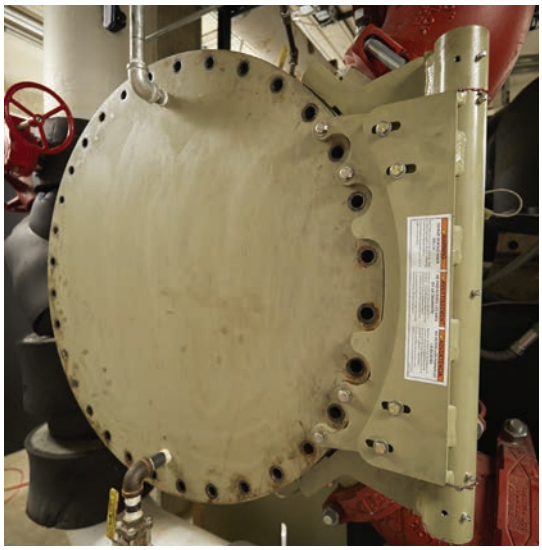
Installation Instructions

CenTraVac™ Chiller Retrofit Hinged Non-Marine Cast Waterboxes and Marine Waterboxes

Models: CVHE, CVHF, and CVHG CenTraVac Chillers

080 Non-Marine Cast Waterbox
050 Non-Marine Cast Waterbox
032 Non-Marine Cast Waterbox



080 Marine Waterbox
050 Marine Waterbox
032 Marine Waterbox

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

May 2020

PART-SVN224E-EN

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs and HCFCs such as saturated or unsaturated HFCs and HCFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

⚠ WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

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Trademarks

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Revision History

- Updated the Non-marine hinges assembly drawing
- Added the updated fabricated waterbox cover drawing
- Added the domed waterbox cover drawing
- Added domed waterbox fingerplate graphics
- Added a graphics of spacers between the fingerplate and waterbox cover
- Added fabricated waterbox cover with spacers graphics.

Table of Contents

Pre-Installation

Important: *Before installing the hinge:*

- ***For NON-MARINE waterboxes:***
  - *Confirm that the condenser size is 032, 050, or 080 (all available starting in 1990) and 2-pass 150 psi only. If the condenser size is NOT 032, 050, or 080, and 2-pass 150 psi, the hinge cannot be installed.*
  - *Confirm that the non-marine waterbox cover type is one of the two types shown in Figure 5, p. 7. If the non-marine waterbox cover type is NOT shown in Figure 5, p. 7, the hinge cannot be installed.*
  - *Inspect parts for damage or missing parts using the list of parts shown in Figure 1, p. 6 for appropriate hinge size.*
- ***For MARINE waterboxes:***
  - *Confirm that the condenser size is 032, 050 (both available starting in 1990), or 080 (available starting in 2005), and 2-pass 150 psi only. If the condenser size is NOT 032, 050, or 080 and 2-pass 150 psi only, the hinge cannot be installed.*
  - *Confirm that the marine waterbox cover type is the type shown in Figure 60, p. 27. If the marine waterbox cover type is NOT shown in Figure 60, p. 27, the hinge cannot be installed.*
  - *Inspect parts for damage or missing parts using the list of parts shown in Figure 58, p. 26 for appropriate hinge size.*

Read all instructions before beginning the installation process.

NOTICE

Torque Specifications!

Failure to follow torque specifications provided in these instructions could result in equipment damage. Do NOT under-tighten or over-tighten bolts.

Tools provided

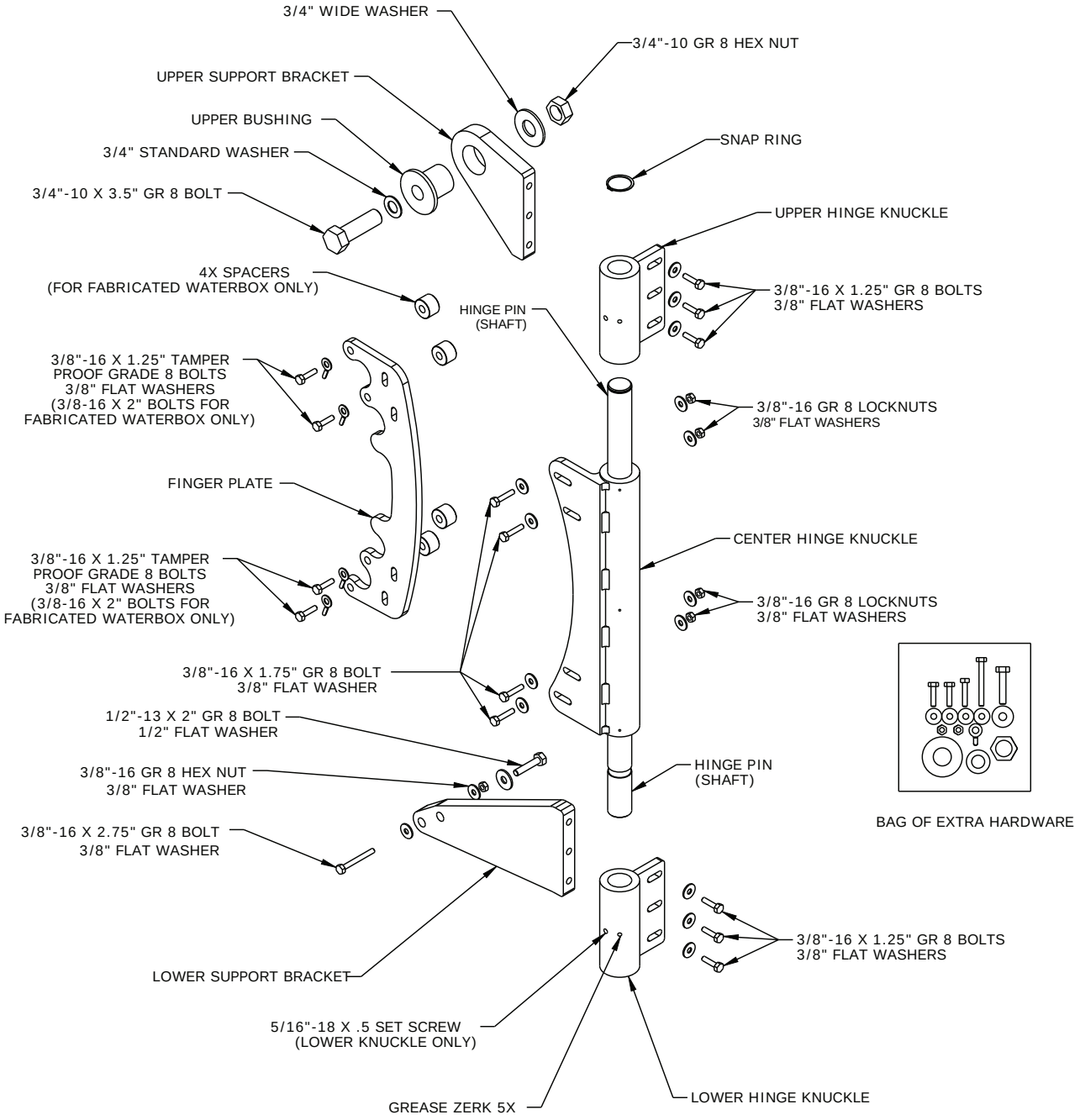
- 3/8-16 UNC tap
- 3/16-inch drill bit
- 5/16-inch drill bit
- 7/16-inch drill bit (non-marine waterbox installation only)
- Drill guides

Tools NOT supplied

- 1/2-13 UNC tap
- Small step ladder (as needed)
- 1/2-inch corded drill
- Adjustable wrench
- Socket wrench and sockets
- 9/16-inch combination wrench
- 5/32-inch Allen-head wrench
- T-handle tap wrench
- 1-1/16-inch deep socket
- Grinder
- Magnetic drill press (optional)
- Magnet (to remove metal shavings)
- Two C-clamps, 6-inch or larger
- Torque wrench(es) capable of 40–170 ft·lb
- Level
- Feeler gauge
- Compressed air for blowing out metal chips
- Tape measure
- Small non-marring hammer
- Flat-head screw driver
- Grease gun
- Multi-purpose grease such as LUB00069
- Multi-purpose cutting/lubricating oil
- 1/2-inch rotary wire brush
- Marker

Installation—Non-Marine Hinges

Figure 1. Non-marine hinge kit contents



Note: *See Figure 4 through Figure 6 for visual examples of each waterbox configuration.*

Table 1. Torque specifications for non-marine hinges

Bolt Size	Torque Value (ft·lb)
3/4-10	170
1/2-13	98
3/8-16	40

Figure 2.

Figure 3.

Important: *Before installing the non-marine hinge:*

- *Confirm that the condenser size is 032, 050, or 080 (all available starting in 1990) and 2-pass 150 psi only. If the condenser size is NOT 032, 050, or 080, and 2-pass 150 psi, the hinge cannot be installed.*
- *Confirm that the non-marine waterbox cover type is one of the two types shown in Figure 5, p. 7. If the non-marine waterbox cover type is NOT shown in Figure 5, p. 7, the hinge cannot be installed.*
- *Inspect parts for damage or missing parts using the list of parts shown in Figure 1, p. 6 for appropriate hinge size.*

Figure 4. Cast waterboxes

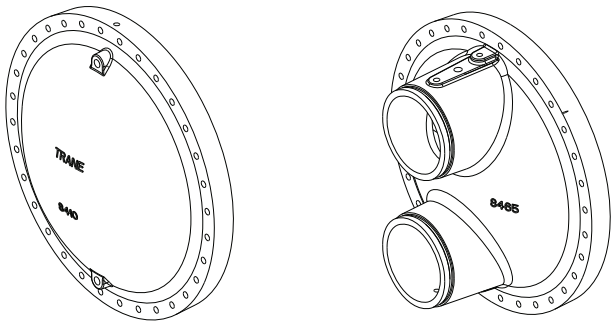


Figure 5. Fabricated waterboxes

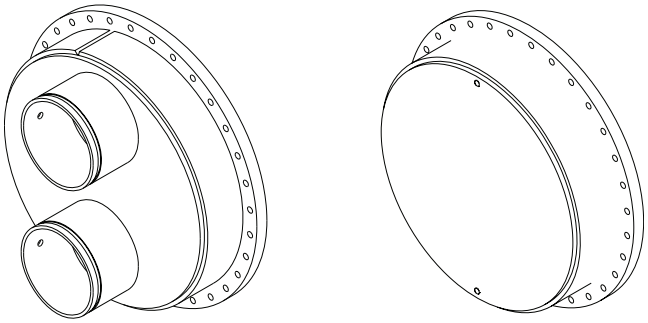
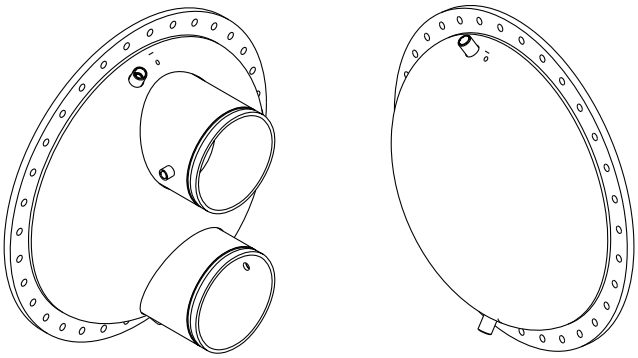


Figure 6. Domed waterboxes



⚠WARNING

Do Not Reuse Hinge!

Failure to leave the hinge permanently installed could weaken the bolts as well as the hinge and waterbox threads and cause the waterbox cover to fall off when opened, which could cause serious injury or death. The hinge was not designed for re-use. Once the hinge is installed and the bolts tightened to final torque specifications, the hinge MUST be left in place.

⚠WARNING

Heavy Waterbox Cover!

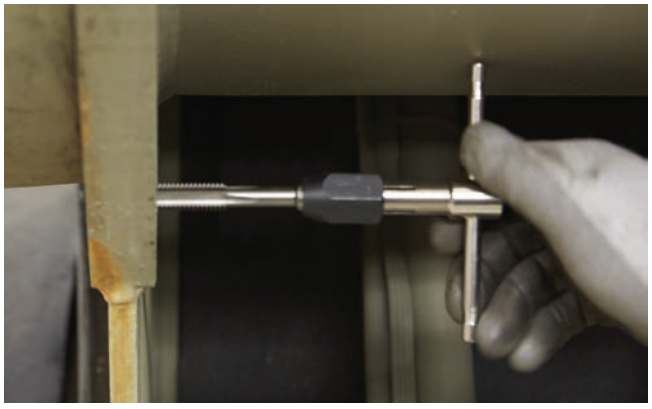
Failure to follow hinge installation instructions could cause the waterbox cover to slide off the hinge, which could result in death or serious injury. The pre-assembled hinge may not be correctly oriented for installation on the selected side of the waterbox. Disassemble the hinge as instructed to ensure correct orientation of the hinge. The hinge MUST be oriented so that the snap ring is installed at the top of the hinge to hold it in place.

1. Determine which end of the chiller will have the hinge installed.
2. Determine the direction the waterbox cover will open when the chiller tubes are serviced.
3. Install the upper support bracket using the support bushing and 3/4-10 bolt, and nut, and lock washer. Use a level as a starting reference to keep the support face oriented vertically.

Figure 7.

4. Using a 1/2-inch rotary wire brush or 1/2-13 UNC tap, clean any paint or debris from the 1/2-13 inch threads located on the tube sheet to prepare for the bottom support bracket installation.

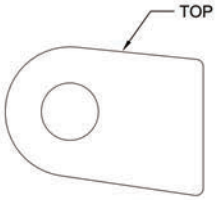
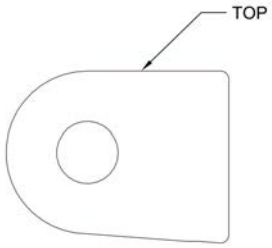
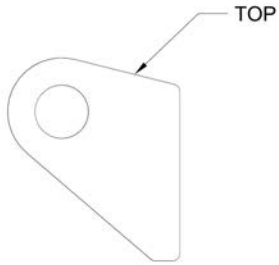
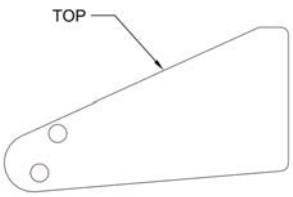
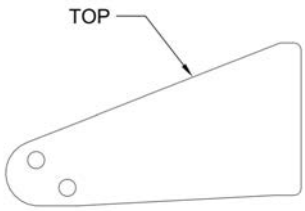
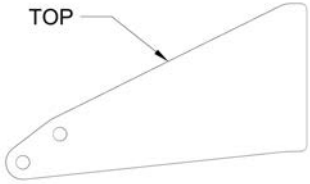
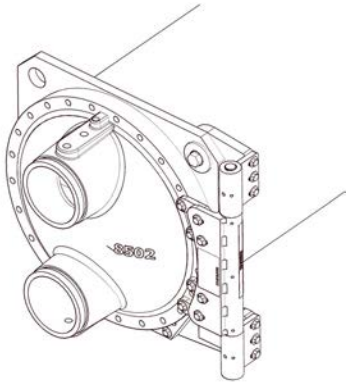
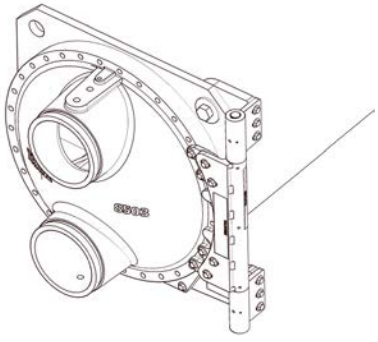
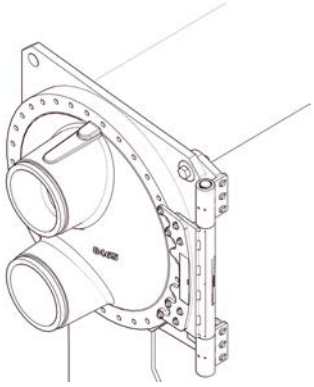
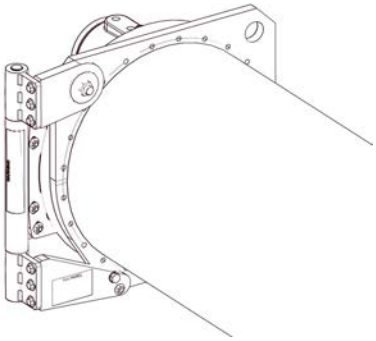
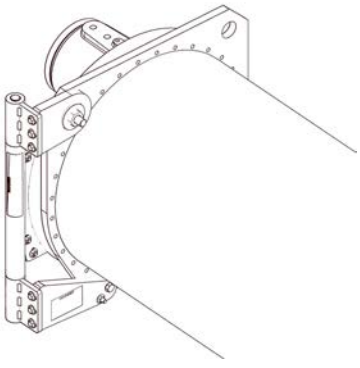
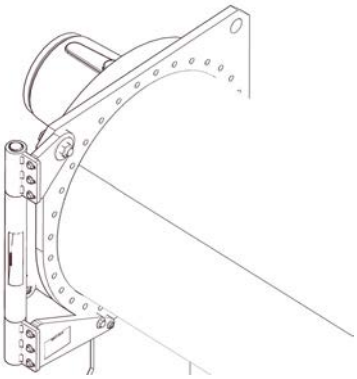
Figure 8.



5. *If the chiller has the 1/2-13 threaded hole in the tube sheet*, proceed to Step 6, p. 10.

   If the chiller does NOT have the 1/2-13 threaded hole in the tube sheet, skip to Step 7, p. 10.

Table 2. Non-marine brackets

	032	050	080
Upper Bracket			
Lower Bracket			
Orientation			
			

6. Install the lower support bracket with the supplied 1/2-13 bolt and washer and finger-tighten. Use a level as a starting reference to keep the support face oriented vertically.

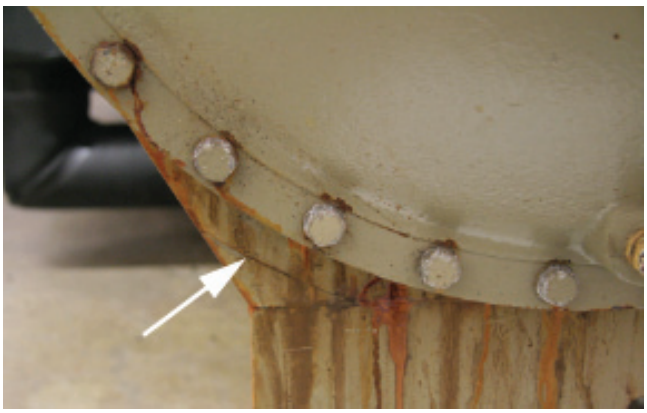
Important: ***This bracket needs to remain adjustable during assembly; do NOT tighten to final torque value.***

Figure 9.

7. *If the chiller has the 1/2-13 threaded hole in the tube sheet*, proceed to Step 14, p. 15.

   If the chiller does NOT have the 1/2-13 threaded hole in the tube sheet as shown in Figure 10, follow this modified procedure for installing the lower mounting bracket:

Figure 10.



   a. Measure the distance from the center of the waterbox cover to the edge of the cover.

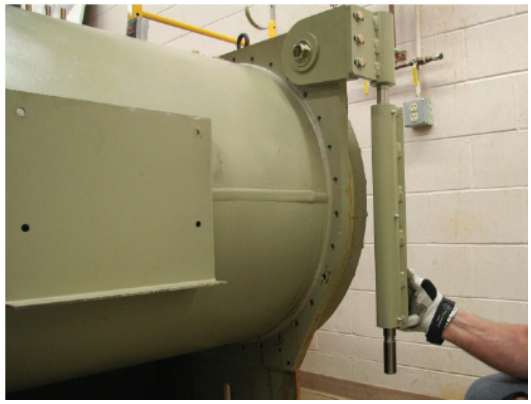
Figure 11.

   b. Mark the distance on the back side of the tube sheet to make sure the new hole will not hit the waterbox cover.

Figure 12.

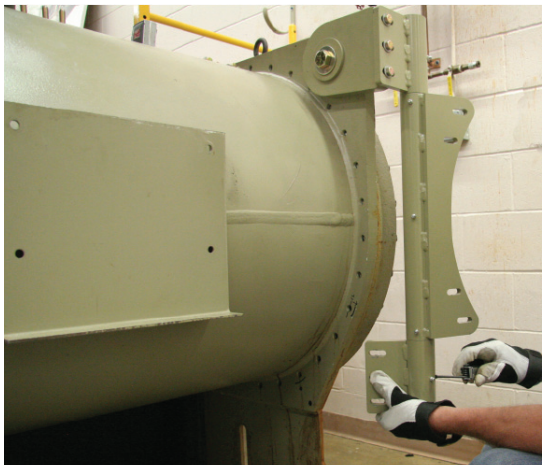
   c. After verifying that the snap ring is seated properly in Step 9, p. 13, install the shaft through the upper knuckle as in Step 11, p. 13.
   d. Install the center knuckle from the bottom of the shaft.

Figure 13.



e. While holding the center knuckle in place, install the lower knuckle and then tighten the 5/16 set screw to lock the lower knuckle in place.

Figure 14.



f. Attach the lower mounting bracket to the lower knuckle.

Figure 15.

g. Position the lower mounting bracket so that the two holes clear the waterbox cover and mark the holes to verify that they are outside of the waterbox cover.

Figure 16.

h. Before drilling, swing the lower mounting bracket away from the tube sheet and verify that the holes clear the waterbox cover and that they are not too close to an edge.

i. Use a C-clamp to secure the lower bracket to the tube sheet.

Figure 17.

j. Insert the drill guide for the 3/16-inch pilot hole and drill through the tube sheet.

Figure 18.

k. Insert the drill guide for the 7/16-inch pilot hole and drill through the tube sheet.

l. Use both of the 3/8-16 X 2.75-inch bolts and nuts provided to secure the lower bracket to the tube sheet; torque to 40 ft·lb.

8. Install the upper and lower knuckles and finger-tighten.

Important: ***These knuckles need to remain adjustable during assembly; do NOT tighten to final torque value.***

Figure 19.

9. Verify that the snap ring is completely set into the snap ring groove on the shaft.

Important: *The snap ring holds the shaft in place and keeps it from sliding through the hinge assembly. Visually inspect the shaft groove and snap ring while rotating the shaft 360° to verify that the snap ring has seated properly in the groove over the entire shaft circumference.*

Figure 20.

10. Verify that the center knuckle fits between the upper and lower knuckles; adjust as necessary to ensure fit.

Figure 21.

11. Ensuring that the snap ring is on the top, install the shaft through the upper knuckle. Adjust the upper and lower support brackets and knuckles so that the shaft easily slides through both knuckles. Tighten and loosen bolts as necessary until the shaft slides freely, or tap lightly with a hammer. Tighten bolts enough to hold the assembly in position.

Note: *Do NOT tighten to final torque value.*

Figure 22.

12. Hold the center knuckle in one hand and then slide the shaft through the upper, center, and lower knuckles, in that order. After the shaft is in place, make any adjustments necessary to ensure that the center knuckle rotates easily and does not bind. Tighten the bolts in the assembly.

    Note: *Do NOT tighten to final torque value.*

Figure 23.

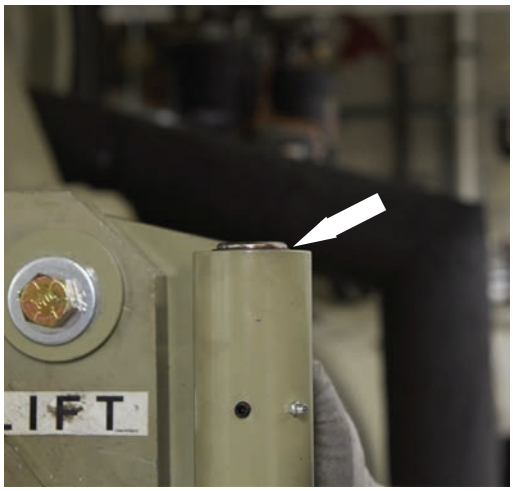
⚠WARNING

Proper Snap Ring Location!

Failure to follow hinge installation instructions could cause the waterbox cover to slide off the hinge, which could result in death or serious injury. The snap ring MUST be installed at the top of the hinge and seated properly in the shaft groove. The snap ring holds the shaft in place and MUST be located at the top of the upper knuckle.

13. Inspect the snap ring at the top of the shaft and verify that it is properly seated.

Figure 24.



14. Bolt finger plate to the center knuckle plate. Finger-tighten only.

    Note: *The finger plate needs to remain adjustable during assembly; do NOT tighten to final torque value.*

Figure 25.

Figure 26.

Note: *For domed waterbox covers Figure 6, p. 7, install the finger plate behind the center knuckle plate as shown in previous figure.*

15. *If the chiller does NOT have a machined waterbox face*, proceed to Step 16, p. 17.

    If the chiller has a machined waterbox face as shown in Figure 27, follow this modified procedure for mounting the finger plate:

Figure 27.

a. After positioning the finger plate properly, mark the points where the finger plate contacts the lip of the machined surface.

Figure 28.

b. Swing the finger plate away from the waterbox cover and grind a bevel at the marked finger plate contact points.

Figure 29.

c. Verify that the finger plate rests flush against the waterbox cover. Grind as needed until the finger plate rests flush on the waterbox cover.

16. Align the finger plate so that it is flush with the waterbox cover.

Figure 30.

17. For fabricated waterbox Figure 5, p. 7, use the provided spacers between the finger plate and waterbox cover and follow the instructions for drilling and tapping in the steps below.

Figure 31.

18. Align the finger plate to the waterbox cover so that the holes are evenly spaced between the cover plate bolts when the finger plate is vertically plumb. Use a socket to verify that there is enough clearance to access all of the bolts on the waterbox cover. Tap the finger plate as needed to place it in the correct position.

    Note: *The holes of the finger plate should align with the center-to-center hole pattern of the waterbox cover.*

Figure 32.

19. After verifying that the finger plate is located on the waterbox cover correctly and all waterbox cover bolts are accessible, adjust the center knuckle of the hinge so that there is a gap of approximately 0.010 inch between the center knuckle and upper knuckle. Both the upper and lower support brackets may need to be adjusted to create the 0.010 inch gap. Before tightening the upper and lower support bracket bolts, ensure that the center knuckle of the hinge rotates freely. Then tighten the upper support bracket bolt and locking nut (3/4-10 bolt) to a torque value of 170 ft·lb.

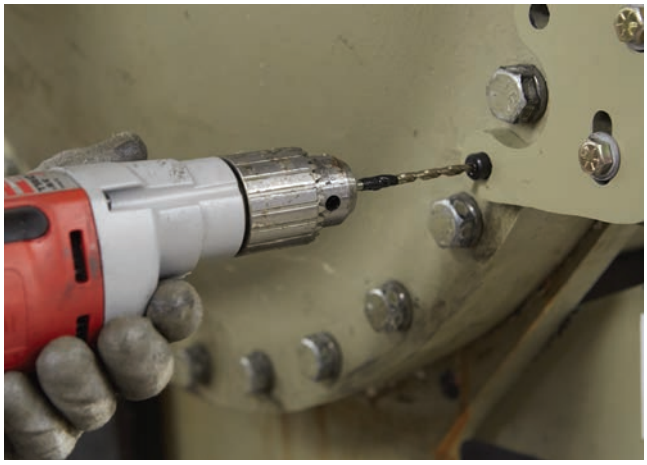
Figure 33.

20. Insert the 3/16 pilot hole drill guide into the bottom finger plate hole. Set the drill depth for 1-1/4 inch deeper than the length of drill guide to drill the required 1-1/4 inch total hole depth into the waterbox cover. Drill the 3/16 inch hole using oil lubrication. Repeat for the remaining three holes on the finger plate.

Important: ***Periodically remove the drill shavings during the drilling process.***

Figure 34.

Figure 34.



21. Insert the 5/16 pilot hole drill guide into the bottom finger plate hole. Set the drill depth for 1-1/4 inch deeper than the length of drill guide to drill the required 1-1/4 inch total hole depth into the waterbox cover. Drill the 5/16 inch hole using oil lubrication. Periodically remove the drill shavings during the drilling process. Repeat for the remaining three holes on the finger plate.

Important: Periodically remove the drill shavings during the drilling process.

Figure 35.

22. Remove shavings with a magnet; remove any remaining shavings with compressed air.

Figure 36.

23. Verify that drilled holes are 1-1/4 in. deep.

Figure 37.

24. After lubricating the 3/8-16 tap, tap all four of the 5/16 inch holes on the finger plate to a depth of 1-1/4 inch (refer to "Guidelines For Properly Tapping Metal Threads," p. 20).

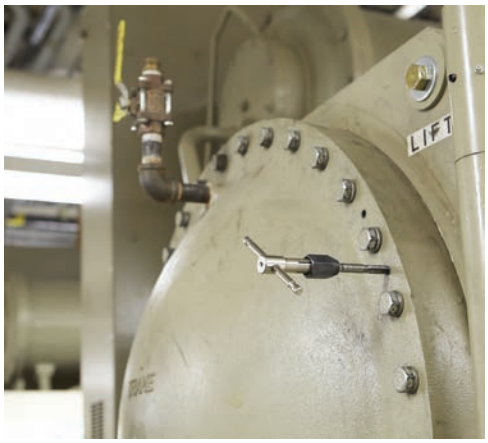
Important: *Perform the tapping procedure slowly and carefully to ensure that the holes are tapped properly and the tap does not break.*

Figure 38.

Guidelines For Properly Tapping Metal Threads

a. Use only a fluted thread tap for 3/8-16 threads.
b. Verify the hole depth of 1-1/4 inch before starting the tapping procedure.
c. Use a lubricant that is designed for tapping metal threads and lubricate the tap.
d. Use a T-handle for tapping the hole.
e. Insert the tap and verify that it is started straight and remains straight while rotating the T-handle clockwise.

Figure 39.



f. Turn the tap carefully and note how the tap feels as it cuts threads. After turning the tap 1/2 revolution clockwise, back off the tap in a counter-clockwise direction to clear away chips and metal shavings.

Important: *Clearing the tap of chips and shavings is critical; the tap will bind and could break if it is not cleared.*

Figure 40.

g. Once the tap reaches the bottom of the hole, stop and clean out the chips and metal shavings. Do NOT force the tap.

h. After cleaning the hole, insert a bolt and measure the depth. Verify that the bolt goes at least 3/4 inch into the hole.

Figure 41.

25. Verify that all four bolts can be installed to fasten the finger plate to the waterbox cover and that the holes have been tapped deep enough to fully engage the bolt without bottoming out. If any of the bolts bottom out and do not fully engage the threaded holes, drill the 5/16 hole deeper and repeat the tapping procedure for that hole to complete the threads.

Figure 42.

26. After verifying that all bolts can be threaded onto the waterbox cover, add the four tabbed washers and torque to 40 ft·lb.

Figure 43.

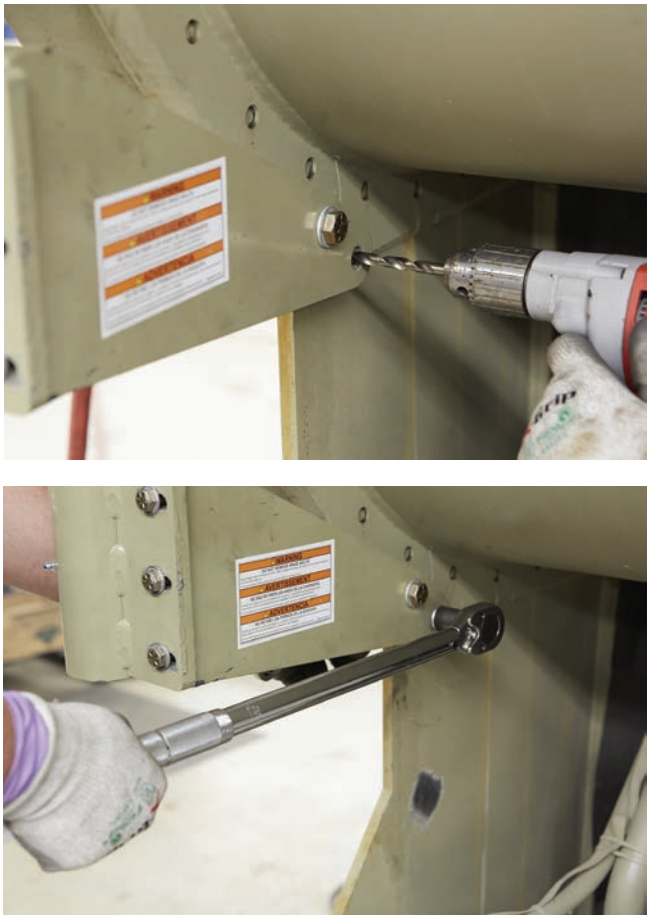
27. With a screw driver and hammer, bend over the washer tabs so that the tabs completely cover the bolts.

Figure 44.

Figure 45. Fabricated waterbox cover with spacers

28. Insert the 3/16 inch drill guide into the bottom mounting bracket hole next to the 1/2-13 inch bolt. Drill completely through the tubesheet. Remove the 3/16 inch drill guide. Use the 7/16 inch drill guide and the 7/16 inch drill bit to complete the hole through the tubesheet. Install the 3/8-16 X 3 bolt and nut through the bracket and tubesheet and tighten to 40 ft·lb.

Figure 46.

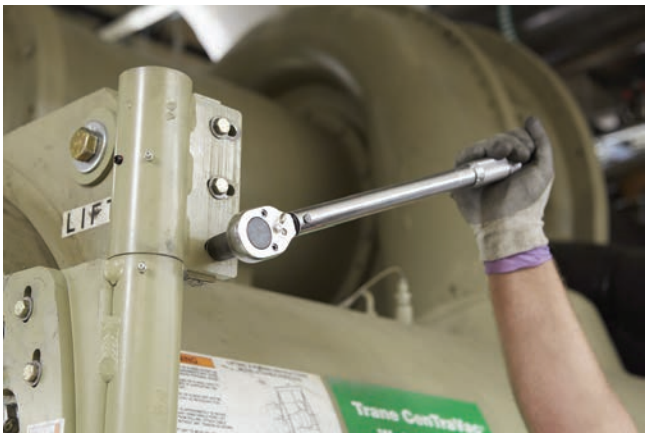


29. Tighten the 1/2-13 X 2 bolt on the bottom support bracket to 98 ft·lb.

Figure 47.

30. Tighten upper knuckle bolts to 40 ft·lb.

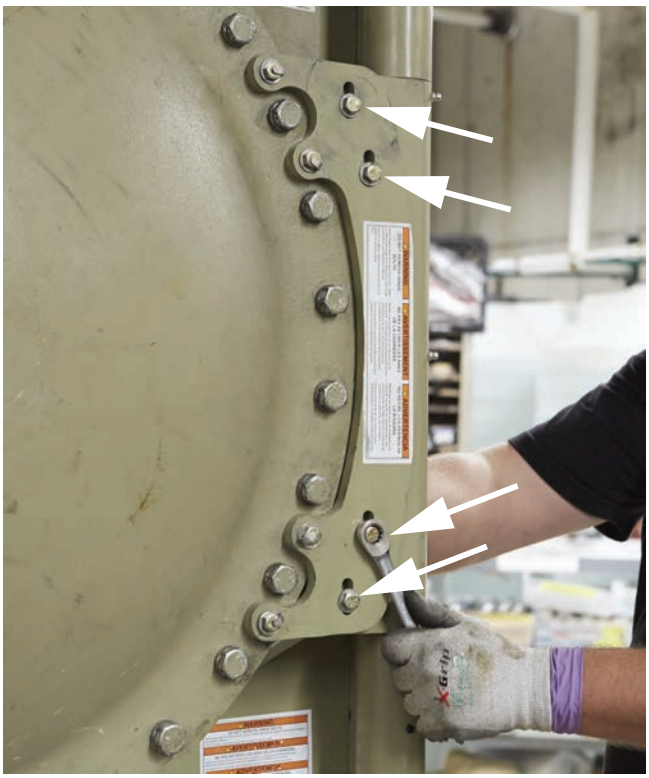
Figure 48.



Shimming Procedure (Non-Marine Design)

a. Leave centerline bolts between the finger plate and center knuckle loose so that the finger plate and center knuckle connection points are free to move in their respective slots.

Figure 49.



b. Loosen the bolts on the bottom knuckle and insert the supplied shim between the lower knuckle and lower support bracket. Torque the bolts to 35 ft·lb.

Figure 50.

c. Tighten the centerline bolts/nuts to 40 ft·lb.

Figure 51.

d. Loosen the bolts in the bottom knuckle and remove the shim, saving it for use with the upper knuckle in Step e. Apply a torque of 40 ft·lb to the bolts.

Figure 52.

e. *For 050 and 032 size waterbox covers:* Skip to Step 31, p. 25.

For 080 size cast and fabricated waterbox cover only: Loosen the bolts on the top knuckle and insert the shim used in Step b between the top knuckle and upper support bracket.

Figure 53.

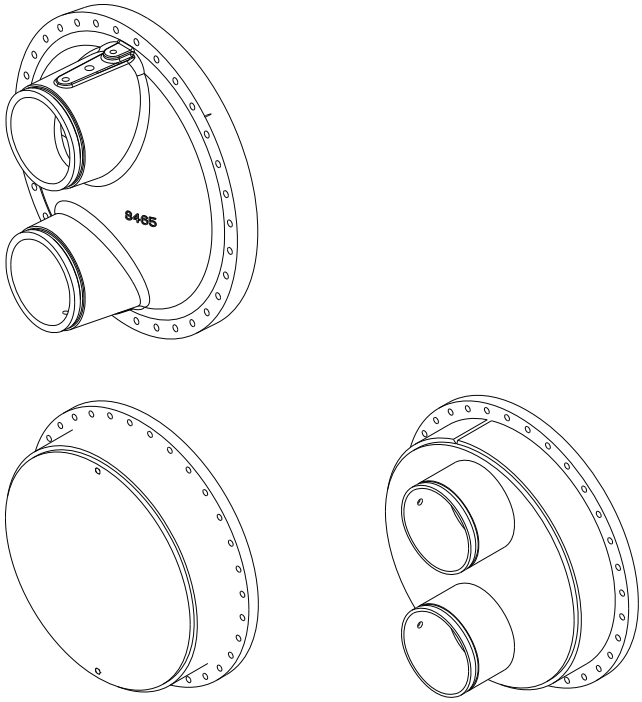


Figure 54.

f. Apply a torque of 40 ft·lb to the bolts and leave shims in place permanently.

Figure 55.

31. Insert the 5/16 thread locking set screw into the top and bottom knuckles and tighten.

Important: *This is a critical safety step to ensure that the bottom portion of the hinge and hinge pin are held securely in place, and that the shaft is held securely in place.*

Figure 56.

32. Before opening waterbox, install all five grease zerks on the hinge and then apply grease to all zerks.

Figure 57.

33. Wipe off excess grease.

Installation—Marine Hinges

Figure 58. Marine hinge kit contents

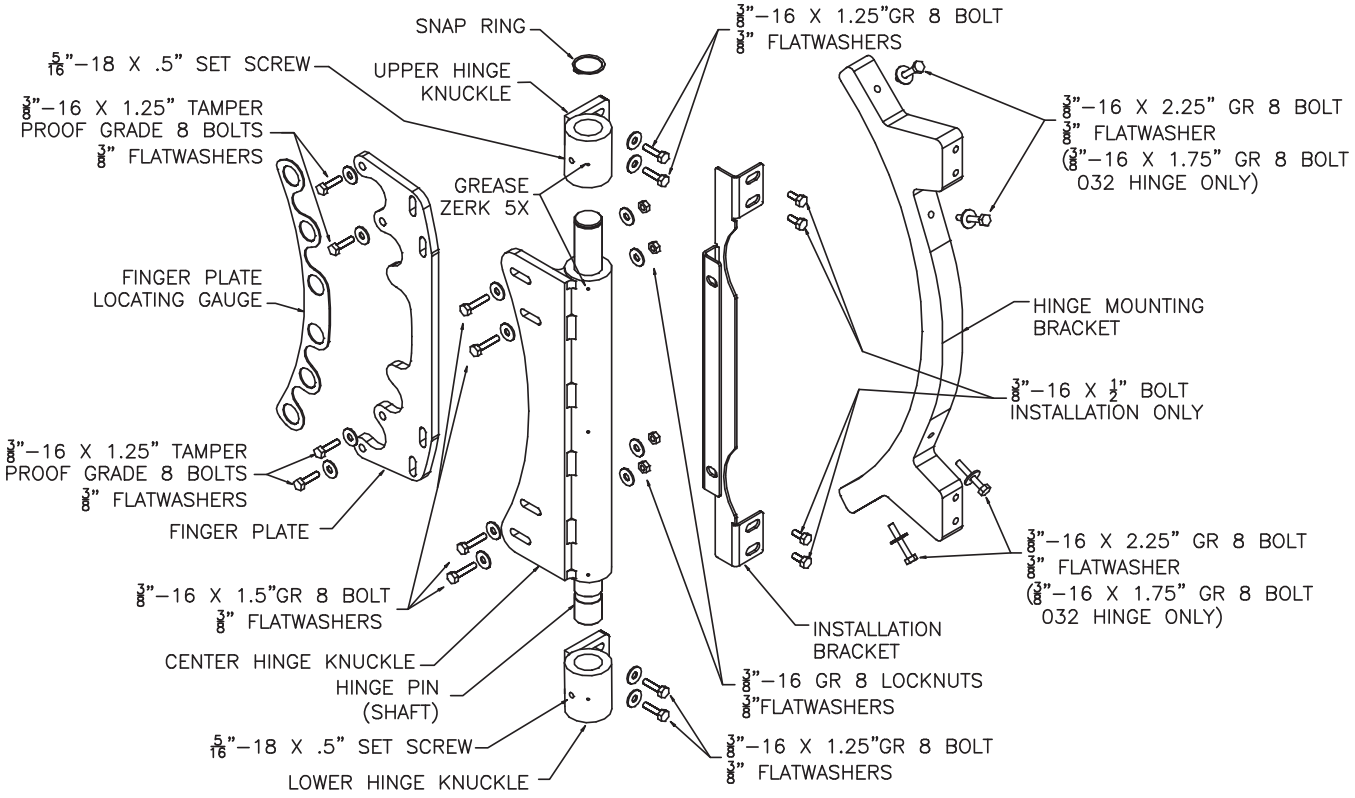


Table 3. Torque specifications for marine hinges

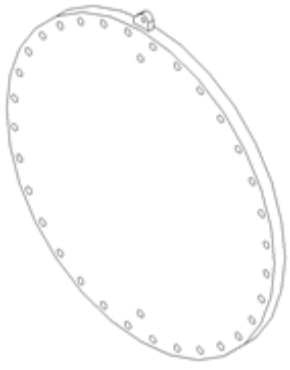
Bolt Size	Torque Value (ft·lb)
3/8-16	40

Figure 59.

Important: *Before installing the marine hinge:*

- *Confirm that the condenser size is 032, 050 (both available starting in 1990), or 080 (available starting in 2005), and 2-pass 150 psi only. If the condenser size is NOT 032, 050, or 080 and 2-pass 150 psi only, the hinge cannot be installed.*
- *Confirm that the marine waterbox cover type is the type shown in Figure 60, p. 27. If the marine waterbox cover type is NOT shown in Figure 60, p. 27, the hinge cannot be installed.*
- *Inspect parts for damage or missing parts using the list of parts shown in Figure 58, p. 26 for appropriate hinge size.*

Figure 60.



⚠WARNING

Do Not Reuse Hinge!

Failure to leave the hinge permanently installed could weaken the bolts as well as the hinge and waterbox threads and cause the waterbox cover to fall off when opened, which could cause serious injury or death. The hinge was not designed for re-use. Once the hinge is installed and the bolts tightened to final torque specifications, the hinge MUST be left in place.

⚠WARNING

Heavy Waterbox Cover!

Failure to follow hinge installation instructions could cause the waterbox cover to slide off the hinge, which could result in death or serious injury. The pre-assembled hinge may not be correctly oriented for installation on the selected side of the waterbox. Disassemble the hinge as instructed to ensure correct orientation of the hinge. The hinge MUST be oriented so that the snap ring is installed at the top of the hinge to hold it in place.

1. Determine which end of the chiller will have the hinge installed.
2. Determine the direction the waterbox cover will open when the chiller tubes are serviced.
3. Use a 6 inch C-clamp to hold the finger plate in place against the marine waterbox cover. Position the finger plate guide over the waterbox cover bolts and move the finger plate to match the contour of the finger plate guide. Tighten C-clamps securely so the finger plate does not move.

Important: *If the finger plate is not placed properly, the entire hinge will be incorrectly installed.*

Figure 61.

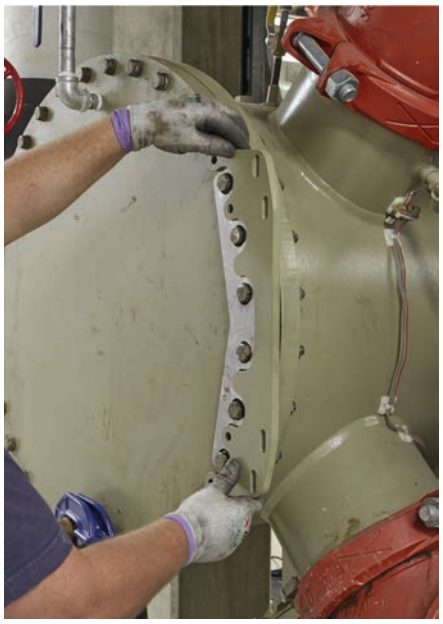
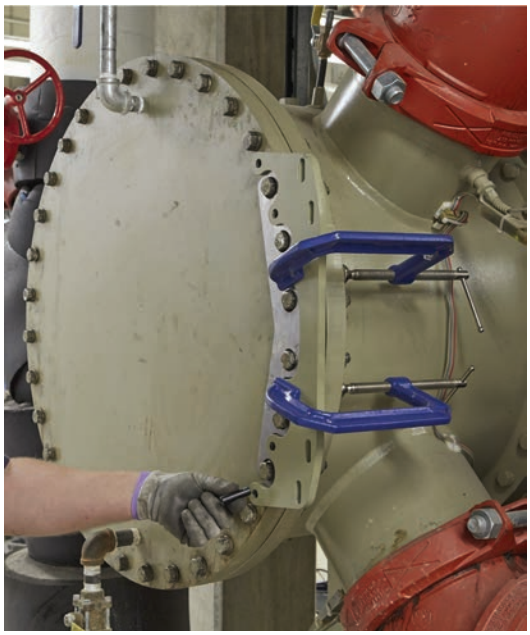


Figure 62.

4. Once the finger plate is properly placed using the finger plate guide and secured in place with C-clamps, insert the 3/16 inch pilot hole drill guide into the finger plate hole.

Figure 63.



5. Set the drill depth to 1-1/4 inch into the cover plate and drill all four 3/16 inch holes, each 1-1/4 inch total hole depth into the cover. Verify that all holes are evenly spaced between the waterbox cover plate bolts.

Important: *During the drilling process, periodically remove the drill guide to clear the holes of chips and debris. This will prevent the drill guide from being pushed out and affecting the final drill depth.*

Figure 64.

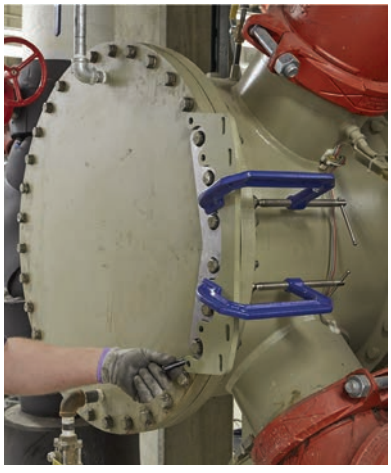
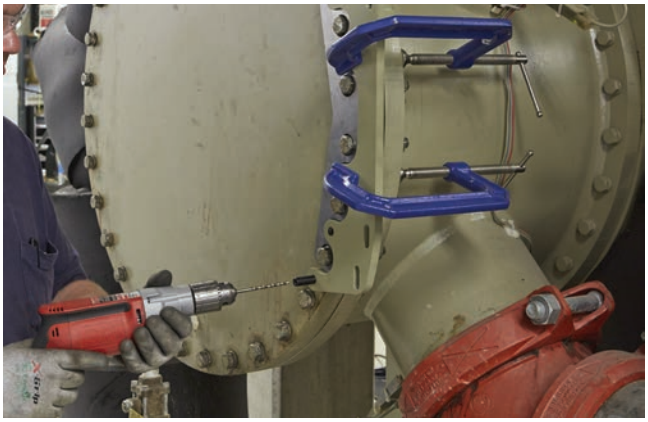
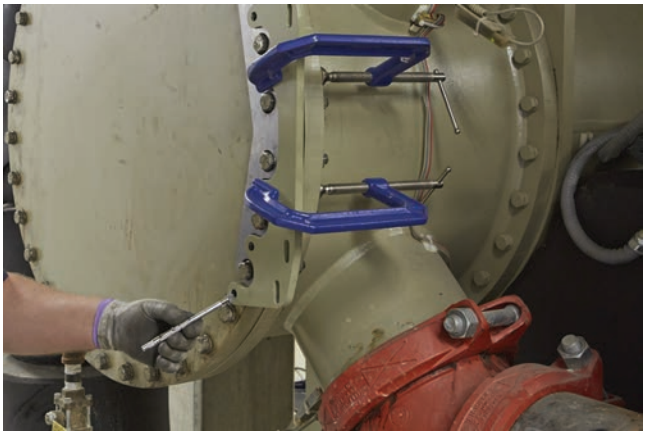


Figure 64. (continued)

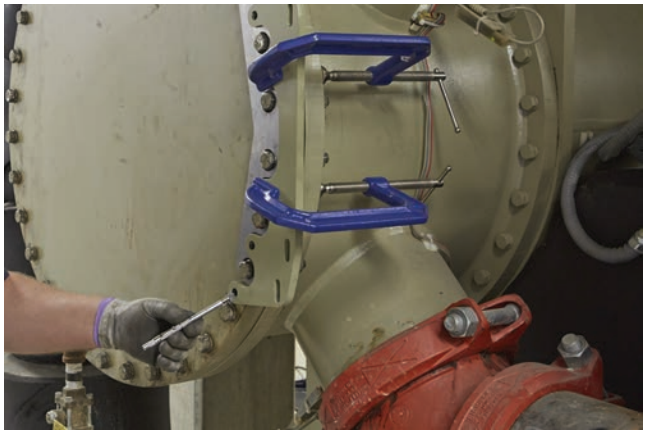




6. Insert the 5/16 inch pilot hole drill guide into the finger plate hole.

Figure 65.

Figure 65. (continued)

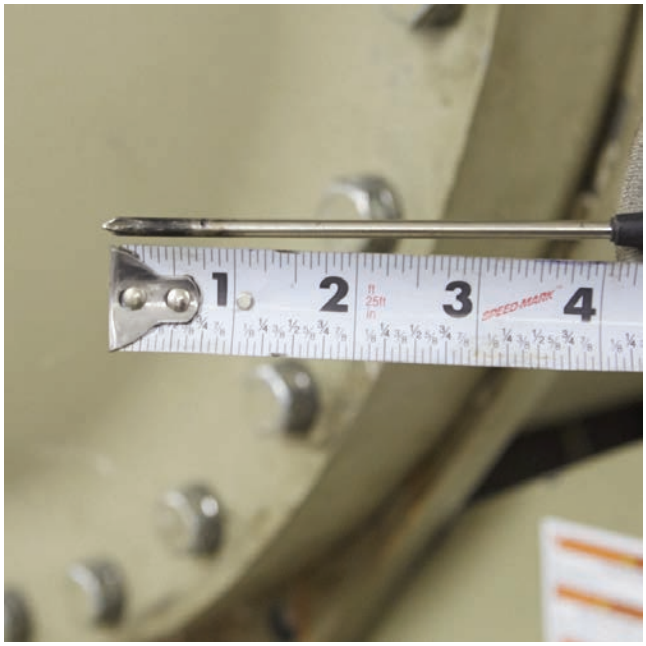


7. Set the drill depth to 1-1/4 inch into the cover plate and drill all four 5/16 inch holes, each 1-1/4 inch total hole depth into the cover. Verify that all holes are evenly spaced between the waterbox cover plate bolts.

Figure 66.

8. Measure each hole depth to verify that all four holes are drilled to 1-1/4 inch deep. If the holes are not 1-1/4 inch deep, check the drill depth setting and drill the holes to 1-1/4 inch deep. Once the holes are all 1-1/4 inch deep, hold the finger plate so that it does not fall and remove the C-clamps.

Figure 67.



9. After lubricating the 3/8-16 tap, tap all four holes on the cover plate with a 3/8-16 to the bottom of each hole (refer to "Guidelines For Properly Tapping Metal Threads," p. 32).

Important: *Perform the tapping procedure slowly and carefully to ensure that the holes are tapped properly and the tap does not break.*

Figure 68.

Guidelines For Properly Tapping Metal Threads

a. Use only a fluted thread tap for 3/8-16 threads.
b. Verify the hole depth of 1-1/4 inch deep before starting the tapping procedure.
c. Use a lubricant that is designed for tapping metal threads and lubricate the tap.
d. Use a T-handle for tapping the hole.
e. Insert the tap and verify that it is started straight and remains straight while rotating the T-handle clockwise.

Figure 69.

f. Turn the tap carefully and note how the tap feels as it cuts threads. After turning the tap 1/2 revolution clockwise, back off the tap in a counter-clockwise direction to clear away chips and metal shavings.

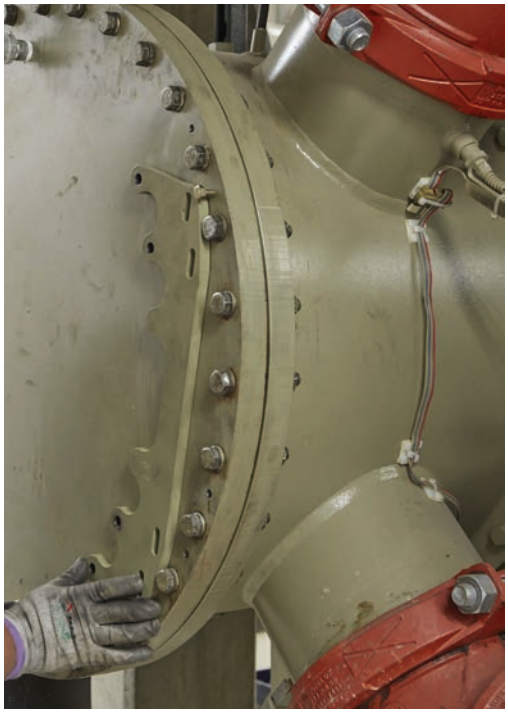
Important: *Clearing the tap of chips and shavings is critical; the tap will bind and could break if it is not cleared.*

Figure 70.

g. Once the tap reaches the bottom of the hole, stop and clean out the chips and metal shavings. Do NOT force the tap.

h. After cleaning the hole, insert a bolt and measure the depth. Verify that the bolt goes at least 3/4 inch into the hole.

Figure 71.



10. Verify that the threads have been tapped deep enough by installing the bolts and holding the finger plate next to each bolt; each of the four bolts should be flush or past flush.

Note: *If the bolts do not engage up to the finger plate, remove the finger plate and tap the threads to the proper depth. Use the finger plate gauge again to locate the correct position.*

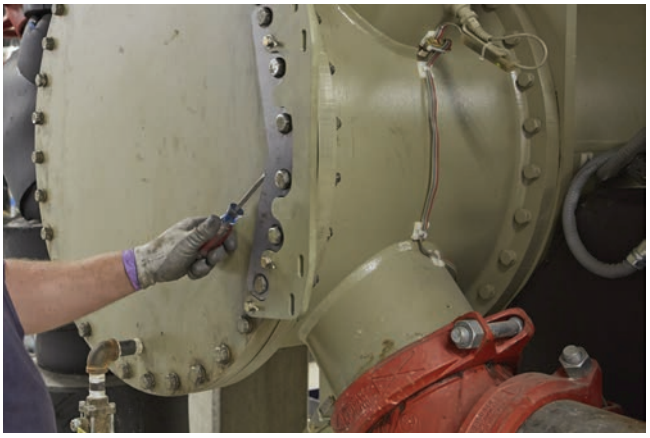
Figure 72.

11. Bolting just tight enough to hold the finger place in place, install the finger plate with washers and bolts.

    Note: *Do NOT tighten to final torque setting.*

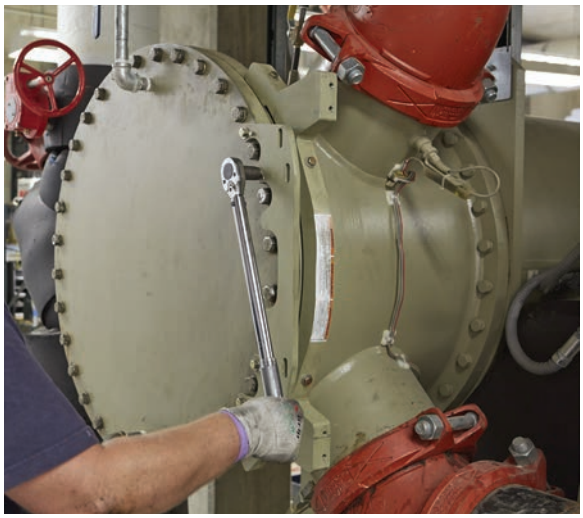
12. After tightening the finger plate bolts, remove the finger plate gauge with a screwdriver.

Figure 73.



13. Tighten finger plate bolts to a torque value of 40 ft·lb.

Figure 74.



14. Bend tabbed washers with a screw driver and then a hammer.

Figure 75.

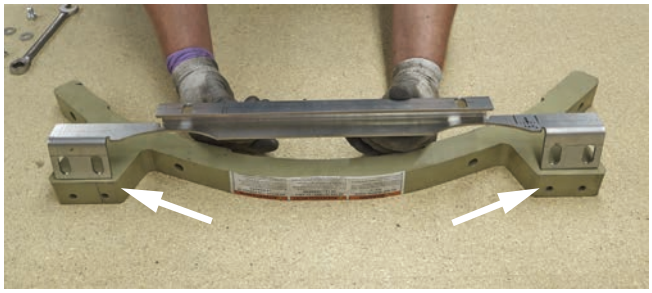
15. Mount the temporary mounting bracket to the flange bracket.

    For 050 and 032 size waterbox covers: The holes on the flange bracket will be symmetrical and will be the same distance front to back.

    For 080 size waterbox cover only: The flange mounting bracket is not symmetrical and mounting orientation is critical. Mount the temporary mounting bracket onto the flange bracket as shown in Figure 76, p. 34.

Figure 76.

CORRECT (note position of drill holes relative to position of temporary mounting bracket plates—*holes should be positioned furthest away from the temporary bracket*)

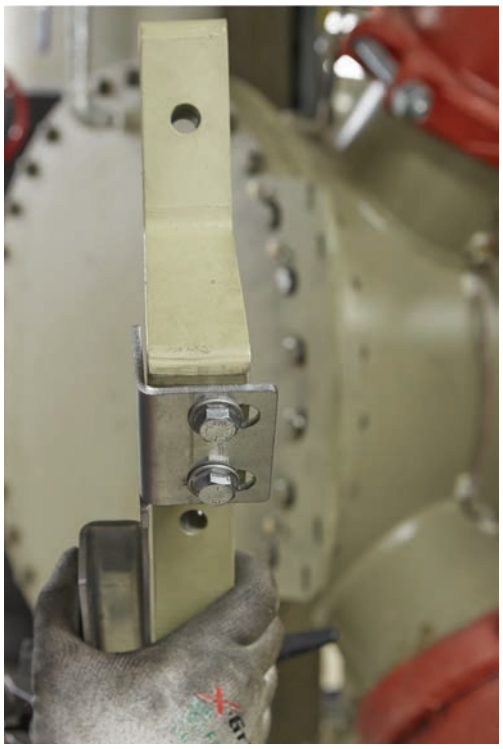


Incorrect (note position of drill holes relative to position of temporary mounting bracket plates—*holes should NOT be positioned closest to the temporary bracket*)

16. Bolt the flange bracket to the temporary mounting bracket using the 1 inch bolts provided.

17. Install the temporary mounting bracket to the finger plate.

Figure 77.

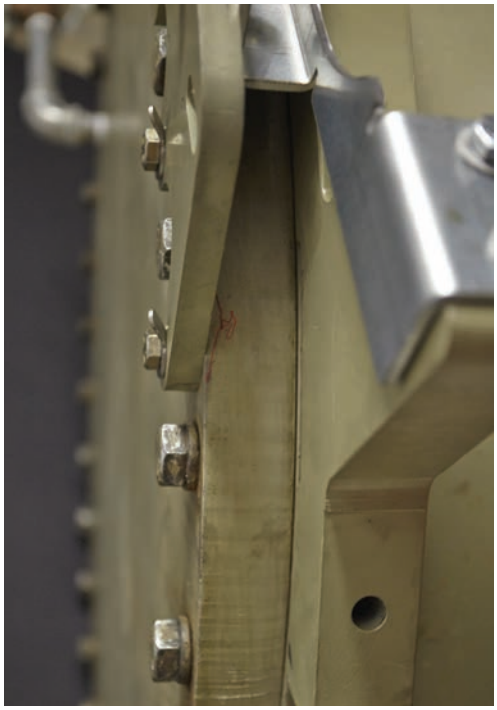


18. Adjust the bolts on the finger plate connection to place the flange bracket against the waterbox. Verify that the flange bracket holes line up between the waterbox cover bolt holes; the flange bracket holes should line up evenly between the waterbox holes.

Figure 78.

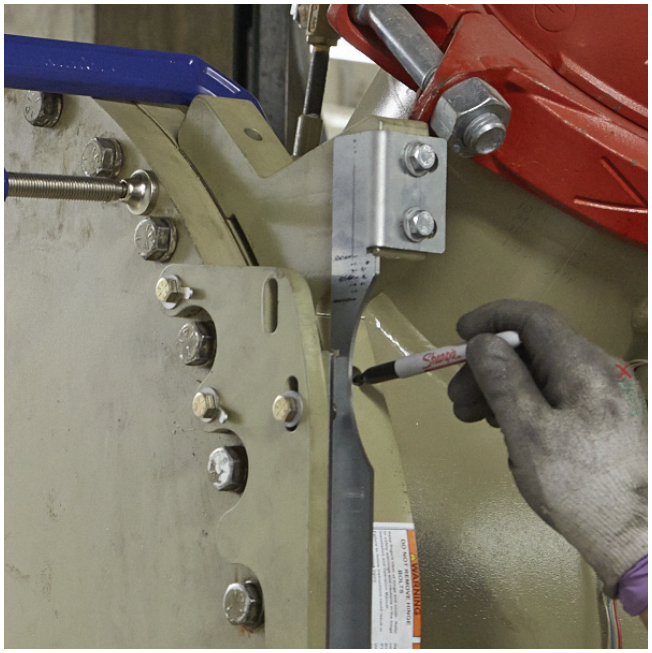
19. Using a clamp as shown in Figure 80, verify that the flange is flush with the waterbox cover seam.

Figure 79.



20. Mark all four hole positions on the waterbox flange through the flange bracket holes so that the locations are visible once the flange bracket is removed.

Figure 80.



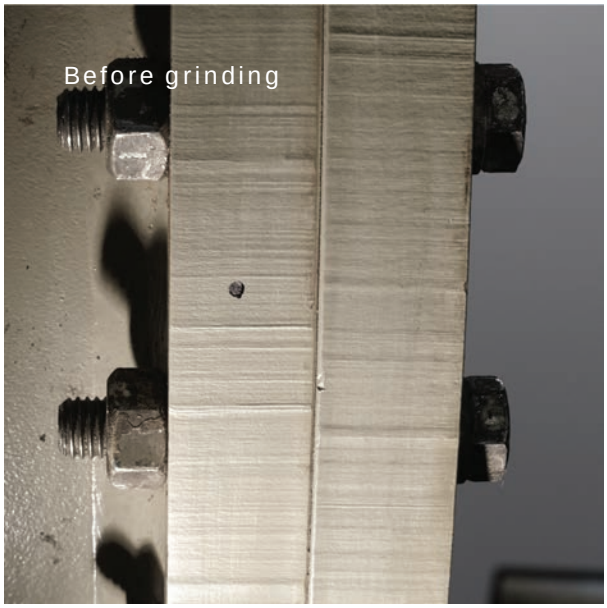
NOTICE

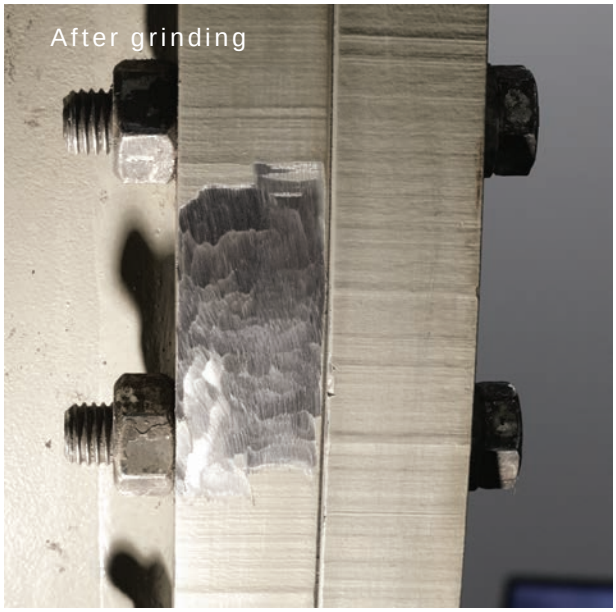
Drill Bit Damage!

Waterbox manufacturing processes result in flame-hardened steel on the surface of the waterbox. This thin layer is extremely hard and will dull and damage drill bits if it is not removed. Step 21 MUST be completed to save drilling time and prevent damage to the drill bits.

21. Use a grinder to remove the hardened surface metal on the waterbox flange at the four marked positions. Grind until the ridges of the flange surface disappear, and the surface is smooth.

Figure 81.





22. Once all four hole position surfaces have been ground to remove the hardened surface material, reassemble the hinge flange to the temporary bracket as described in Step 18 and Step 19, p. 35.

Figure 82.

23. After verifying that the hinge flange bracket is located properly (see Step 18 and Step 19, p. 35), secure the finger plate connection bolts firmly in place to prevent the flange bracket from moving while drilling.

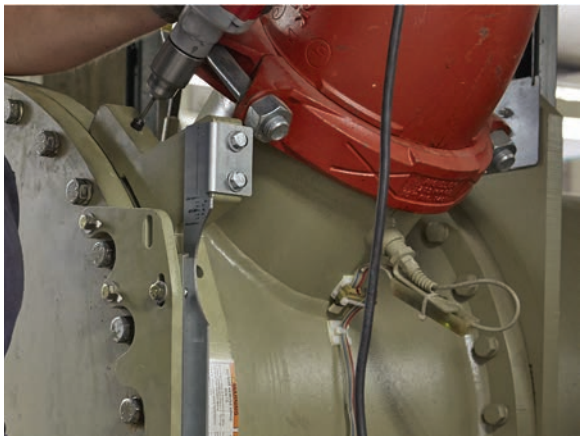
Figure 83.

24. Insert the 3/16 inch pilot hole drill guide into the flange bracket hole and set the drill depth to 1-1/4 inch deep. Set the drill depth to 1-1/4 inch into the waterbox flange and drill all four 3/16 inch holes in the flange, each
1-1/4 inch total hole depth into the flange.

Important: ***Periodically remove the drill shavings during the drilling process.***

Figure 84.

Figure 84. (continued)



25. Insert the 5/16 inch pilot hole drill guide into the flange bracket hole and set the drill depth to 1-1/4 inch deep. Set the drill depth to 1-1/4 inch into the waterbox flange and drill all four 5/16 inch holes in the flange, each
1-1/4 inch total hole depth into the flange.

Important: Periodically remove the drill shavings during the drilling process.

26. Remove shavings with a magnet; remove any remaining shavings with compressed air.
27. Verify that drilled holes are 1-1/4 in. deep.
28. After lubricating the 3/8-16 tap, tap all four of the 5/16 inch holes on the waterbox flange to a depth of 1-1/4 inch using proper tapping procedures and lubrication (refer to "Guidelines For Properly Tapping Metal Threads," p. 20).

Figure 85.

29. Bolt the flange bracket to the waterbox using the bolts provided.

Figure 86.

30. Bolt the flange bracket to the waterbox. Torque to 40 ft·lb.

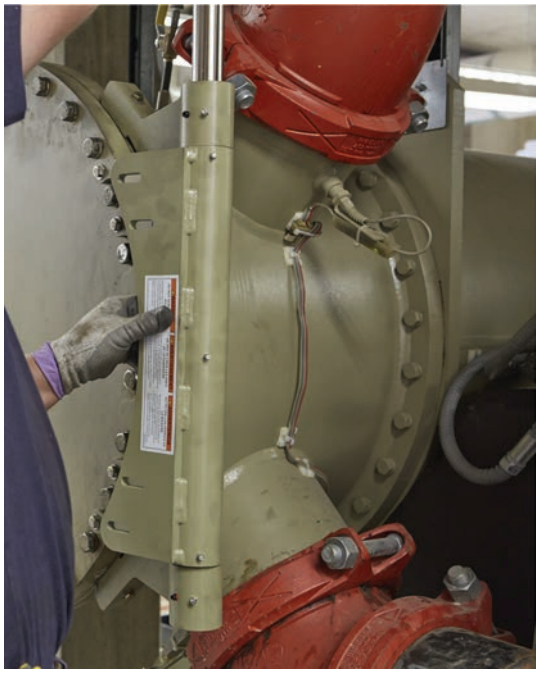
Figure 87.

31. Bolt the upper and lower knuckles to the flange brackets.

Figure 88.

32. Hold the center knuckle in one hand and then slide the shaft through the upper, center, and lower knuckles, in that order. After the shaft is in place, make any adjustments necessary to ensure that the center knuckle rotates easily and does not bind.

Figure 89.



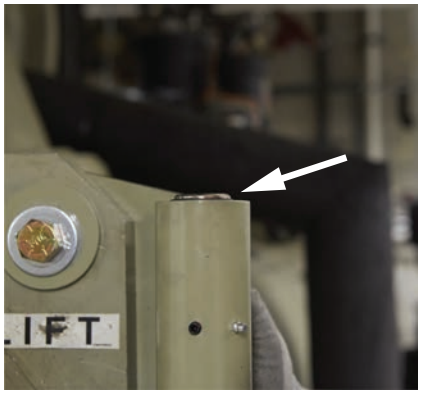
⚠WARNING

Proper Snap Ring Location!

Failure to follow hinge installation instructions could cause the waterbox cover to slide off the hinge, which could result in death or serious injury. The snap ring MUST be installed at the top of the hinge and seated properly in the shaft groove. The snap ring holds the shaft in place and MUST be located at the top of the upper knuckle.

33. Inspect the snap ring at the top of the shaft and verify that it is properly seated.

Figure 90.



34. Tighten the upper and lower knuckle bolts to 40 ft·lb.

Figure 91.

35. Install the four centerline bolts and nuts on the center knuckle/finger plate and tighten to 40 ft·lb.

Figure 92.

36. Insert the 5/16 thread locking set screw into the bottom knuckle and tighten.

Important: ***This is a critical safety step to ensure that the bottom portion of the hinge and hinge pin are held securely in place.***

Figure 93.

37. Before opening waterbox, install all five grease zerks on the hinge and then apply grease to all zerks.

Figure 94.

38. Wipe off excess grease.

Figure 95.

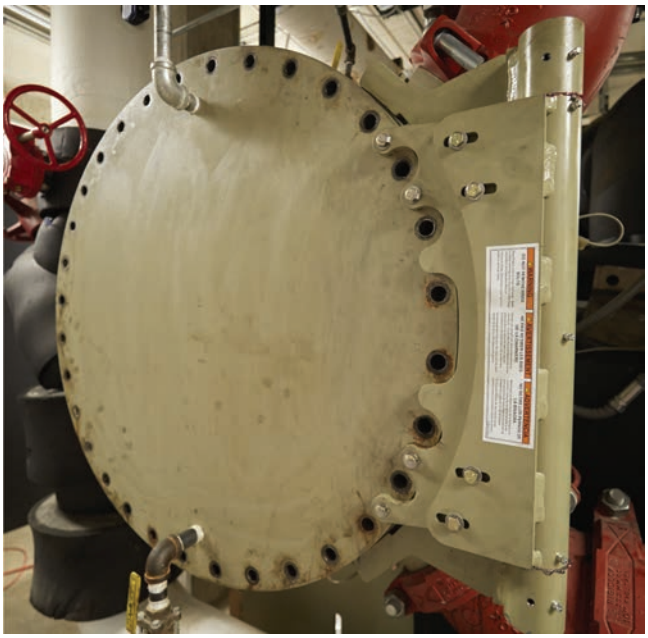
Annual Inspection and Maintenance

Inspection

- Inspect the hinge assembly and verify that all bolts are in their proper place. Refer to Figure 1, p. 6 (non-marine hinges) and Figure 58, p. 26 (marine hinges) for bolt locations.
- Inspect for any loose bolts.
- Inspect all bolts on the hinge assembly and verify that all bolts are seated against hinge surfaces. If any bolts are not seated against hinge, remove the bolt and replace with the equivalent length grade 8 bolt.

Important: *Do NOT use any bolt other than grade 8.*

Figure 96.



Maintenance

Use a multi-purpose grease (such as LUB00069) and apply grease to all grease zerks on the hinge assembly every time the hinge is used to open the waterbox cover.

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PART-SVN224E-EN 22 May 2020
Supersedes PART-SVN224D-EN (Nov 2019)