

CodeLineTM

PRESSURE VESSELS

USER'S GUIDE **80E Series**

Fiberglass Pressure Vessels
For Reverse Osmosis

MODEL 80E15



MODEL 80E25



MODEL 80E40



MODEL 80E60



MODEL 80E100



MODEL 80E120



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Chardon, Ohio Phone: 800-922-8265 • Fax 800-942-7659
Herentals, Belgium Phone: 32 14 25 99 11 • Fax 32 14 25 99 75
Taipei, Taiwan Phone: 886-2-2253-1721 • 886-2-2253-1940

Ontario, California • Shanghai, China • New Delhi, India • Dubai,
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www.pentairwater.com

Preface

The 80E Series Family of Vessels

The CodeLine™ 80E Series is a standardized family of fiberglass pressure vessels designed for continuous, long-term use as housings for reverse osmosis membrane elements. Any make of eight-inch nominal diameter spiral-wound element is easily accommodated.

The 80E Series includes six models having different pressure ratings. They are unified in design and have a maximum number of parts in common. Each model has the appropriate strength and materials of construction to provide years of continuous use in typical service when properly maintained.

Each model is available in lengths to house from one to eight 40-inch long elements and two, four or five 60-inch long elements.

The 80E Series is designed and built in accordance with the engineering standards of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers (ASME Code). A vessel marked with an ASME Code stamp is accepted worldwide as being built to the highest standards of safety.

Each model in the CodeLine™ 80E Series has passed rigorous ASME Code qualification tests which require that vessels not burst at less than six times their design pressure. Safe use is further assured in that vessels will not fail catastrophically; overpressure is relieved by weeping through the fiberglass shell. Also, every production vessel is tested to one and one-half times its design pressure to verify structural integrity.

CONTENTS

SECTION 1 OPERATION / MAINTENANCE GUIDE OM-1

- Safety Precautions OM-2
- Installation Notes OM-3
- Pre-pressurization Checklist OM-4
- Component Identification
 - 80E15/25 OM-5
 - 80E40/60 OM-5A
- Opening Vessel OM-6
- Replacing Elements OM-8
- Closing Vessel OM-12
- Head Rebuilding
 - 80E15/25 OM-16
 - 80E40/60 OM-18
- Preventive Maintenance OM-25
- Troubleshooting OM-26

Note: Due to difference in design of the 80E port retainers, some pages in this guide apply either to the 80E15/80E25, 80E40/80E60 or the 80E100/120 models only. Pages are headed accordingly. Pages not so headed apply to all 80E models.

SECTION 2 INSTALLATION GUIDE I-1

- Handling and Receiving I-2
- Mounting Shell I-3
- Piping Connections I-5

SECTION 3 APPLICATION GUIDE A-1

- Suitability for Intended Use A-2
- Elasticity and Mounting Requirements A-3
- Corrosion A-4
- Safety A-5

SECTION 4 APPENDIX APX-1

- Pre-pressurization Checklist APX-2
- Engineering Drawings APX-3
- Component List APX-12
- Warranty APX-13
- Registration Card APX-14

80E SERIES USER'S GUIDE

MODEL 80E15



MODEL 80E40



MODEL 80E100



MODEL 80E25



MODEL 80E60



MODEL 80E120



Danger - High Pressure Device

This vessel may cause loss of life, severe bodily harm, and/or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given before attempting to open, operate or service this vessel.

Failure to follow these guidelines and observe every precaution may result in malfunction and could result in catastrophic failure.

Misuse, incorrect assembly or use of damaged or corroded components can result in high-velocity release of the end closure.

We recommend that only a qualified mechanic, experienced in servicing high-pressure hydraulic systems, open, close and service this vessel.

This section is a guide to proper operation and maintenance of CodeLine™ 80E Series pressure vessels. Good industrial practice must be used in applying this information to assure safe vessel use. These guidelines are not intended to relieve the user from full responsibility for correct operation and maintenance of the vessels.

For information on application and installation, refer to the 80E Series **Application and Installation** sections.

For technical specifications and dimensions, refer to the Engineering Drawing of each specific model.

The information in all three sections must be carefully adhered to in order for the vessels to provide the safe, long service life for which it is designed.

OPERATION AND MAINTENANCE GUIDE

Proper vessel handling and installation are important to safe use and long vessel life. The guidelines outlined herein should be followed carefully; however, they are intended only as guidelines and do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Damage due to improper handling or installation is the sole responsibility of the purchaser.

Improper assembly, misuse or corrosion damage can result in mechanical failure, property damage and serious injury or death. *Read and follow all instructions carefully.* Pay particular attention to the safety precautions given in this **Operation and Maintenance** section. Should any information in this guide not agree with the system supplier's instructions, call the CodeLine for clarification.

TABLE OF CONTENTS

Safety Precautions	OM-2
Installation Notes	OM-3
Pre-Pressurization Checklist	OM-4
Component Identification	
80E15/25	OM-5
80E40/60	OM-5A
Opening Vessel	OM-6
Replacing Elements	OM-8
Closing Vessel	OM-12
Head Rebuilding	
80E15/25	OM-16
80E40/60	OM-18
Preventive Maintenance	OM-25
Troubleshooting	OM-26

SAFETY PRECAUTIONS

DO

- Read, understand and follow every part of this section. Failure to take every precaution may void warranty and could result in catastrophic failure.
- Install in an area where water leakage resulting from a vessel or piping malfunction would not damage sensitive or expensive equipment, such as electronic components.
- Verify that head locking components are properly placed and secured.
- Inspect end closures regularly, replace deteriorated components and correct causes of corrosion.
- Follow membrane element manufacturer's recommendations for loading elements into vessel (see **Replacing Elements** on page OM-8).

DO NOT

- Operate vessel at pressures in excess of specific rating or temperatures over 120°F. (See vessel information chart on page OM-3.)
- Service any component until you verify that vessel pressure is fully relieved from the vessel.
- Use corroded components. Use of such components may result in catastrophic failure.
- Pressurize vessel until after visually inspecting to insure that the retaining ring is correctly installed in the stainless steel groove in the vessel.
- Tolerate leaks or allow end closures to be routinely wetted in any way.
- Use excessive silicone lubricant.

INSTALLATION NOTES

Even though your vessel may have been installed by others, there are a few quick checks on installation you should make before use. Vessels must be installed correctly to ensure safe use and long service life.

- Vessel mounted on horizontal support frame using compliant black urethane saddles; hold-down straps tightened just snug.
- Vessel free to expand under pressure; shell not clamped rigidly in place; piping to vessel ports not made with rigid connections.
- Vessel not used in any way to support other components, such as piping manifolds hanging from ports.

If you have any questions about the installation of the vessels in your unit, contact your supplier. For installation guidelines, refer to the **80E Series Installation Guide**.

VESSEL INFORMATION CHART						
	80E15	80E25	80E40	80E60	80E100	80E120
MAX OPERATING PRESSURE (PSI)	150	250	400	600	1000	1200
OPERATING TEMPERATURE RANGE	20 F - 120 F					
FACTORY TEST PRESSURE (PSI)	225	375	600	900	1500	1800
PROTOTYPE MIN. BURST PRESSURE (PSI)	900	1500	2400	3600	6000	7200
ENGINEERING DRAWING NUMBER	523008	523001	523002	523003	523011	523012
80E SERIES USER GUIDE NUMBER	523010					

PRE-PRESSURIZATION CHECKLIST

Danger – High Pressure Device

This vessel may cause loss of life, severe bodily harm, and/or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given before attempting to open, operate or service this vessel.

Failure to follow these guidelines and observe every precaution may result in malfunction and could result

in catastrophic failure.

Misuse, incorrect assembly or use of damaged or corroded components can result in high-velocity release of the end closure.

We recommend that only a qualified mechanic experienced in servicing high-pressure hydraulic systems, open, close and service this vessel.

This checklist is an operational aid intended to augment detailed guidelines given in the 80E Series **Operation and Maintenance Guide**.

Note that the checklist alone does not include all the details needed for safe vessel operation. Use the checklist each time any service operation is carried out to ensure that each step is completed before pressurizing the vessel.

MEMBRANE ELEMENTS

- Installed per manufacturer's recommendations.
- Feed flow direction correctly noted and elements correctly oriented.
- Column of elements centered inside shell.

ELEMENT INTERFACE

- Adapters installed at both ends of element column.
- Thrust ring installed downstream from element column.

HEAD

- All components in as-new condition, clean and free of damage or corrosion.
- All components properly assembled with new, freshly lubricated seals.
- Port retainer for feed/concentrate port in correct position.
- Port nut snug – 80E40/60 (Note: left-hand thread)
- Permeate port snap ring installed – 80E15/25

HEAD ASSEMBLY INTERLOCK

- Locking groove at each end of shell clean, free of corrosion and/or delamination with outboard face of groove true and in sound condition.
- All components in as-new condition, clean and free of damage or corrosion.
- Retaining ring fully seated in the retaining ring groove.

PIPING CONNECTIONS

- Properly secured.
- Leak free.

Assembled By: _____

Date of Assembly: _____

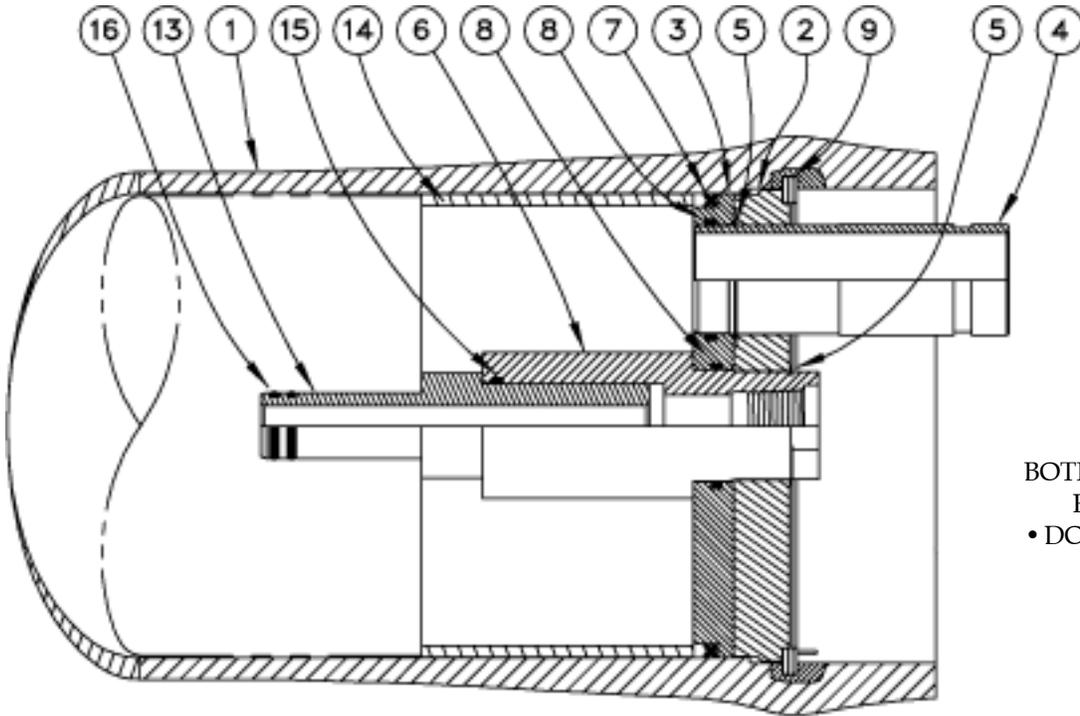
Checked By: _____

Date of Inspection: _____

The following vessels listed by serial number below were serviced under this checklist:

COMPONENT IDENTIFICATION

• 80E15/25 ONLY •



BOTH ENDS IDENTICAL
EXCEPT ITEM 16
• DOWNSTREAM ONLY •

SECTION THROUGH END CLOSURE

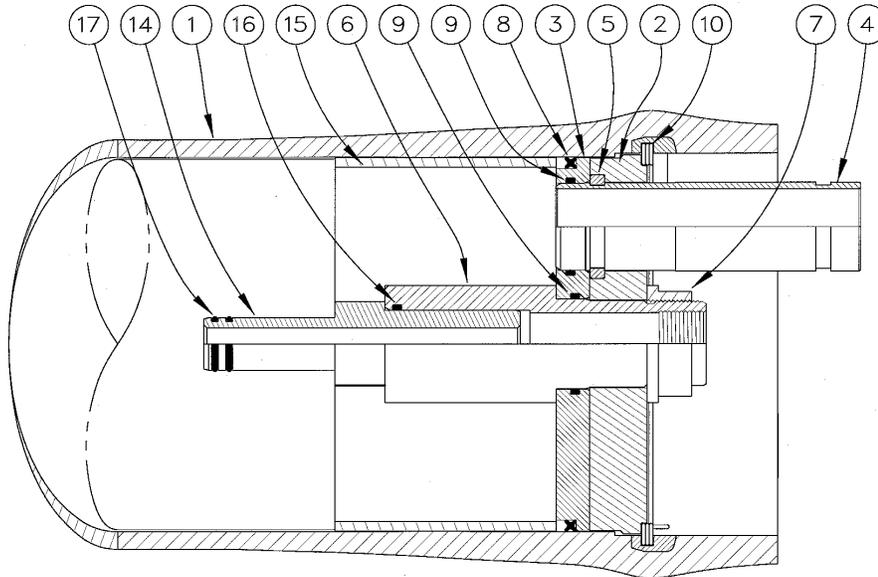
Dwg. Ref	Qty. Per	Part Name	Materials/Remarks
SHELL			
1	1	Shell Length	Filament wound epoxy/glass composite- Head locking groves integrally wound in-place
HEAD			
2	2	Bearing Plate	6061-T6 aluminum alloy-hard anodized
3	2	Sealing Plate	PVC Thermoplastic
4	2	Feed/Conc Port	Type 316 Stainless Steel
5	4	Port Retainer	PH15-7MO SST
6	2	Permeate Port	PVC Thermoplastic
7	2	Head Seal	Ethylene Propylene, Quad Ring
8	4	Port Seal	Ethylene Propylene, O-Ring
HEAD INTERLOCK			
9	2	Retaining Ring	302 SST
VESSEL SUPPORT			
10	*2	Saddle	Engineering Thermoplastic
11	*2	Strap Assy	304 SST - Thermoplastic cushion
12	4	Strap Screw	5/16-18 UNC, 18-8 Stainless Steel
ELEMENT INTERFACE			
13	2	Adapter	Engineering Thermoplastic
14	1	Thrust Ring	Thermoplastic, White
15	2	Adapter Seal	Ethylene Propylene - O - Ring
16	4	PWT Seal	Ethylene Propylene - O - Ring
*3 each furnished w ith length code 7, 7.5 & 8			



End closure component identification

COMPONENT IDENTIFICATION

• 80E 40/60 80E 100/120 ONLY •



SECTION THROUGH END CLOSURE

Dwg. Ref	Qty. Per	Part Name	Materials/Remarks
SHELL			
1	1	Shell Length	Filament wound epoxy/glass composite- Head locking groves integrally wound in-place
HEAD			
2	2	Bearing Plate	6061-T6 aluminum alloy-hard anodized
3	2	Sealing Plate	PVC Thermoplastic
4	2	Feed/Conc Port	Type 316 Stainless Steel, Two piece set
5	2	Port Retainer Set	304 Stainless Steel, Two piece set
6	2	Permeate Port	PVC Thermoplastic
7	2	Port Nut	PVC Thermoplastic-left hand thread
8	2	Head Seal	Ethylene Propylene, O-Ring
9	4	Port Seal	Ethylene Propylene, O-Ring
HEAD INTERLOCK			
10	2	Retaining Ring	302 SST
VESSEL SUPPORT			
11	*2	Saddle	Engineering Thermoplastic
12	*2	Strap Assy	304 SST - Thermoplastic cushion
13	4	Strap Screw	5/16-18 UNC, 18-8 Stainless Steel
ELEMENT INTERFACE			
14	2	Adapter	Engineering Thermoplastic
15	1	Thrust Ring	Thermoplastic, White
16	2	Adapter Seal	Ethylene Propylene - O - Ring
17	4	PWT Seal	Ethylene Propylene - O - Ring
*3 each furnished with length code 7, 7.5 & 8			



End closure component identification

OPENING VESSEL

Step-By-Step Guide

NOTE

Read all guidelines in this section before attempting to open the vessel.

STEP 1 RELIEVE PRESSURE

1. Shut off all sources of pressure and relieve pressure from the vessel, following the system manufacturer's recommendations.

STEP 2 DISCONNECT PERMEATE PORT

1. Disconnect and remove permeate piping from the permeate port of the vessel.

STEP 3 EXAMINE END CLOSURE

1. Examine end closure of vessel for corrosion. If any is evident, proceed as follows:
 - A. Loosen any deposits with a small wire brush and/or a medium grade piece of Scotchbrite®.



Loosening Deposits

- B. Flush away loosened deposits with clean water.

CAUTION

Corroded products can cause difficulty in removing head and/or other components. Do not attempt to remove components until all apparent corrosion is removed.

WARNING

DO NOT ATTEMPT TO SERVICE ANY COMPONENT WITHOUT FIRST VERIFYING THAT VESSEL PRESSURE IS FULLY RELIEVED FROM THE VESSEL. ATTEMPTING TO REMOVE AND COMPONENT BEFORE PRESSURE IS RELIEVED MAY RESULT IN EXPLOSIVE RELEASE OF THE HEAD.

STEP 4 REMOVE RETAINING RING

1. Lift the end of the 8" retaining ring up and out of the stainless steel groove in the shell. This can be accomplished with a pair of pliers or by using CodeLine™ Removal Tool (part no. 50303), available from your supplier. The retaining ring can be lifted upward by simply rotating the tool counterclockwise after inserting it over the tab on the retaining ring. Hold the tool flat against the end margin. It is then possible to pull the end of the retaining ring straight out. If the retaining ring is difficult to remove, try soaking with a warm release agent such as LPS™ or WD40™, being careful to avoid any contamination of a membrane element. Take care to avoid hitting or levering against the vessel, as this could result in delamination.



Lifting end of retaining ring out of groove

NOTE

Hold the removal tool flat against the end margin to keep the retaining ring tab from slipping out of the tool.

- 2 Remove the retaining ring from the stainless steel groove in the shell. This is accomplished by running your finger behind the retaining ring as it continues to exit the groove.



Removing the retaining ring from the groove

STEP 5 REMOVE HEAD

CAUTION

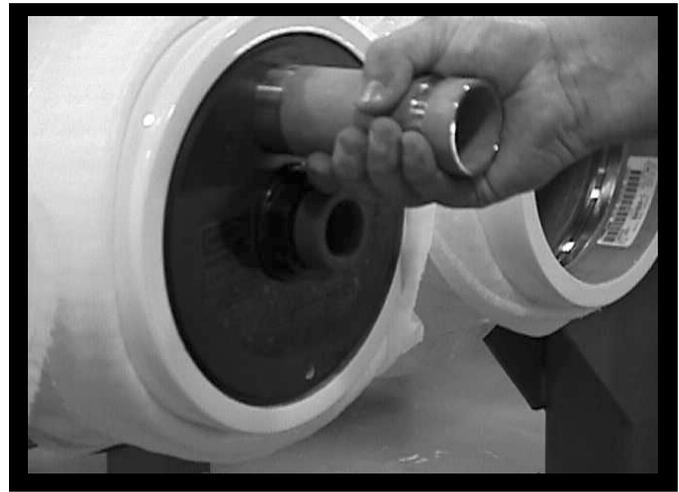
Do not strike or apply undue force on ports to remove heads.

NOTE

If vessel has been in service for some time, head may be difficult to remove. For assistance in head removal, 80E Series head tool (p/n 65260) is available from CodeLine.

STEP 5A REMOVAL BY HAND

1. Grasp feed/concentrate port and pull head straight out. A sharp forceful tug may be required to start head assembly moving.
2. If the head seal remains in the vessel bore, it should be removed at this time.

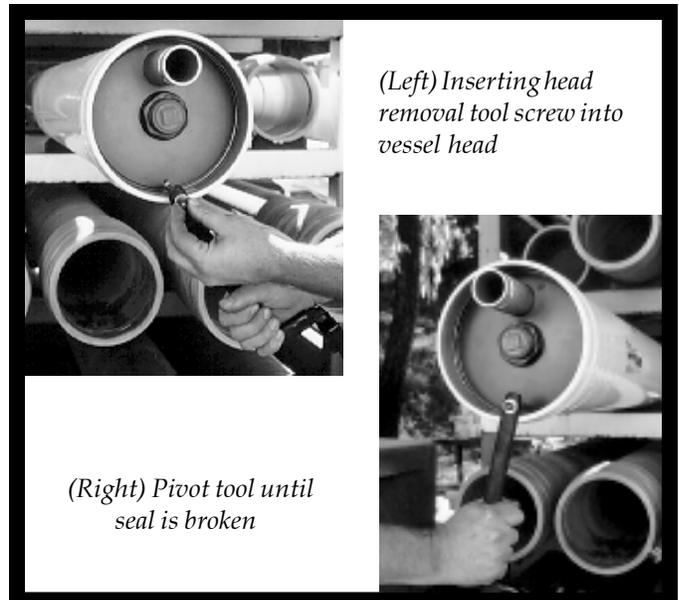


Head assembly removal – by hand

NOTE

It may be helpful to rock head slightly to break head seal bond.

STEP 5B REMOVAL USING HEAD TOOL



(Left) Inserting head removal tool screw into vessel head

(Right) Pivot tool until seal is broken

Head assembly removal – using head tool

1. Insert the bolt through the hole in removal tool and thread into the hole in the bearing plate 1/2" deep.
2. Pivot in a downward motion until seal is broken and head is freed.
3. Remove tool and set aside.
4. Grasp the feed/concentrate port and continue as explained in Step 5A.

REPLACING ELEMENTS

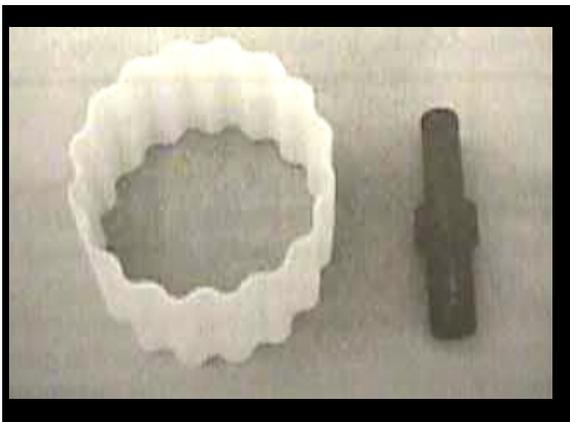
NOTE

Read all parts of this section before replacing elements. These procedures are provided for general information only. Elements should be installed in accordance with the element manufacturer's recommendations.

WARNING

DO NOT ATTEMPT TO SERVICE ANY COMPONENT WITHOUT FIRST VERIFYING THAT PRESSURE IS FULLY RELIEVED FROM VESSEL.

MAKE SURE THAT THE CENTRAL (PERMEATE) TUBE OF MEMBRANE ELEMENT STACK IS CONNECTED TO THE PERMEATE PORTS INSIDE BOTH ENDS OF VESSEL, USING THE ADAPTERS SUPPLIED. PRESSURIZING VESSEL WITHOUT ELEMENTS AND BOTH ADAPTERS INSTALLED COULD RESULT IN CATASTOPHIC FAILURE.



Thrust Ring

Adapter

PRELIMINARY STEPS

DO NOT PROCEED WITH STEP BY STEP INSTRUCTIONS UNTIL...

1. All pressure has been relieved from the vessel, following system manufacturer's recommendations.
2. Both heads have been removed from vessel following step by step instructions in **Opening Vessel**.

STEP 1 REMOVE ELEMENT INTERFACE HARDWARE

1. Remove thrust ring from downstream end.
2. Remove adapters from elements at each end.

STEP 2 ELEMENT REMOVAL

1. Remove elements from vessel following element manufacturer's instructions. Clean off any excess lubricant from vessel inside diameter before removing elements. Elements must be removed in direction of feed flow.

CAUTION

Do not scratch or damage vessel bore when removing or installing elements.

WARNING

DO NOT PRESSURIZE VESSEL WITHOUT ELEMENTS INSTALLED OR OTHERWISE OPERATE VESSEL WITH PERMEATE PORT PRESSURE IN EXCESS OF 125 PSI*. OPERATION IN EXCESS OF THIS PRESSURE COULD RESULT IN CATASTROPHIC PORT FAILURE.

NOTE

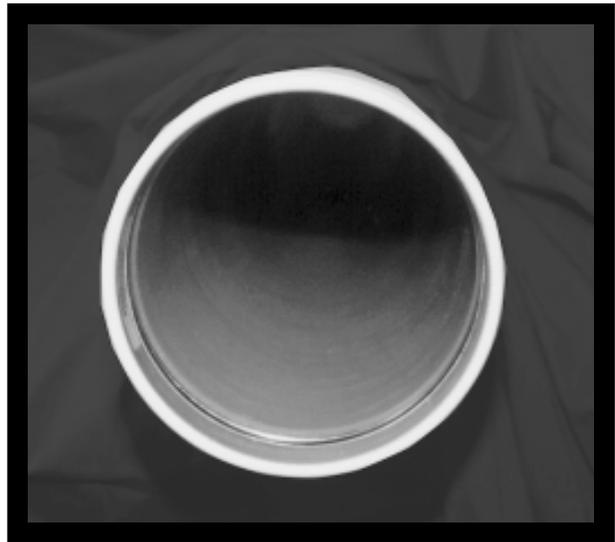
- A record of element serial numbers and locations should be made and checked during loading.

STEP 3 ELEMENT LOADING

1. Flush out vessel with clean water to remove all dust and debris.
2. Examine inside diameter of the vessel for scratches or imperfections that may affect sealing capability of head or element seals. Corrosion deposits or other foreign matter, including any excess lubricant, should be removed as described in **Closing Vessel, Step 1** on page OM-12.

* PVC Permeate Port

3. Examine membrane element surfaces for any imperfection which could scratch the vessel bore. Pay particular attention to edges of anti-telescope device (ATD/brine seal carrier). If any defects are found which cannot easily be corrected, contact the element manufacturer for corrective action.
4. Using an approximate 50% mixture of glycerine in water, lubricate the inside of the vessel. This may best be accomplished using a suitably sized swab soaked in the mixture. This procedure will ease membrane element loading and reduce chance of scratching the vessel bore.



Examine bore for scratches

NOTE

If the brine seal is not installed on element and element supplier does not specify otherwise, a brine seal should be placed on upstream end of elements. Open side of seal must face upstream.

5. Load the first element into upstream end of the vessel. Leave a few inches of the element projecting from the vessel to facilitate interconnection to next element.
6. Apply O-lube sparingly to O-ring of interconnector (amount of O-lube should be just sufficient to give a luster to the O-ring. Excess O-lube must be removed to prevent possibility of element contamination).
7. Assemble the interconnector to the loaded element.

CAUTION

Maintain element alignment carefully during assembly process. Do not allow element weight to be supported by interconnector.

Misalignment can result in damage to interconnectors or permeate tubes or to element outer surface.

8. Line up the next element to be loaded and assemble it to the interconnector already assembled on first element.
9. Push both elements into the vessel until a few inches are projecting from the vessel. Repeat loading process until all elements are installed.

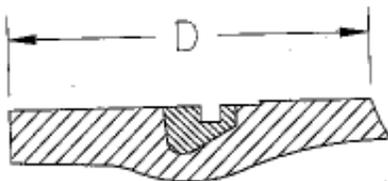
NOTE

As final element is installed, the element stack must be pushed forward until the face of the downstream element is at dimension "D" as shown in table. Take care to avoid pushing elements too far as it can be difficult to push stack in reverse direction.

VESSEL TYPE DIMENSION "D"

(see Figure 2)

80E15	8.11 in.
80E25	8.36 in.
80E40	8.61 in.
80E60	8.86 in.



Downstream Element Position

Figure 2

NOTE

Alternate To Measurement Method

Insert a clean thrust ring into downstream end of vessel.

Insert head assembly, without quad seal or adapter, into downstream end of vessel.

Install the retaining ring into the groove in the vessel.

Load elements as described in 5. through 9.

Install upstream adapter per Step 4 (page OM-10) and head assembly, per section on "Closing Vessel."

Remove downstream head assembly. Reinstall head assembly plus adapter, per section on "Closing Vessel."

STEP 4 INSTALL ELEMENT INTERFACE HARDWARE

1. Assemble adapter to element permeate tube at each end of vessel.

WARNING

PRESSURIZING VESSEL WITHOUT BOTH ADAPTERS INSTALLED COULD RESULT IN CATASTROPHIC FAILURE.

2. Install thrust ring at downstream end.

CAUTION

Install the thrust ring at the **downstream** end. Serious damage may result if thrust ring is not installed in correct location.



Installing thrust ring

NOTE

Ensure thrust ring is clean before installation.

Thrust ring requires no orientation; simply push into shell.

For step by step instructions on vessel closure, refer to the **Closing Vessel**, page OM-12.

CLOSING VESSEL

Step-By-Step Guide

NOTE

Read all guidelines in this section before attempting to close the vessel.

WARNING

CHECK THE HEAD ASSEMBLY FOR CORROSION AS DESCRIBED IN THE HEAD REBUILDING SECTION. CORRODED PARTS CAN RESULT IN CATASTROPHIC FAILURE.

KEEP PORT NUT SNUG. (80E40/60 80E100/120 ONLY - NUT HAS LEFT HAND THREAD!) IF NUT LOOSENS, FEED/CONCENTRATE PORT RETAINERS MAY FALL OUT OF POSITION RESULTING IN CATASTROPHIC RELEASE OF PORT.

DO NOT PRESSURIZE THE VESSEL UNTIL AFTER VISUALLY INSPECTING TO ENSURE THAT RETAINING RING IS FULLY SEATED.



Cleaning vessel inside surface

PRELIMINARY STEPS

Do not proceed until...

1. Elements and adapters have been installed in vessel following guidelines in **Replacing Elements**.
2. Head has been checked for correct component assembly by following step-by-step instructions in **Head Rebuilding**.
3. Vessel has been shimmed to prevent movement of the membrane elements if required. See page OM-27 of the trouble shooting section for a description of when shimming is required.

STEP 1 INSPECT SHELL INSIDE SURFACE

1. Inspect the vessel inside surface for any corrosion deposits or other foreign matter. If any are found, clean the surface as follows:
 - A. Using a medium or finer grade of Scotchbrite™ and a mild soap solution, clean each end of the vessel liner surface up to 8" in from each end of vessel.
 - B. Rinse away all loosened deposits from shell inside surface.

2. Inspect vessel inside surface for scratches or other damage which could cause leaks. Vessels that leak must be replaced.

CAUTION

Never attempt to repair a fiberglass shell.

STEP 2 SHELL AND HEAD SEAL LUBRICATION

1. Work O-ring lubricant into shell area behind the retaining ring groove and approximately 1/2" into the vessel I.D. (See **Figure 3**)
2. Ensure entire head seal is covered with a thin layer of O-ring lubricant, with no dirt or dust contamination.

NOTE

Glycerin is a commercially available lubricant that will not foul membranes. However, silicone lubricant will better assist correct performance and ease head assembly, installation and removal.

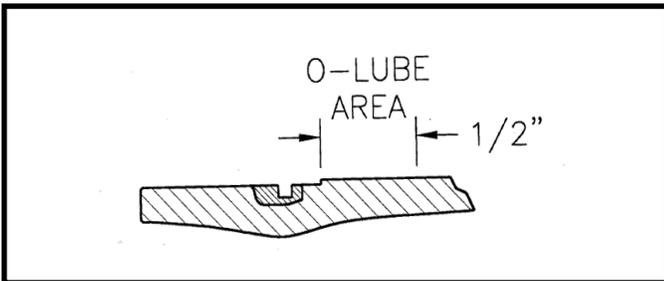


Figure 3

NOTE

Any remaining lubricant should be cleaned from vessel bore before applying fresh lubricant.

STEP 3 INSTALL HEAD

NOTE

If an 80E Series head insertion tool (p/n 50733) is available to ease head installation. (The tool can be obtained from CodeLine) If a tool is not available, proceed as follows.

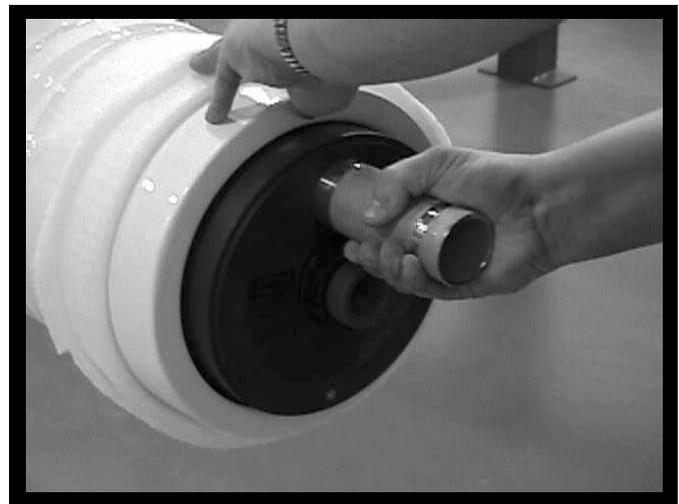
In some installations it may be advisable to tighten a system-required permeate port nipple or fitting into permeate port before head is assembled into the vessel.

CAUTION

Do not tighten a component into thermoplastic permeate port more than one turn past hand tight.

STEP 3A INSTALLATION BY

1. **HAND** Align any previously placed index marks on head assembly and vessel body. This will ensure correct alignment for port connections. Do not rotate head assembly after insertion into vessel as this may cause head seal to become detached.
2. Hold head assembly square to axis of shell and slide it straight in until a slight resistance is felt.
3. Using both hands, firmly push head in as far as it will go (a sharp, forceful thrust may be necessary to push head seal into vessel bore.) When head is in correct position, entire retaining ring groove will be exposed.



Installing head assembly – by hand

CAUTION

If head is allowed to rock side to side during installation, head seal may become detached.

STEP 3B INSTALLATION USING TOOL

1. Align any previously placed index marks on head assembly and vessel body. This will ensure correct alignment for port connections. Do not rotate head assembly after insertion into vessel as this may cause head seal to become detached.
2. Hold the head assembly square to axis of the shell and slide it straight in until a slight resistance is felt.
3. Slide tool (p/n 50733) into shell just behind the head.
4. Tap tool alternating around circumference with a dead-blow hammer until retaining ring groove is fully exposed.
5. Remove tool by pulling straight out. Do not rotate.



Installing head assembly – using head insertion tool

STEP 4 INSTALL INTERLOCK

1. With the head assembly installed in shell, place the tip of the head retaining ring in the stainless steel groove.
2. Begin pushing the retaining ring into the groove as you rotate your hand around the I.D. of the shell.

3. Continue until the entire retaining ring is installed in the groove.
4. Verify that the retaining ring is fully seated in the groove before proceeding.



Installing retaining ring

WARNING

RETAINING RING MUST BE CORRECTLY INSTALLED. INCORRECT ASSEMBLY OR INSTALLATION CAN RESULT IN EXPLOSIVE HEAD FAILURE.

STEP 5 RECONNECT PORTS

NOTE

Using teflon tape or anaerobic sealant on all threaded connections will help ensure a leak-free assembly.

1. Reconnect piping manifold to the vessel

CAUTION

Do not tighten a component into thermo-plastic permeate port more than one turn past hand tight.

STEP 6 PRE-PRESSURIZATION CHECKS

It is vitally important that the following checks be carried out before any attempt is made to pressurize the vessel.

It is recommended that the **Pre-Pressurization Checklist** (Page OM-4) be used to systematically verify that all steps have been performed.

HEAD ASSEMBLY

Verify that...

1. Head assembly is in good condition, with no evidence of damage or corrosion. See the sections on **Head Rebuilding and Maintenance**
2. Port nut is snug (80E40/60 80E100/120 left-hand thread) or snap ring is in position (80E15/25).
3. Port retainers are correctly installed.
4. Retaining rings is seated in groove

MEMBRANE ELEMENTS

Verify that...

1. Elements are installed in the vessel.
2. Element adapters are installed at each end of vessel.
3. Thrust ring is installed at downstream end of vessel.

PIPING CONNECTIONS

1. Check all piping connections to ensure that they will provide a leak-free seal.

STEP 7 PRESSURIZATION

WARNING

**DO NOT PRESSURIZE VESSEL
WITHOUT ELEMENTS INSTALLED.**

1. After following the above pre-pressurization checks, pressurize vessel in accordance with the element manufacturer's specifications.
2. Vessels should be filled slowly to assist trapped air to escape.
3. Vessels should be pressurized slowly to avoid damage to membrane elements and vessel components.

HEAD REBUILDING – 80E15/25 ONLY

Step-By-Step Guide

NOTE

*Read all guidelines in this section
before attempting to rebuild the head.*

Head rebuilding should be performed in a clean work area. Dust or dirt on O-rings or other parts can scratch inner surfaces and cause leakage.

WARNING

DO NOT SERVICE ANY COMPONENT UNTIL YOU VERIFY THAT PRESSURE IS FULLY RELIEVED FROM THE VESSEL.

REPLACE ANY COMPONENTS NOT IN “AS-NEW” CONDITION. REUSING CORRODED OR DAMAGED COMPONENTS CAN RESULT IN CATASTROPHIC FAILURE.

SNAP RINGS MUST BE FULLY SEATED AT BOTTOM OF GROOVES PROVIDED. INCORRECT ASSEMBLY CAN RESULT IN CATASTROPHIC RELEASE OF PORT.



Head component identification (80E15/25) – head disassembled

• 80E15/25 ONLY •

PRELIMINARY STEPS

Do not proceed with step by step guidelines until...

1. All pressure has been relieved from the vessel, following system manufacturer's recommendations.
2. Head has been removed from the vessel following guidelines in **Opening Vessel**.

TO DISASSEMBLE HEAD

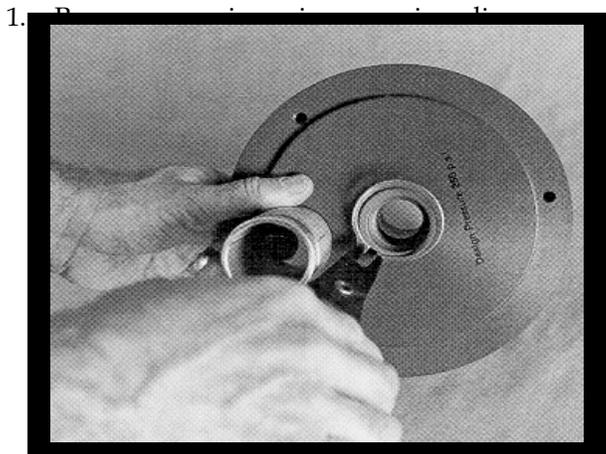
NOTE

Refer to pages OM-5 and OM-16 for head component identification.

CAUTION

It is recommended that safety glasses be worn during removal of snap ring.

STEP 1 REMOVE PERMEATE PORT

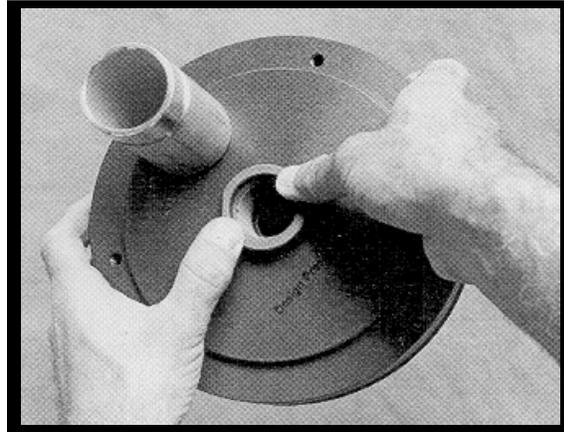


Snap ring removal using snap ring pliers

NOTE

If necessary, ports may be tapped with a rubber mallet to ease removal.

2. Remove permeate port by pressing out from small end.



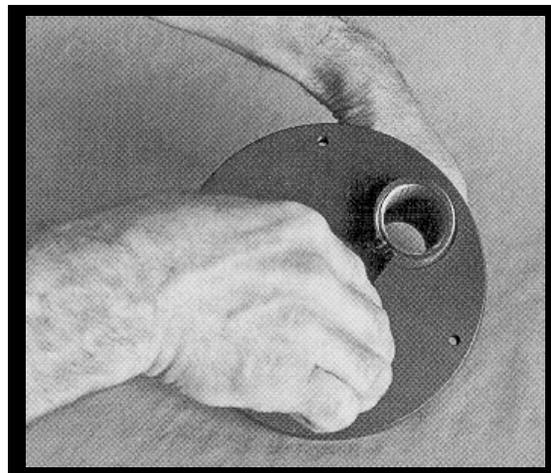
Pressing out (80E15/25) permeate port

STEP 2 REMOVE SEALING PLATE

1. Hold feed/concentrate port and bearing plate stationary and rotate sealing plate slightly to break seal. Remove sealing plate.

STEP 3 REMOVE FEED/CONCENTRATE PORT

1. Remove snap ring using snap ring pliers.



Snap ring removal with pliers

2. Remove feed/concentrate port from bearing plate.

Steps for rebuilding the heads of the 80E15/25 continue on page OM-20.

HEAD REBUILDING – 80E40/60 ONLY

Step-By-Step Guide

NOTE

*Read all guidelines in this section
before attempting to rebuild the head.*

Head rebuilding should be performed in a clean work area. Dust or dirt on O-rings or other parts can scratch inner surfaces and cause subsequent leakage.

WARNING

DO NOT SERVICE ANY COMPONENT UNTIL YOU VERIFY THAT PRESSURE IS FULLY RELIEVED FROM THE VESSEL.

REPLACE ANY COMPONENTS NOT IN “AS-NEW” CONDITION. REUSING CORRODED OR DAMAGED COMPONENTS CAN RESULT IN CATASTROPHIC FAILURE.

UPON REASSEMBLY, PORT NUT MUST BE SNUG (LEFTHAND THREAD). IF NUT LOOSENS, FEED/CONCENTRATE PORT RETAINERS MAY FALL OUT OF POSITION RESULTING IN CATASTROPHIC RELEASE OF PORT.



Head component identification (80E40/60 80E100/120) – head disassembled

• 80E40/60 ONLY •

PRELIMINARY STEPS TO DISASSEMBLE HEAD

Do not proceed with step by step guidelines until...

1. All pressure has been relieved from the vessel, following system manufacturer's recommendations.
2. Head has been removed from the vessel following guidelines in **Opening Vessel**.

NOTE

Refer to pages OM-5A and OM-18 for head component identification.

STEP 1 REMOVE PERMEATE PORT

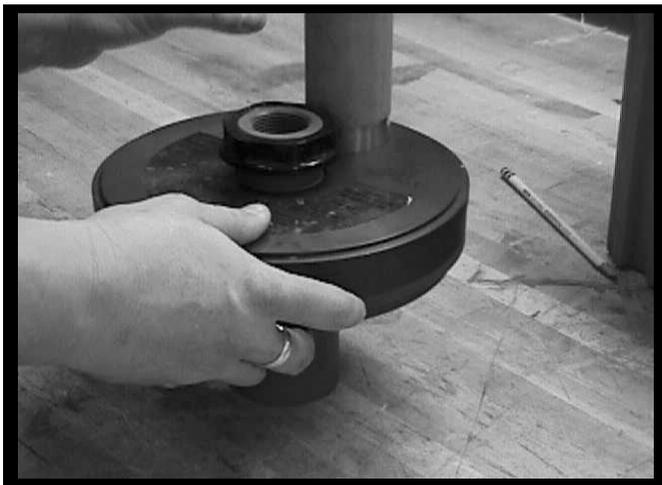


Removing port nut (left-hand threaded)

NOTE

If necessary, ports may be tapped with a rubber mallet to ease removal.

2. Remove permeate port by pressing out from threaded end.



Pressing out permeate port

STEP 2 REMOVE SEALING PLATE

1. Hold feed/concentrate port and bearing plate stationary and rotate sealing plate slightly to break seal. Remove sealing plate.

STEP 3 REMOVE FEED/ CONCENTRATE PORT

1. Press long, exposed end of feed/concentrate port further into bearing plate to free the port retainer set.
2. First remove port retainer set (2 pieces), then feed/concentrate port from bearing plate.



Removing port retainer set

Steps for rebuilding the head of the 80E40/60
80E100/120 continue on page OM-20.

• All Models •

STEP 4 REMOVE SEALS

1. Carefully remove 3 seals from the sealing plate and one seal from permeate port.



Removing seals

NOTE

A small screwdriver or similar tool may be used to remove O-rings. However, do not damage the sealing plate surfaces in any way or leakage may result.

It is recommended that all seals be replaced each time the head is assembled.

It is recommended that on 80E15/25 vessels, the snap ring be replaced each time head is assembled.

COMPONENT CLEANING AND EXAMINATION

STEP 1 WASH COMPONENTS

1. Wash all components in fresh water.
2. Blow components dry with compressed air, if available.

STEP 2 INITIAL COMPONENT INSPECTION

1. Examine all components for any damage that could affect structural strength or sealing properties.
2. Replace any parts considered to be structurally unacceptable.

CAUTION

Read all guidelines in this section before making decisions on component structural or corrosion problems and treatment.

This section is intended only to provide guidelines in dealing with corrosion or component damage. In combination with good industrial practice, these guidelines provide a basis for safe system operation.

Any condition not covered in this section should be referred to the CodeLine

Corrosion in this context includes metal oxidation products and mineral deposits.

THE FOLLOWING EXAMPLES INDICATE WHEN REPLACEMENT IS REQUIRED.

- A. **FEED/CONCENTRATE PORT** bent or distorted.
- B. **PERMEATE PORT** or **NUT** stripped or overstrained.
- C. **PERMEATE PORT** internal thread stripped or overstrained.
- D. **BEARING PLATE** dented or distorted or with anodizing removed (possibly from being dropped or hit).
- E. **SEALING PLATE** cracked, distorted or with sealing area damaged.
- F. **RETAINING RING** bent or damaged.

Any other detail consideration to be a potential problem should be referred to CodeLine.

NOTE

Alternate materials are available for high corrosion environments. Call CodeLine for information.

STEP 3 EVALUATING CORRODED METAL COMPONENTS

This procedure applies to the following parts:

- A. Retaining Ring
- B. Bearing plate
- C. Feed/concentrate port
- D. Port retainers

CAUTION

This procedure is to be used on any corroded metal parts. If this fails to bring any component to "as-new" standards, the part must be replaced.

1. Examine all components for corrosion. For any components not in "as-new" condition, proceed as follows:
 - A. Loosen any large deposits with small wire brush.
 - B. Place components in shallow container of soapy water and scrub entire surface with medium grade Scotchbrite™ until all corrosion is removed.
 - C. Rinse components clean with fresh water.
 - D. Blow components dry with compressed air, if available.
 - E. Re-examine components for damage that could affect structural strength or sealing properties. Any components not in "as-new" condition must be replaced.
 - F. Inspect components for any condition that may have promoted corrosion, (e.g. gouged anodizing, inappropriate material selection, etc.)

NOTE

Damage to anodized or plated parts may be temporarily sealed with epoxy paint while waiting for replacement parts.

STEP 4 REMOVING DEPOSITS FROM PLASTIC

CAUTION

The following procedure should be used on all plastic components contaminated by mineral deposits or other foreign matter. If any component cannot be brought to "as -new" standards, it must be replaced.

This procedure applies to the following components:

- A. Port nut (E80E40/60 only)
 - B. Permeate port
 - C. Sealing plate
 - D. Adapter
1. Examine all plastic components for mineral deposits or other foreign matter. If any are found, proceed as follows.
 - A. Place components in shallow container of soapy water and scrub entire surface with medium grade Scotchbrite™ until all foreign matter is removed.
 - B. Rinse components clean with fresh water.
 - C. Blow components dry with compressed air, if available.
 - D. Re-examine components for any damage that could affect structural strength or sealing properties. Any components not in "as-new" condition must be replaced.

NOTE

If any components are cracked, softened or discolored this may indicate a chemical resistance problem. These components must be replaced. Alternate materials may be required in these applications.

TO REASSEMBLE HEAD

WARNING

HEAD MUST BE CAREFULLY ASSEMBLED FOLLOWING THESE INSTRUCTIONS. INCORRECT ASSEMBLY CAN RESULT IN CATASTROPHIC FAILURE.

CAUTION

Use Parker Super-O-Lube™ sparingly on all seals each time the head is assembled. Excessive lubricant may foul membrane.

NOTE

It is recommended that all seals be replaced each time the head is assembled. A seal replacement kit is available from your supplier.

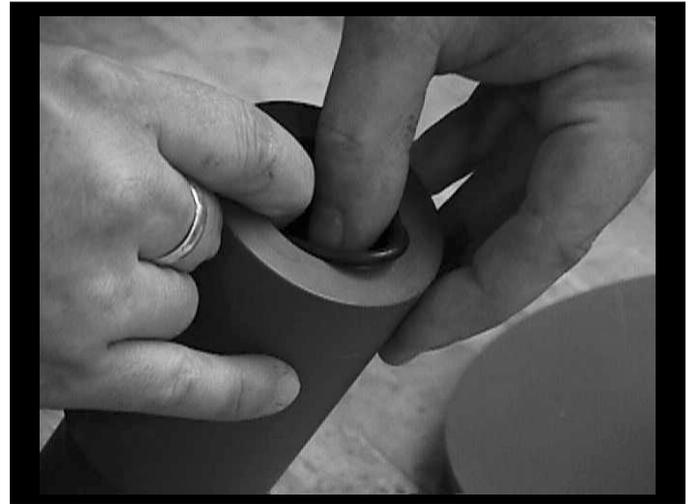
STEP 1 LUBRICATE AND INSTALL SEALS

1. Cover each seal with a thin, even layer of O-ring lubricant.

NOTE

Glycerin is a commercially available lubricant that will not foul membranes. However, silicone lubricant, correctly used, will better assist correct performance and ease head assembly and disassembly.

2. Install port seals in sealing plate and adapter seal in permeate port.



Installing seals

STEP 2 INSTALL FEED/CONCENTRATE PORT

1. Hold the bearing plate so that the counter bore in the off center hole is facing toward you. From the other side, insert the smaller, machined end of the stainless steel feed/concentrate port through the off-center hole.



Installing feed/concentrate port

NOTE

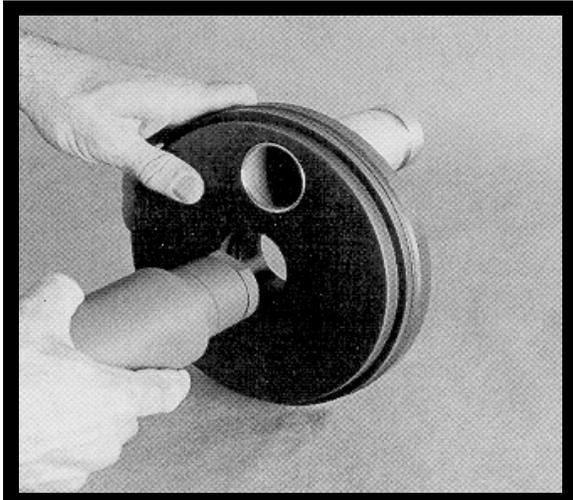
Steps for rebuilding the head of the 80E15/25 only continue on page OM-23. Steps for the 80E40/60 80E100/120 continue on page OM-24.

• 80E15/25 ONLY •

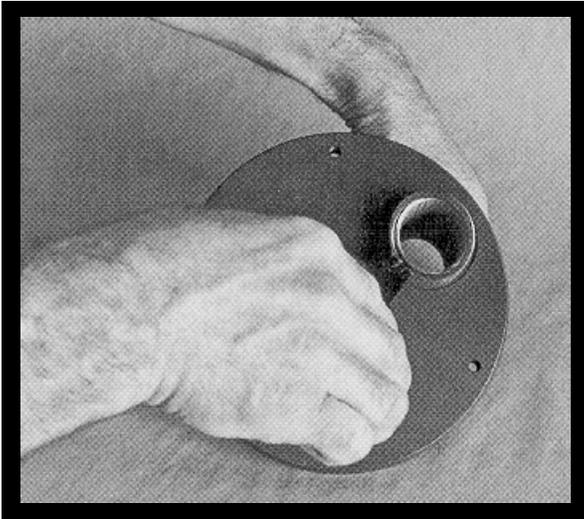
CAUTION

It is recommended that safety glasses be worn during installation of snap ring.

2. Install snap ring into groove in feed/concentrate port using snap ring pliers.



Permeate port being inserted



Port being fitted using snap ring pliers

WARNING

SNAP RING MUST BE FULLY SEATED AT BOTTOM OF GROOVE PROVIDED. INCORRECT ASSEMBLY CAN RESULT IN CATASTROPHIC FAILURE.

STEP 3 INSTALL SEALING PLATE

1. With its larger diameter facing the bearing plate, press the sealing plate onto the machined end of the feed/concentrate port.
2. Rotate sealing plate until the two center holes are aligned.

STEP 4 INSTALL PERMEATE PORT

1. From sealing plate side, insert threaded end of permeate port through bearing/sealing plate combination. Press firmly until permeate port bottoms on sealing plate.
2. Install snap ring into groove on outer end of permeate port using snap ring pliers.

NOTE

Head rebuilding of the 80E15/25 is now complete.

• 80E40/60 80E100/120 ONLY •

(Cont'd from page OM-22)

2. Install the port retaining set into the groove in the machined end of the feed/concentrate port. Pull port back until retaining ring set bottoms in bearing plate recess.



Installing port retaining set

STEP 3 INSTALL SEALING PLATE

1. Hold these components together so the retaining ring set remains firmly seated. With its larger diameter facing the bearing plate, press the sealing plate onto the machined end of the feed/concentrate port.
2. Rotate sealing plate until the two center holes are aligned.

STEP 4 INSTALL PERMEATE PORT

1. From sealing plate side, insert threaded end of permeate port through bearing/sealing plate combination. Press firmly until permeate port bottoms on sealing plate.



Installing permeate port

2. Thread port nut (left-hand thread) onto permeate port. Tighten until snug.

WARNING

WITH THE PORT NUT TIGHTENED, THE SEALING PLATE MUST SIT FLUSH AGAINST THE BEARING PLATE. IF ANY GAP IS EVIDENT, THE COMPONENTS HAVE NOT BEEN ASSEMBLED CORRECTLY.

INCORRECT ASSEMBLY CAN RESULT IN CATASTROPHIC FAILURE.

NOTE

Head rebuilding of the 80E40/60 is now complete.

PREVENTIVE MAINTENANCE

Corrosion prevention is essential for the maintenance of safe operating conditions and to ease membrane element servicing.

Attention to the points listed below will enhance long-term safe operation and will ease servicing.

For suggestions on cleaning corrosion deposits from the vessel inside surface, refer to **Closing Vessel**.

For suggestions on cleaning corrosion deposits from head components, refer to **Head Rebuilding**.

PREVENTION CHECKLIST

- End closures. Inspect for components that may have deteriorated. Replace as needed.
- Keep external head assembly components as dry as possible.
- Do not tolerate leaks.
- Ensure that protective coatings are intact. Exposed metal may promote corrosion.

CAUTION
Any leakage indicates a potentially dangerous condition. Failure to eliminate leakage may void the warranty and could result in vessel failure.

TROUBLESHOOTING

This section is intended only to provide guidelines for dealing with problems that might arise while working with CodeLine™ pressure vessels.

These guidelines are not in any way a replacement for the good industrial practice required to ensure safe operation. We recommend that only a qualified mechanic experienced in servicing high pressure hydraulic systems carry out the following tasks.

PRELIMINARY INSPECTION

Inspect the vessel at each end for corrosion which may interfere with head assembly removal. If corrosion is evident, proceed as follows:

1. Loosen any deposits with a small wire brush and/or a medium grade piece of Scotchbrite™.



Loosening Deposits

2. Flush away loosened deposits with clean water.
3. Proceed with instructions given in **Opening Vessel** section.

DIFFICULTY IN OPENING VESSEL

NOTE
Recommendations listed below are intended only as a guide. If the head assembly is still difficult to remove after all recommendations have been followed, call CodeLine for technical assistance.

CAUTION
When applying penetrating fluid, be careful to avoid element contamination.

RETAINING RING

1. Will not release from groove and or bearing plate:
 - A. Apply penetrating fluid (such as WD-40™ or LPS-1™) around retaining ring at the retaining ring groove and bearing plate interfaces.



Applying penetrating fluid.

- B. Use a cushioned mallet or hammer in conjunction with a wood block to tap the face of the bearing plate and retaining ring.
- C. Again attempt to remove the retaining ring.

SUDDEN DROP IN PERMEATE QUALITY

If a system is started and stopped frequently and no provision is made to raise the pressure slowly, movement of the membrane column may damage O-ring seals and reduce permeate quality.

If the quality of the permeate suddenly drops off, and poor membrane performance is not suspected, remove the head per instructions in the User's Guide (See OPENING VESSEL section on pages OM-6 through OM-7). Remove the adapters from each end of the vessel. Remove the PWT seals from the adapters and the adapter seal from each of the permeate ports. Inspect these O-ring seals carefully for breakage or other damage. If the seals have rolled out of the groove, or are damaged, this may indicate excessive movement is occurring during startup and shutdown. To overcome this problem, the vessel should be shimmed to minimize this movement. Follow the procedure for shimming as given below:

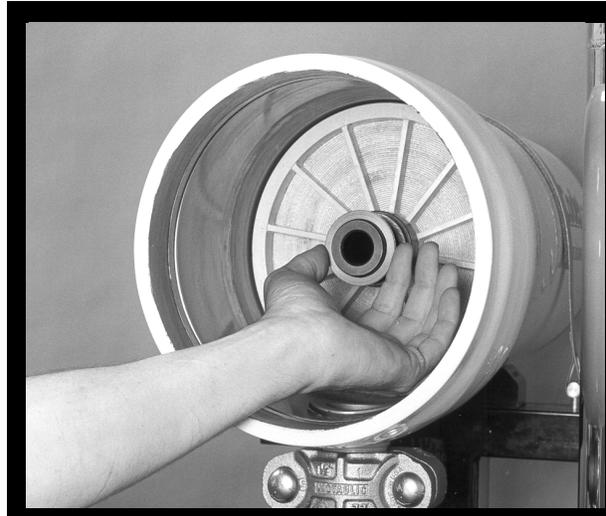
SHIMMING

Shimming is accomplished by placing spacers between the adapter and the hub on the permeate port on the up-stream end of the vessel. When done properly, shimming will prevent excessive movement of the membrane elements and the adapters, thus preventing potential damage of the O-ring seals. The spacers used for shimming are shaped like a plastic washer and are 0.20 inches thick.

The suggested procedure for shimming is as follows:

1. With the membrane properly loaded, install the adapters and place the thrust ring in the downstream end of the vessel. (See REPLACING ELEMENTS section on pages OM-8 through OM-11).
2. Install a head in the downstream end of the vessel following Steps 1 through 4 of the section entitled CLOSING VESSEL on pages OM-12 through OM-15).
3. Remove the adapter seal and head seal from the remaining head. Install the head far enough into the upstream end of the vessel so that you can place a locking ring segment in the locking ring groove. This will assure that there is no interference in any of the components and establish the force required to seat the head.

4. Remove the head and slide some spacers over the end of the adapter that fits into the permeate port. Add enough spacers so that when the head is installed, it is not possible to install the retaining ring in the groove. This will normally require 2 to 3 spacers.



Sliding spacers onto adapter

5. Remove one spacer at a time until it is just possible to install the retaining ring in the shell groove with the head in place.
6. Remove the head and reinstall the adapter seal and head seal.
7. Now close the vessel according to the VESSEL CLOSING section which begins on page OM-12.

INSTALLATION GUIDE

Proper vessel handling and installation are important to safe use and long vessel life. These guidelines outlined herein should be followed carefully; however, they are intended only as guidelines and do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Damage due to improper handling or installation is the sole responsibility of the purchaser.

Improper assembly, misuse or corrosion damage can result in mechanical failure, property damage and serious injury or death. *Read and follow all instructions carefully.* Pay particular attention to the safety precautions given in this **Operation and Maintenance** section. Should any information in this guide not agree with the system supplier's instructions, call CodeLine for clarification.

TABLE OF CONTENTS

Handling and Receiving	I-2
Mounting Shell	I-3
Piping Connections	I-5

HANDLING AND RECEIVING

Fiberglass reinforced plastic (FRP) pressure vessels are extremely rugged and durable. They are designed for safe, long-term service when they are handled and installed properly. However, damage to the vessel shell or related components from improper handling or installation could result in malfunction or catastrophic failure while in service. Therefore, exercise the following precautions whenever handling vessels.

1. Never lift or move a vessel by placing anything inside it. The vessel is durable and ideally suited to its purpose, but it can be permanently damaged by careless handling.
2. Be careful not to scratch the inside wall of the shell, especially in the sealing area inboard of retaining ring groove near each end.
3. DO NOT drop vessel or allow it to hit hard on the ground or against other objects.
4. DO NOT apply undue stress to shell.
5. Before using a forklift to handle the vessel, pad the forks to lessen the chance of damaging the shell. Severe scratches or gouging of the vessel can result in failure of the vessel wall.

NOTE ON IMPACT DAMAGE

Exterior vessel damage can lead to early vessel failure. Damage received in shipment should be reported to the shipping company immediately upon receipt. Minor damage such as scratches that go no deeper than the paint may be acceptable. Call CodeLine Customer Service for advice if in doubt.

MOUNTING SHELL

This section is concerned with the mounting of 80E Series pressure vessels only.

These guidelines must be integrated with any additional procedures required for specific installation.

Installation Guidelines:

1. Provide adequate room for servicing at both ends of vessel. Elements are installed from the upstream end, pushed through towards the downstream end and, eventually, removed from downstream end.
2. Follow all applicable handling guidelines. (Page I-2)
3. Position each vessel on its mounting frame such that it is centered between headers.

NOTE
It is important that each vessel be placed to minimize any strain on the tubing which connects a vessel to a header. Normally each vessel should be placed such that dimension from the vessel retaining ring groove to U-bend/header connection point be equal at both ends. However, if U-bends are not symmetrical at both ends, the vessel may need to be positioned off center such that connections can be made easily, without undue strain, at both ends of the vessel.

4. Mount vessels on urethane saddles positioned in line with pre-drilled frame holes for -1 through -5 vessels. The holes should be drilled at approximate center span 'S'. For -6, -7, -7.5 and -8 vessels, holes should be drilled within 10" to 30" from ends of vessel and a third saddle and strap, should be placed at mid span. These dimensions are shown on the corresponding engineering drawing.

WARNING
DO NOT MOUNT VESSEL RIGIDLY. RESTRICTED EXPANSION CAN RESULT IN DAMAGE TO THE VESSEL.
SEE ELASTICITY AND MOUNTING REQUIREMENTS IN THE APPLICATION SECTION FOR FURTHER DETAILS.

5. Place mounting straps over vessel.
6. Provide adequate room for servicing at both ends of vessel. Elements are installed and removed in the direction of feed flow.
7. Position screw through the frame mounting holes into strap nuts and run up to the frame finger tight.
8. Using a wrench, tighten mounting bolts **one** additional full turn. This should result in 25-50 lbs-in. of torque.

CAUTION
To avoid damage to vessel shell DO NOT over-tighten mounting nuts.

PIPING CONNECTIONS

The following are suggested guidelines to ensure that the vessel is allowed to expand and is easily serviced.

1. Support the header independently; support the branch with the header and the vessel.
2. Include an expansion loop in the branch connection to allow for:
 - A. Elastic growth in vessel length
 - B. Thermal growth in vessel length
 - C. Sagging of the vessel (which can occur even when supported at recommended span.)
3. The recommended branch connection is a U-bend pipe with flexible connections at each end, or a flexible hose.
4. The total weight of the branch connection and fittings should not exceed 16 lbs. for feed/concentrate and 8 lbs. for permeate port for 80E Series vessels.

APPLICATION GUIDE

This **Application Guide**, together with the **Installation Guide** and the **Operation and Maintenance Guide**, outlines the general conditions for safe use of 80E Series pressure vessels. Because of the considerable risk inherent in high pressure systems, it is the purchaser's responsibility to evaluate carefully each specified application to ensure that the 80E vessel selected is appropriate to that application.

CodeLine will assist the purchaser in determining the suitability of the standard vessel for their specific operating conditions. For non-standard applications, alternate materials are available on special order. The final determination, however, including evaluation of the standard materials of construction for compatibility with the specific environment, is the responsibility of the purchaser.

TABLE OF CONTENTS

Suitability for Intended Use	A-2
Elasticity and Mounting Requirements	A-3
Corrosion	A-4
Safety	A-5

SUITABILITY FOR INTENDED USE

80E Series RO pressure vessels are designed for continuous, long-term use as housings for reverse osmosis membrane elements. Models are available for 150, 250, 400, 600, 1000, and 1200 psi. Any make of eight inch nominal diameter spiral wound element is easily accommodated.

In an RO system there is considerable potential for catastrophic failure, with consequent serious injury or loss of life. All decisions as to suitability for use must include full consideration of the various safety aspects involved. These include, but are not limited to:

- Process fluid compatibility (e.g. chemical and temperature considerations).
- External environmental factors (e.g. corrosive atmosphere; remote or special environments where plastics might be undesirable; etc.).
- Abnormal back pressure which might result in pressurizing permeate port above 125 psi (alternate materials are available).
- Capability of the user to maintain vessel properly.
- Requirement for increased fire resistance in some circumstances (e.g. may preclude use of PVC for permeate ports).

Use of a CodeLine™ pressure vessel for other than its intended application will void the warranty.

CodeLine will assist the purchaser in determining the suitability of the standard vessel for their specific operating conditions. For non-standard applications, alternate materials are available on special order. The final determination, however, including evaluation of the standard materials of construction for compatibility with the specific environment, is the responsibility of the purchaser.

ELASTICITY AND MOUNTING REQUIREMENTS

Mounting design must allow for vessel expansion, both axially and radially. Although the expansion under pressure is slight, undue restriction can result in damage to the vessel and to other system components. Expansion is typically up to .020 inch in diameter and up to 0.007 inch per foot in length. A six-element vessel, for example, would expand approximately .150 inch in length. The following suggestions will help to ensure the vessel is allowed to expand and will ease servicing.

1. Mount the vessel on the urethane support pads furnished. Do not mount directly to any rigid structure.
2. Use the stainless steel straps furnished. Straps should be tightened sufficiently to hold the vessel on the urethane support pads, but not so tightly as to restrict expansion. (A torque of 25-50 lbs-in. is sufficient.)
3. U-bolts should not be used for vessel mounting under any circumstances.
4. Provide a flexible piping connection to permit decoupling the header from the vessel. The recommended branch connection is a U-bend pipe with flexible connections at each end, or a flexible hose.
5. Do not hard plumb either end of vessel.
6. Support the header independently; support the branch with the header and the vessel.
7. Include an expansion loop in the branch connection to allow for:
 - A. Elastic growth under pressure.
 - B. Thermal growth in vessel length.
 - C. Sagging of the vessel (which occurs even when supported at two points at recommended span.)
8. The total weight of branch connection and fittings should not exceed 16 lbs for feed/concentrate ports and 8 lbs for the permeate port for 80E series vessels.

The above suggestions are intended to help prevent damage in typical applications. Unusual or special applications may involve other considerations, to be determined by the system designer.

CORROSION

Considerations relating to corrosion are an important factor in vessel application. Corrosion can result in catastrophic failure and/or cause difficulty in removing head components from the shell. Correct component material selection is essential for safe long-term use. Although the process fluid is the main consideration, external environmental conditions should also be taken into account.

All reasonable precautions should be taken to protect head assemblies from external wetting, particularly in corrosive atmospheres (e.g. salt water areas or acidic atmospheres such as near lead acid battery arrays, etc.). Leaks from vessel or nearby components which allow head parts to be routinely wetted should not be tolerated.

The following typical list of CodeLine™ pressure vessel components shows the standard material of construction of each part. An evaluation of the possibility of corrosion damage to metal head interlock components is of critical importance. Alternate materials are available upon request.

80E15/25 ONLY

Dwg. Qty.		Part Name	Materials/Remarks
Ref	Per		
SHELL			
1	1	Shell Length	Filament wound epoxy/glass composite- Head locking groves integrally wound in-place
HEAD			
2	2	Bearing Plate	6061-T6 aluminum alloy-hard anodized
3	2	Sealing Plate	PVC Thermoplastic
4	2	Feed/Conc Port	Type 316 Stainless Steel
5	4	Port Retainer	PH15-7MO SST
6	2	Permeate Port	PVC Thermoplastic
7	2	Head Seal	Ethylene Propylene, Quad Ring
8	4	Port Seal	Ethylene Propylene, O-Ring
HEAD INTERLOCK			
9	2	Retaining Ring	302 SST
VESSEL SUPPORT			
10	*2	Saddle	Engineering Thermoplastic
11	*2	Strap Assy	304 SST - Thermoplastic cushion
12	4	Strap Screw	5/16-18 UNC, 18-8 Stainless Steel
ELEMENT INTERFACE			
13	2	Adapter	Engineering Thermoplastic
14	1	Thrust Ring	Thermoplastic, White
15	2	Adapter Seal	Ethylene Propylene - O - Ring
16	4	PWT Seal	Ethylene Propylene - O - Ring
		*3 each furnished with length code 7, 7.5 & 8	

80E40/60 80E100/120 ONLY

Dwg. Qty.		Part Name	Materials/Remarks
Ref	Per		
SHELL			
1	1	Shell Length	Filament wound epoxy/glass composite- Head locking groves integrally wound in-place
HEAD			
2	2	Bearing Plate	6061-T6 aluminum alloy-hard anodized
3	2	Sealing Plate	PVC Thermoplastic
4	2	Feed/Conc Port	Type 316 Stainless Steel, Two piece set
5	2	Port Retainer Set	304 Stainless Steel, Two piece set
6	2	Permeate Port	PVC Thermoplastic
7	2	Port Nut	PVC Thermoplastic-left hand thread
8	2	Head Seal	Ethylene Propylene, O-Ring
9	4	Port Seal	Ethylene Propylene, O-Ring
HEAD INTERLOCK			
10	2	Retaining Ring	302 SST
VESSEL SUPPORT			
11	*2	Saddle	Engineering Thermoplastic
12	*2	Strap Assy	304 SST - Thermoplastic cushion
13	4	Strap Screw	5/16-18 UNC, 18-8 Stainless Steel
ELEMENT INTERFACE			
14	2	Adapter	Engineering Thermoplastic
15	1	Thrust Ring	Thermoplastic, White
16	2	Adapter Seal	Ethylene Propylene - O - Ring
17	4	PWT Seal	Ethylene Propylene - O - Ring
		*3 each furnished with length code 7, 7.5 & 8	

SAFETY

CAUTION
Pressure vessels may cause loss of life, severe bodily harm or property damage if not correctly installed, operated and maintained.

Safety in service of fiberglass pressure vessels depends on proper application, installation, operation and maintenance. This section is intended to provide guidance towards safe system design. The safety information given in the **Installation** and **Operation and Maintenance** sections should also be studied and used appropriately in conjunction with the precautions listed below.

DESIGN CONSIDERATIONS FOR SAFETY

Fluid Compatibility

The materials of construction selected must be compatible with the process fluid and with proposed preserving and cleaning fluids. Standard materials are listed on the engineering drawings. In cases where the standard materials are unacceptable, suitable alternates may be available.

Pressure and Temperature Design Limits

Operation of a vessel outside its design limits will void the warranty and could result in vessel fatigue with possible eventual catastrophic failure. Although each 80E vessel is tested to 1.5 times design pressure, long term operation above design pressure must be prevented. Permeate port pressure must not exceed 125 psi (with standard materials). Vessels should not be continuously operated at temperatures above 120°F.

Overpressure Protection

It is essential that over-pressure protection be provided such that the pressure to which any vessel is subjected cannot exceed 105% of design pressure.

Mounting

The pressure vessel should not be used as a support. Piping manifolds and other fittings should be supported by properly designed system framework. Operating personnel should be discouraged from applying undue force to any fittings connected directly to a pressure vessel.

Accessibility

Pressure vessels should be positioned within the system such that elements can be inserted at the upstream end and removed from the downstream end (i.e. elements are installed and removed in the direction of feed flow).

APPENDIX

TABLE OF CONTENTS

Pre-Pressurization Checklist	APX-2
Engineering Drawings	APX-3
Component List	APX-12
Limited Warranty	APX-13
Registration Card.....	APX-14

PRE-PRESSURIZATION CHECKLIST

Danger – High Pressure Device

This vessel may cause loss of life, severe bodily harm, and/or property damage if not correctly installed, operated or maintained. Read and understand all guidelines given before attempting to open, operate or service this vessel.

Failure to follow these guidelines and observe every precaution may result in malfunction and could result

in catastrophic failure.

Misuse, incorrect assembly or use of damaged or corroded components can result in high-velocity release of the end closure.

We recommend that only a qualified mechanic experienced in servicing high-pressure hydraulic systems, open, close and service this vessel.

This checklist is an operational aid intended to augment the detailed guidelines given in the E8 Series **Operation and Maintenance Guide**.

Note that the checklist alone does not include all the details needed for safe vessel operation. Use the checklist each time any service operation is carried out to ensure that each step is completed before pressurizing the vessel.

MEMBRANE ELEMENTS

Installed per manufacturer's recommendations.

Feed flow direction correctly noted and elements correctly oriented.

Column of elements centered inside shell.

ELEMENT INTERFACE

Adapters installed at both ends of element column.

Thrust ring installed downstream from element column.

HEAD

All components in as-new condition, clean and free of damage or corrosion.

All components properly assembled with new, freshly lubricated seals.

Port retainer for feed/concentrate port in correct position.

Port nut snug-80E40/60 (Note: left-hand thread).

Permeate port snap ring installed-80E15/25.

HEAD ASSEMBLY INTERLOCK

Locking groove at each end of shell clean, free of corrosion with outboard face of groove true and in sound condition.

All components in as-new condition, clean and free of damage or corrosion.

Retaining ring fully seated in the retaining ring groove.

PIPING CONNECTIONS

Properly secured.

Leak free.

Assembled By: _____

Date Of Assembly: _____

Checked By: _____

Date of Inspection: _____

The following vessels listed by serial number below were serviced under this checklist:

ENGINEERING DRAWINGS

Model 80E15	APX-4 to APX-5
Model 80E25	APX-6 to APX-7
Model 80E40	APX-8 to APX-9
Model 80E60	APX-10 to APX-11
Model 80E100.....	APX-12 to APX-13
Model 80E120.....	APX-14 to APX-15

80E SERIES RO PRESSURE VESSEL COMPONENT LIST

PART NAME	80E15	80E25	80E40	80E60	80E100	80E120
Bearing Plate	51053	51050	51091	51052	47317	47317
Sealing Plate	50550 O-rings 225/442					
Feed/Concentrate Port	50607		50567		50550	
Feed/Concentrate Port Retainer	45247 (Snap Ring)		45090 (2 pc set)		45080 (2 pc set)	
Permeate Port	51067	50608	50569		50558	
Permeate Port Retainer	45247 (Snap Ring)		45066 (Port Nut)			
Head Seal	45320					
Port Seal (20/kit)	50292				45312	
Adapter Seal (20/kit)	50290				45308	
Head Interlock	45261					
Saddle - 2 each for -1 thru -6 3 each for -7 thru -7.5	45100		45102	45103		
Strap	45042					
Strap Screw (included above)	46265					
Thrust Ring	45069					
Head Assembly (dwg items 2-9)	50270	50271	50272	50273	50146	
Head Insertion Tool	50733					
Head Removal Tool (Includes bolt and washer. Bolt and washer are needed on 80E series only)	65260					

Note: The numbers shown above are for ordering purposes only. Due to differences in assembly numbers and part numbers, the number stamped on a part may be different from the numbers shown above and may not always be reflected on the actual part. When appropriate, the part will be supplied with O-ring(s) lubricated and assembled to the part.

WARRANTY

The seller warrants that the goods supplied shall conform to CodeLine™ specifications and shall be free from defect in material or workmanship. The warranty expires one (1) year from the date of invoice. If the buyer discovers within this period a failure of the product to conform to specifications, or a defect in material or workmanship, the buyer must promptly notify the seller in writing. In no event may that notification be received by the seller more than 30 days after the end of the warranty period. Any goods that the buyer believes to be defective are to be returned to the seller's factory for examination. However, upon request of the buyer, the seller may, at his discretion, agree to examine the good in the field. If, upon examination by the seller, any goods sold under this agreement or purchase order do fail to conform to CodeLine™ specifications, or prove to be defective in material or workmanship, the seller will supply an identical or substantially similar part F.O.B., the seller's factory; or the seller, at its option, will repair such part or give credit to the buyer for the original cost of such goods. However, if the goods were examined in the field and the seller determines that they do conform to CodeLine™ specifications, the buyer will be responsible to pay to the seller, a \$750 field service charge, plus travel expenses and a \$75 per diem charge. Any replacement goods provided hereunder will be warranted against defects in material and workmanship for the unexpired portion of the one-year warranty period applicable to the goods. Normal wear of replaceable components, including elastomeric seals, is excluded from this warranty. These remedies are the purchasers only remedies for breach of warranty.

This warranty will not be applicable if the goods have been subject to any accident, damage caused by disasters, faulty installation, misapplication, mishandling, chemical attack, unauthorized attachments or modifications, abuse or misuse, if the buyer has used the goods after discovery of a defect without sellers written consent, or if the buyer refused to permit the seller to examine the goods to ascertain the nature of the defect.

This warranty is expressly in lieu of any and all other expressed or implied warranties with respect to the goods or their installation, use, operation, replacement or repair, including any implied warranty of merchantability or fitness of purpose. This agreement constitutes the entire contract and exclusively determines the rights and obligations of the seller and the buyer, any prior course of dealing, custom or usage or trade or course of performance notwithstanding. Seller will not be liable by virtue of this warranty or otherwise for any special, incidental or consequential loss or damage resulting from the use or loss of use of the goods based on breach of warranty, breach of contract, negligence, strict tort, or any other legal theory. Damages that the seller will not be responsible for include, but are not limited to, loss of profits, loss of the use of the product or any associated equipment, cost of removing or installing the product; downtime; the claims of third parties including customers; and injury to property. This limitation does not apply to damages caused by breach of the warranty of title or the warranty against infringements or to claims for personal injury. Any action for breach of warranty must be commenced within 60 days of the end of the warranty period.

