possible, isolation and identification of damaged fibers for further testing.

Pricing of Module Autopsy (includes report):

$2200.00 for first module
$1500.00 for each additional module

C. Module Dissection (destructive test)

Disassembly of the module in order to obtain samples for further testing to include SEM, EDX, ICP, and/or any other test found to be necessary in order to complete evaluation.

Pricing of Module Dissection:

$700.00 per module.

D. In House Analysis

Objective is to analyze the condition of the fibers, determine the composition of possible foulants within the fibers or deposited upon the fibers and / or deposited in the filtrate area. Also, physical strength tests may be performed.

This may include:

- Optical Microscopy examination of membrane surface **($100/sample)**
- Dye Test **($300/element)**
- Scanning Electron Microscopy (SEM) examination of membrane surface **(EDAX included $1000/sample)**
- Electron Dispersive X-Ray analysis (EDX) of surface deposits **(SEM included $1000/sample)**
- Physical Strength Testing – flux, tensile strength, burst and collapse pressure testing **($500 for all physical strength tests)**

Tests performed by outside laboratories

- Infrared Spectrum (IR) of membrane surface and deposits
- X-Ray Fluorescence (XRF) analysis of foulant deposits

Outside laboratory analysis: Actual charges plus shipping and handling.

E. Laboratory Analysis (compositions) of Samples

Objective is to obtain the chemical composition of samples collected from the system or membrane element(s).

This may include:

1) Analysis of composition of foulant deposits
2) Analysis of composition of water samples
3) Analysis of composition of spent cleaning solutions

Pricing of Laboratory Analysis:

In house analysis: **$300.00** per procedure.

Outside laboratory analysis: Actual charges plus shipping and handling.

NOTE!

Customer/OEM should be aware that in some cases, even after applying the most advanced analytical methods available, it might not be possible to identify the exact cause of membrane degradation. This could be the result of inadequate analytical techniques presently available, or that the membrane degradation was a result of transient conditions which are difficult to identify.

NOTE!

Except for module inspection and performance evaluation, the majority of analytical procedures are both destructive and expensive. Hydranautics personnel will advise what tests may be applicable in specific cases, but will not conduct them without authorization from the customer/OEM.

General Conditions

1. The customer is responsible for shipping charges of returned membrane element(s) / module(s). No goods will be accepted unless returned freight prepaid unless prior arrangements are made with the RGA Coordinator.

2. The customer/OEM will issue a P.O. number to Hydranautics for all examination and evaluation requirements of returned element(s) prior to any work being performed.

3. If membrane failure is not a result of materials or workmanship defects, the customer/OEM will be billed for evaluation charges. The membrane elements will either be disposed of or shipped back to the customer, per the customers' directive. The shipment will be charged freight collect.

4. All replacement elements / module(s) will be sent at full charge.
   - If the failure **is not** a result of materials or workmanship defects, the customer **will** be billed for evaluation charges and **will not** be issued warranty credit.
   - If the failure **is** a result of materials or workmanship defects, the customer **will not** be billed for evaluation charges and **will** be issued warranty credit.

5. If the membrane elements are not received by Hydranautics, San Diego, within **45 DAYS (North America)** and **60 DAYS (International)** of issuing the RGA, the file will be closed and the customer/OEM will be notified.

6. Hydranautics will try to make a complete membrane examination, including an evaluation report, within **4 weeks** of receipt of element(s) at Hydranautics in Oceanside, except in cases that involve outside laboratory analysis.

7. Under special circumstances, a Hydranautics representative will travel to the customer's premises and test the alleged defective elements / modules. If the element / module failure is **not** due to a materials or workmanship problem, the customer will pay Hydranautics **$2000.00** per day plus direct travel expenses incurred by Hydranautics' employees in connection with any examination and testing of such elements / modules on buyer's premises.

NOTE!

Hydranautics will waive all evaluation charges if element(s) / module(s) failure is a result of materials or workmanship defects or if any specific warranties offered by Hydranautics apply. If this is the case, the Customer/OEM will be given new elements / modules at full charge and then Hydranautics will issue a credit to offset these charges.

NOTE!

Element / module cleaning will only be performed for determining the effectiveness of a specific cleaning reagent and for limited numbers. It is within Hydranautics *own discretion* to decide to perform this service. Cleaning charges are as follows:

2" to 4" membrane elements- **$600.00** per element and per cleaning procedure.
6" to 8" membrane elements- **$800.00** per element and per cleaning procedure.
Hydracap modules - **$1800.00** per module.

Element (Non-evaluation) and other Products Return Procedure

Products other than membrane elements returned for evaluation can be returned to Hydranautics only after the following conditions have been met:

1. Product return has to be authorized by the Hydranautics RGA Coordinator.

2. An RGA number has been issued to the customer/OEM, and an RGA shipper has been obtained.

Products returned due to customer/OEM order error should be sent freight prepaid to Hydranautics.

Customers who choose to return unused elements must do so within 6 months of the original shipping date. These elements must have been properly stored according to TSB108. A restocking fee will apply; see "General Conditions" below. After 6 months, unused elements may not be returned for credit. Note, properly stored elements (TSB108) can stay in storage for many years and still perform within expected ranges. In some cases, use of elements that are stored for many years should be done according to the "Long Term Storage" recommendations in TSB108.

Products returned due to a Hydranautics error may be sent freight collect to Hydranautics if arrangements are made with the RGA Coordinator.

Packaging

All products that are to be returned to stock must be returned to Hydranautics in original packaging.

Product Inspection

All returned products will be inspected by Hydranautics Quality Assurance (QA) Department to determine product condition before returning to stock and before credit/exchange is issued to customer/OEM.

General Conditions

1. There will be a **15% or $150.00**, whichever is greater, restocking charge applied to all products returned due to customer order error.

2. If returned products are determined to be defective upon inspection by quality control they will be returned to customer/OEM freight collect and no credit/exchange will be issued.

3. If products are not received at Hydranautics, Oceanside within **45 DAYS (North America)** and **60 DAYS (International)** of issuing the RGA, the file will be closed and the customer/OEM will be notified.

4. Any warranty conditions or other commercial agreements between Hydranautics and the customer will be applied.

Summary of Costs for Procedures

Procedure	Element Type or Module	Price
Inspection and Retest	2"-4" Diameter Membrane Element	$200/element
	6"-8" Diameter Membrane Element	$400/element
	Hydracap Modules	$900 for 1st; $500 for addt'l
Full Autopsy	All Elements except Hydracap	$2000/element
	Hydracap Module	$2200 for 1st Module; $1500 for addt'l
Dissection	All Elements except Hydracap	$300/element
	Hydracap Module	$700/module
Element Deshell/Reshell	4" Diameter Membrane Element	$250/element
	6"-8" Diameter Membrane Element	$500/element
Cleaning	2"-4" Diameter Membrane Element	$600/element/cleaning procedure
	6"-8" Diameter Membrane Element	$800/element/cleaning procedure
	Hydracap Modules	$1800/module
Dye Test	All Elements	$300/element
	Laboratory Analyses	
Optical Microscopy	All Elements and Modules	$100/sample
SEM/EDaX (includes both)	All Elements and Modules	$1000/sample
Cell Test	All Elements	$200/sample
Carbonate Test	All Elements	$100/sample
Fujiwara Oxidation Test	All Elements	$300/sample
Weight Loss on Ignition	All Elements	$300/sample
Physical Strength Test	All Elements and Modules	$500/sample
Water Sample	Typically for Membrane Elements	$300/procedure; $2000 full spectrum
Foulant Deposit Sample	Typically for Hydracaps	$300/procedure
Spent Cleaning Sol'n Sample	Typically for Hydracaps	$300/procedure

Hydranautics
401 Jones Rd.
Oceanside, CA 92058
Tel: (760) 901-2500
Fax: (760) 901-2664
e:mail: info@hydranautics.com
www.membranes.com

NITTO DENKO

HYDRANAUTICS
www.membranes.com
A Nitto Denko Company

Technical Service Bulletin

November 2007 TSB118.10

Membrane Start-up, Shutdown, and Preservative Flushing Guidelines

This Technical Service Bulletin provides information related to starting up and shutting down an RO system with Hydranautics membranes, and for flushing composite elements prior to use.

Preservative Flushing Introduction

To preserve elements from biological growth and to help maintain performance over time, Hydranautics composite type membranes (CPA, ESPA, ESNA, LFC, and SWC) are stored in either a 0.99% sodium bisulfite solution, or a combination of 0.99% sodium bisulfite and 10% propylene glycol solution. It is therefore advised to flush membranes prior to use to eliminate residual preservatives in the product stream. The standard model types that are stored in the sodium bisulfite and propylene glycol solution are the CPA2-4040, ESNA1-4040, ESPA1-4040, ESPA3-4040, ESPA4-4040, ESPA1, ESPA3, and ESPA4. All other standard model types are stored in sodium bisulfite only.

Once the elements have had the preservatives flushed from them, they would need to have preservatives re-applied for long-term storage. Please refer to TSB108 which details our short-term and long-term storage procedures for our composite membranes.

Preservative Flushing during Start-up

Once elements have been loaded and vessels sealed, it is recommended to flush the system to drain with feedwater at design operating pressure for a minimum of 2 hours. If the elements are to be used in systems requiring ultrapure water, a minimum flushing time of 24 hours is recommended to reduce the TOC concentration to below 50 ppb (assuming zero TOC in the feedwater).

Warning: For potable applications using models that are preserved with both sodium bisulfite and propylene glycol, discard the product water for at least 24 hours prior to drinking or using in food applications. Ingestion of the preservative may cause irritation to the gastrointestinal tract, colic, diarrhea, or other similar symptoms.

For potable applications using models that are preserved with sodium bisulfite only, discard the product water for at least 2 hours prior to drinking or using in food applications.

RO System Start-up

It is important to be sure that the elements are loaded and shimmed correctly to remove any excess slack that may cause disconnects (see TSB122 - Element Loading Guidelines). A low pressure flush to purge air from the membranes is always recommended before a high pressure startup. This can be accomplished through the use of a soft-start mechanism, or a variable frequency drive. Failure to do this can result in a water shock wave (water hammer) that can cause physical damage to the RO membranes. The permeate valves should always be open to drain during this flush to prevent damage to the membranes.

After the air has been purged from the system the feed pressure should be increased gradually up to the working pressure of the RO unit. Pressurization (and depressurization) of the membrane elements should not exceed ten (10) psi/second (0.7 bar/second) at any time.

RO System Shutdown

Brackish Systems

Upon shutdown for brackish systems, a flush with the feed water at low recovery (brine valve wide open) is usually sufficient to remove the high concentration of salts from the membranes. The permeate valves should be open to drain during this flush to prevent damage to the membranes.

Seawater Systems

Upon shutdown for seawater systems, a flush with RO permeate is recommended to remove the high concentration of salts from the membranes. The permeate valves should be open to drain during this flush to prevent damage to the membranes. If RO permeate is temporarily unavailable, the membranes should be flushed with RO feed at low recovery (with brine valve wide open). The membranes should then be flushed with RO permeate as soon as it is available. The seawater RO system should not be left unflushed with a high concentration brine on the membrane surface.

NOTE:

The quantity of water used in both normal *RO System Start-up* and *RO System Shutdown* flushing should be equal to or greater than that which is retained in the system. For standard 16-inch X 40 inch elements assume thirty-four (34) gallons (130 L) per element. For standard 8-inch X 40-inch elements assume ten (10) gallons (37.85L) per element. For standard 4-inch X 40-inch elements assume three (3) gallons (11.35L) per element.

If further information is required, please relay questions to the Technical Support department at our corporate headquarters.

Hydranautics
401 Jones Rd.
Oceanside, CA 92058
Tel: (760) 901-2500
Fax: (760) 901-2664
email: info@Hydranautics.com
Internet: www.membranes.com

NSF Product and Service Listings

These NSF Official Listings are current as of **Tuesday, December 20, 2011** at 12:15 a.m. Eastern Time. Please contact NSF International to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information:
http://www.nsf.org/Certified/PwsComponents/Listings.asp?Company=31590&Standard=061&

NSF/ANSI STANDARD 61
Drinking Water System Components - Health Effects

NOTE: Unless otherwise indicated for Materials, Certification is only for the Water Contact Material shown in the Listing. Click here for a list of Abbreviations used in these Listings.

Hydranautics

401 Jones Road
Oceanside, CA 92054
United States
760-901-2656
Visit this company's website

Facility : Oceanside, CA

Mechanical Devices

Trade Designation	Size	Water Contact Temp	Water Contact Material
Reverse Osmosis Element			
CPA2[3]	[2]	CLD 23	MLTPL
CPA3[3]	[2]	CLD 23	MLTPL
CPA4[3]	[2]	CLD 23	MLTPL
ESNA1-LF LD[3]	[2]	CLD 23	MLTPL
ESPA1 DE[3]	[2]	CLD 23	MLTPL
ESPA3[3]	[2]	CLD 23	MLTPL
ESPA4 LD[3]	[2]	CLD 23	MLTPL
HYDRACoRe10[3]	[2]	CLD 23	MLTPL
NANO SW[3]	[2]	CLD 23	MLTPL
ESPA4 MAX Reverse Osmosis Filtration Membrane Element [3]	[2]	CLD 23	MLTPL
ESPA4 Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL

ESPA1[3]	[2]	CLD 23	MLTPL
SWC6 LD[3]	[2]	CLD 23	MLTPL
SWC5 MAX[3]	[2]	CLD 23	MLTPL
SWC4B MAX[3]	[2]	CLD 23	MLTPL
SWC4 LD[3]	[2]	CLD 23	MLTPL
SWC4[3]	[2]	CLD 23	MLTPL
SWC2[3]	[2]	CLD 23	MLTPL
ESPA[3]	[2]	CLD 23	MLTPL
ESNA4-LF[3]	[2]	CLD 23	MLTPL
ESNA1-LF2 LD[3]	[2]	CLD 23	MLTPL
ESNA1-LF2[3]	[2]	CLD 23	MLTPL
ESNA1-LF[3]	[2]	CLD 23	MLTPL
CPA5 LD[3]	[2]	CLD 23	MLTPL
CPA5[3]	[2]	CLD 23	MLTPL
CPA3 LD[3]	[2]	CLD 23	MLTPL
ESPA4B MAX Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL
SWC5 LD[3]	[2]	CLD 23	MLTPL
SWC5[3]	[2]	CLD 23	MLTPL
SWC4+[3]	[2]	CLD 23	MLTPL
SWC4 MAX[3]	[2]	CLD 23	MLTPL
SWC4 B[3]	[2]	CLD 23	MLTPL
SWC3+[3]	[2]	CLD 23	MLTPL
SWC3[3]	[2]	CLD 23	MLTPL
SWC1[3]	[2]	CLD 23	MLTPL
NANO SW MAX[3]	[2]	CLD 23	MLTPL
NANO BW MAX[3]	[2]	CLD 23	MLTPL
HYDRACoRe70[3]	[2]	CLD 23	MLTPL
HYDRACoRe50[3]	[2]	CLD 23	MLTPL
ESPAB MAX[3]	[2]	CLD 23	MLTPL
ESPA4 MAX[3]	[2]	CLD 23	MLTPL
ESPA2 MAX[3]	[2]	CLD 23	MLTPL
ESPA2 LD[3]	[2]	CLD 23	MLTPL
ESPA2[3]	[2]	CLD 23	MLTPL
ESPAB+ Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL
ESPAB Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL
ESPA4 LD Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL
ESPA3 Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL
ESPA1 Reverse Osmosis Filtration Membrane Element[3]	[2]	CLD 23	MLTPL
SWC6 MAX[3]	[2]	CLD 23	MLTPL
SWC6[3]	[2]	CLD 23	MLTPL
CPA2 DE[3]	[2]	CLD 23	MLTPL
NANO BW[3]	[2]	CLD 23	MLTPL
ESPAB[3]	[2]	CLD 23	MLTPL
ESPA4[3]	[2]	CLD 23	MLTPL
ESPA2 DE[3]	[2]	CLD 23	MLTPL
ESNA4[3]	[2]	CLD 23	MLTPL
CPA5 MAX[3]	[2]	CLD 23	MLTPL

[2] Certification is for 8" diameter models only.
[3] Certification is for a minimum flow of 2,650 liters per day, and is based on flushing the unit for a minimum of 30 minutes at 145-155 psi prior to being placed into service.

Ultrafiltration Devices			
HYDRAcap[1]	40" and 60" units	CLD 23	MLTPL

[1] Certified for a minimum flow of 10,000 gallons per day.

Number of matching Manufacturers is 1
Number of matching Products is 59
Processing time was 0 seconds

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Document A310™ – 2010

Conforms with The American Institute of Architects AIA Document 310

Bid Bond

CONTRACTOR:
(Name, legal status and address)
HYDRANAUTICS
401 JONES ROAD
OCEANSIDE, CA 92058

SURETY:
(Name, legal status and principal place of business)
FIDELITY AND DEPOSIT COMPANY
OF MARYLAND
3910 KESWICK RD.
BALTIMORE, MD 21211

Mailing Address for Notices
3910 KESWICK RD.
BALTIMORE, MD 21211

OWNER:
(Name, legal status and address)
CITY OF PORT ST. LUCIE
OFFICE OF MANAGEMENT & BUDGET
121 SW PORT STREET, ST. LUCIE BLVD,
PORT ST. LUCIE, FL 34984-5099

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

BOND AMOUNT: FIVE PERCENT OF BID AMOUNT (5%)

PROJECT:
(Name, location or address, and Project number, if any)

SEALED BID# 20110120 - DRINKING WATER RO MEMBRANE REPLACEMENT

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 20TH day of DECEMBER ,2011

Paige Gourley
(Witness) Paige Gourley

HYDRANAUTICS
(Principal) *(Seal)*

(Title) Bhaskar Dave, VP Sales

(Witness) BETTY J SIMMONS

(Surety) FIDELITY AND DEPOSIT COMPANY OF MARYLAND *(Seal)*

Novetta M Anderson
(Title) Novetta M Anderson, Attorney-In-Fact

Power of Attorney
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

KNOW ALL MEN BY THESE PRESENTS: That the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, a corporation of the State of Maryland, by FRANK E. MARTIN JR., Vice President, and GREGORY E. MURRAY, Assistant Secretary, in pursuance of authority granted by Article VI, Section 2, of the By-Laws of said Company, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, does hereby nominate, constitute and appoint **Barbara A. THOMPSON, Carolyn E. WHEELER, Leslie M. PATTERSON, Novetta M. ANDERSON, Kellie A. MCKINNEY, Tara W. MEALER, Mary VOLMAR, Loretta M. JONES and Sandra WARD, all of Knoxville, Tennessee, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Company, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the Company at its office in Baltimore, Md., in their own proper persons. This power of attorney revokes that issued on behalf of Barbara A. THOMPSON, Carolyn E. WHEELER, Leslie M. PATTERSON, Novetta M. ANDERSON, Kellie A. MCKINNEY, Tara W. MEALER, Mary VOLMAR, Loretta M. JONES, dated August 29, 2011.

The said Assistant Secretary does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article VI, Section 2, of the By-Laws of said Company, and is now in force.

IN WITNESS WHEREOF, the said Vice-President and Assistant Secretary have hereunto subscribed their names and affixed the Corporate Seal of the said FIDELITY AND DEPOSIT COMPANY OF MARYLAND, this 18th day of October, A.D. 2011.

ATTEST: **FIDELITY AND DEPOSIT COMPANY OF MARYLAND**

By:

Gregory E. Murray Assistant Secretary *Frank E. Martin Jr.* *Vice President*

State of Maryland }
City of Baltimore } ss:

On this 18th day of October, A.D. 2011, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, came FRANK E. MARTIN JR., Vice President, and GREGORY E. MURRAY, Assistant Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and they each acknowledged the execution of the same, and being by me duly sworn, severally and each for himself deposeth and saith, that they are the said officers of the Company aforesaid, and that the seal affixed to the preceding instrument is the Corporate Seal of said Company, and that the said Corporate Seal and their signatures as such officers were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn *Notary Public*

My Commission Expires: July 14, 2015

EXTRACT FROM BY-LAWS OF FIDELITY AND DEPOSIT COMPANY OF MARYLAND

"Article VI, Section 2. The Chairman of the Board, or the President, or any Executive Vice-President, or any of the Senior Vice-Presidents or Vice-Presidents specially authorized so to do by the Board of Directors or by the Executive Committee, shall have power, by and with the concurrence of the Secretary or any one of the Assistant Secretaries, to appoint Resident Vice-Presidents, Assistant Vice-Presidents and Attorneys-in-Fact as the business of the Company may require, or to authorize any person or persons to execute on behalf of the Company any bonds, undertaking, recognizances, stipulations, policies, contracts, agreements, deeds, and releases and assignments of judgements, decrees, mortgages and instruments in the nature of mortgages,...and to affix the seal of the Company thereto."

CERTIFICATE

I, the undersigned, Assistant Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that the Vice-President who executed the said Power of Attorney was one of the additional Vice-Presidents specially authorized by the Board of Directors to appoint any Attorney-in-Fact as provided in Article VI, Section 2, of the By-Laws of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed."

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said Company.

this 20 day of December, 2011.

Gerald F. Haley

Assistant Secretary

Form **W-9**
(Rev. October 2007)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give form to the requester. Do not send to the IRS.

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)
Hydranautics, Inc.

Business name, if different from above

Check appropriate box: ☐ Individual/Sole proprietor ☑ Corporation ☐ Partnership
☐ Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶ .....
☐ Other (see instructions) ▶

☐ Exempt payee

Address (number, street, and apt. or suite no.)
401 Jones Road

Requester's name and address (optional)

City, state, and ZIP code
Oceanside, CA 92058

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I Instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number

or

Employer identification number
95 2949422

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here Signature of U.S. person ▶ [signature] Date ▶ 23-December-2010

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,

- The U.S. grantor or other owner of a grantor trust and not the trust, and
- The U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person, do not use Form W-9. Instead, use the appropriate Form W-8 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity not subject to backup withholding, give the requester the appropriate completed Form W-8.

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 28% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the Part II instructions on page 3 for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See the instructions below and the separate Instructions for the Requester of Form W-9.

Also see *Special rules for partnerships* on page 1.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name

If you are an individual, you must generally enter the name shown on your income tax return. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

Sole proprietor. Enter your individual name as shown on your income tax return on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name" line.

Limited liability company (LLC). Check the "Limited liability company" box only and enter the appropriate code for the tax classification ("D" for disregarded entity, "C" for corporation, "P" for partnership) in the space provided.

For a single-member LLC (including a foreign LLC with a domestic owner) that is disregarded as an entity separate from its owner under Regulations section 301.7701-3, enter the owner's name on the "Name" line. Enter the LLC's name on the "Business name" line.

For an LLC classified as a partnership or a corporation, enter the LLC's name on the "Name" line and any business, trade, or DBA name on the "Business name" line.

Other entities. Enter your business name as shown on required federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name" line.

Note. You are requested to check the appropriate box for your status (individual/sole proprietor, corporation, etc.).

Exempt Payee

If you are exempt from backup withholding, enter your name as described above and check the appropriate box for your status, then check the "Exempt payee" box in the line following the business name, sign and date the form.

Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends.

Note. If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

The following payees are exempt from backup withholding:

1. An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2),

2. The United States or any of its agencies or instrumentalities,

3. A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities,

4. A foreign government or any of its political subdivisions, agencies, or instrumentalities, or

5. An international organization or any of its agencies or instrumentalities.

Other payees that may be exempt from backup withholding include:

6. A corporation,

7. A foreign central bank of issue,

8. A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States,

9. A futures commission merchant registered with the Commodity Futures Trading Commission,

10. A real estate investment trust,

11. An entity registered at all times during the tax year under the Investment Company Act of 1940,

12. A common trust fund operated by a bank under section 584(a),

13. A financial institution,

14. A middleman known in the investment community as a nominee or custodian, or

15. A trust exempt from tax under section 664 or described in section 4947.

The chart below shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 15.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 9
Broker transactions	Exempt payees 1 through 13. Also, a person registered under the Investment Advisers Act of 1940 who regularly acts as a broker
Barter exchange transactions and patronage dividends	Exempt payees 1 through 5
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 7[2]

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation (including gross proceeds paid to an attorney under section 6045(f), even if the attorney is a corporation) and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, and payments for services paid by a federal executive agency.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-member LLC that is disregarded as an entity separate from its owner (see *Limited liability company (LLC)* on page 2), enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at *www.ssa.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. You can get Forms W-7 and SS-4 from the IRS by visiting *www.irs.gov* or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: *A disregarded domestic entity that has a foreign owner must use the appropriate Form W-8.*

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, and 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). Exempt payees, see *Exempt Payee* on page 2.

Signature requirements. Complete the certification as indicated in 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account [1]
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor [2]
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee [1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner [1]
5. Sole proprietorship or disregarded entity owned by an individual	The owner [3]
For this type of account:	**Give name and EIN of:**
6. Disregarded entity not owned by an individual	The owner
7. A valid trust, estate, or pension trust	Legal entity [4]
8. Corporate or LLC electing corporate status on Form 8832	The corporation
9. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
10. Partnership or multi-member LLC	The partnership
11. A broker or registered nominee	The broker or nominee
12. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or "DBA" name on the second name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships* on page 1.

Note. If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records from Identity Theft

Identity theft occurs when someone uses your personal information such as your name, social security number (SSN), or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

Call the IRS at 1-800-829-1040 if you think your identity has been used inappropriately for tax purposes.

Victims of identity theft who are experiencing economic harm or a system problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS personal property to the Treasury Inspector General for Tax Administration at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at: *spam@uce.gov* or contact them at *www.consumer.gov/idtheft* or 1-877-IDTHEFT(438-4338).

Visit the IRS website at *www.irs.gov* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons who must file information returns with the IRS to report interest, dividends, and certain other income paid to you, mortgage interest you paid, the acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA, or Archer MSA or HSA. The IRS uses the numbers for identification purposes and to help verify the accuracy of your tax return. The IRS may also provide this information to the Department of Justice for civil and criminal litigation, and to cities, states, the District of Columbia, and U.S. possessions to carry out their tax laws. We may also disclose this information to other countries under a tax treaty, to federal and state agencies to enforce federal nontax criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism.

You must provide your TIN whether or not you are required to file a tax return. Payers must generally withhold 28% of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to a payer. Certain penalties may also apply.