

Installation, Operation and Maintenance Manual for **Models OC, GC & ACA Straight Tube, Removable Bundle Heat Exchangers***

*Also includes procedures for MEA & MEAH tube bundles.

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

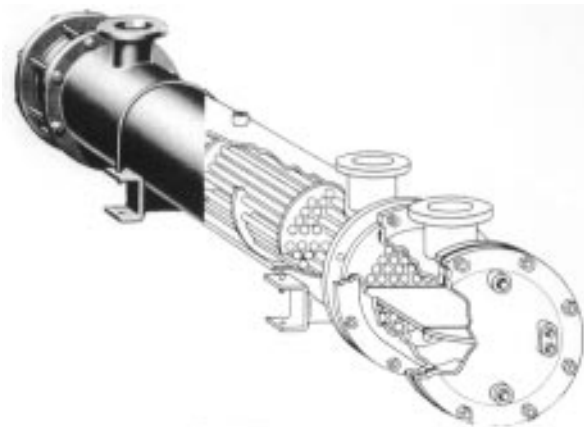


SAFETY INSTRUCTION

This safety alert symbol will be used in this manual to draw attention to safety related instructions. When used, the safety alert symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.**

Bell & Gossett

Morton Grove, IL, U.S.A.



INSTALLATION

1. Provide sufficient clearance at the stationary tube sheet end of the unit to permit removal of tube bundles from shells. On the packed floating tube sheet end, a space of 3 or 4 feet should be provided to permit the removal of the rear head, packing and retainer rings.
2. Provide valves and by-passes in the piping systems so that both the shells and tube bundles may be by-passed to permit cutting out the unit for inspection or repairs.
3. Provide thermometer wells and pressure gauge connections in all piping to and from the unit and located as near the unit as possible.
4. Provide convenient means for frequently cleaning the unit as suggested under "Maintenance."
5. Provide necessary air vent cocks for units so they can be purged to prevent or relieve vapor or gas binding of either the tube or the shell sides.
6. Foundations must be adequate so that exchangers will not settle and cause piping strains. Foundation bolts should be set to allow for setting inaccuracies. In concrete footings, pipe sleeves at least one size larger than bolt diameter slipped over the bolt and cast in place are best for this purpose, as they allow the bolt center to be adjusted after the foundation has set.
7. Loosen foundation bolts at one end of unit to allow free expansion of shells. Oval holes in foundation brackets are provided for this purpose.
8. Set exchangers level and square so that pipe connections may be made without forcing.
9. Inspect all openings in exchanger for foreign material. Remove all wooden plugs and shipping pads just before installing. Do not expose units to the elements with pads or other covers removed from nozzles or other openings since rain water may enter the unit and cause severe damage due to freezing.
10. Be sure the entire system is clean before starting operation to prevent plugging of tubes with sand or refuse. The use of strainers in settling tanks in pipe lines leading to the unit is recommended.
11. Drain connections should not be piped to a common closed manifold.
12. Steam hammer can cause serious damage to the tubes of any heat exchanger. A careful consideration of the following points before an installation is made can prevent costly repairs which may be caused by steam hammer.
 - a. A vacuum breaker and/or vent, should be used in accordance with the type of steam system installed.
 - b. The proper trap for the steam system installed should be used.
 - c. The trap and the condensate return line to the trap should be properly sized for the total capacity of the convertor.
 - d. The trap should be sized for the pressure at the trap, not the inlet pressure to the steam controller.
 - e. Condensate should be piped and pitched to a condensate receiver, condensate return pump or drain at an elevation below the heat exchanger.



CAUTION: During times of shutdown, volumetric expansion can occur. We recommend the installation of a properly sized relief valve on both sides of the heat exchanger.

OPERATION

1. When placing a unit in operation, open the vent connections and start to circulate the cold medium only. Be sure that the passages in the exchanger are entirely filled with the cold fluid before closing the vents. The hot medium should then be introduced gradually until all passages are filled with liquid, close vents and slowly bring the unit up to temperature.
2. Start operation gradually. Do not admit hot fluid to the unit suddenly when empty or cold. Do not shock unit with cold fluid when unit is hot.



CAUTION: Fluids must be gradually introduced to the unit. Failure to do so can cause damage to the heat exchanger.

3. In shutting down, flow of hot medium should be shut off first. If it is necessary to stop circulation of cooling medium the circulation of hot medium should also be stopped by by-passing or otherwise.
4. Do not operate equipment under conditions in excess of those specified on nameplate.



WARNING: Failure to operate the heat exchanger within the design pressure and temperature on the nameplate may result in damage to the heat exchanger and potential injury to adjacent personnel.

5. Drain all fluids when shutting down to eliminate possibility of freezing and corrosion. To guard against water hammer, condensate should be drained from steam heaters and similar apparatus both when starting up and when shutting down.
6. In all installations there should be no pulsation of fluids since this causes vibration and strain with resulting leaks.
7. All gasketed joints should be checked after starting for leaks and tightened if necessary.

MAINTENANCE

1. Do not open heads until all pressure is off equipment and the unit is drained.
2. Do not blow out heat exchangers with air when operating fluids are of a flammable or otherwise hazardous nature.



WARNING: Proper precautions must be taken (special clothing, equipment, etc.) to protect personnel from injury due to escaping fluids.



Illustration No. 1 – The method employed to push tube bundle out of shell.

3. Provide convenient means for frequently cleaning heat exchangers as suggested below:
 - a. Circulating hot wash oil or light distillate through tubes or shell at good velocity will effectually remove sludge or other similar soft deposits.
 - b. Soft salt deposits may be washed out by circulating hot fresh water.
 - c. Some cleaning compounds on the market, such as "Oakite" may be used to advantage for removing sludge or coke, provided hot wash oil or water, as described above, does not give satisfactory results.
 - d. If none of the above described methods are effective for the removal of hard scale or coke a mechanical means may be used. The interior of the tubes may be rodded.



WARNING: Care must be exercised when handling certain fluids. Follow manufacturers instructions. Use eye and skin protection. Wear a respirator when required.

4. To clean or inspect inside of tubes, remove channel cover and rear head. On exchangers having bonnet type heads (without channel cover), piping must be disconnected and both heads removed.
5. Do not attempt to clean tubes by blowing steam through individual tubes. This overheats the tube and results in tube expansion strains and sometimes leaking tubes.
6. Frequently and at regular intervals, observe interior and exterior condition of all tubes and keep them clean. Frequency of cleaning should be according to scale build-up.



CAUTION: Neglect in keeping all tubes clean may result in complete stoppage of flow through some tubes with consequent overheating of these tubes, resulting in severe expansion strains, leaking tube joints, and damage to the heat exchanger.

7. Exchangers subject to fouling or scaling should be cleaned periodically. A light sludge or scale coating on the tube greatly reduces its effectiveness. A marked increase in pressure drop and/or reduction in performance usually indicates cleaning is necessary, if the unit has been checked for air or vapor binding and this has been found not to be the cause. Since the difficulty of cleaning increases rapidly as the scale thickens or deposits increases, the interval between cleanings should not be excessive.
8. Tube bundle removal:
 - a. During bundle removal, the dead weight of bundle should never be supported on individual tubes since the tubes are small and of relatively thin metal. Rest the bundle on the tube sheet, support plates, or wood blocks cut to fit periphery of the bundle.
 - b. Be sure there is a soft wood filler between ends of tubes and steel bearing plate when pushing bundle out. On smaller bundles of 12" diameter and under, it is permissible to use hard wood block in place of wood filler and steel bearing plates. See Illustration No. 1.
 - c. Tube bundles may be raised using slings formed by bending light plates into a "U" form and attaching lifting lugs to the ends of the sheets. Baffles can be easily bent and damaged if dragged over rough surfaces.

CAUTION: Failure to follow the procedures mentioned in steps 8a, b, and c may result in damage to the tubes or tube joints leading to premature failure of the heat exchanger.

9. Removing the tube bundle:

Refer to drawings on pages 6 and 7 giving part names of models MEAH, OC, GC and ACA. The model MEAH tube bundles are more difficult to remove than the other models. The MEAH exchanger has the horizontal baffles (N) extending from the stationary tube steel (B) to about 5 inches of the packed floating tube sheet (E). Two rubber baffle strips (O) are adhered to the horizontal steel baffle (N). The rubber baffle strips seal the space between the shell and horizontal baffle, and prevent liquid by-passing. These rubber baffle strips (O) in the MEAH act as brakes against the shell (C) making bundle removal more difficult.

- a. If the exchanger is difficult to work upon, hoist it into the open after disconnecting piping.
- b. Remove front (A) and rear (F) heads. See Illustration No. 2.



Illustration No. 2 – Removing rear head (completely remove front and rear heads).

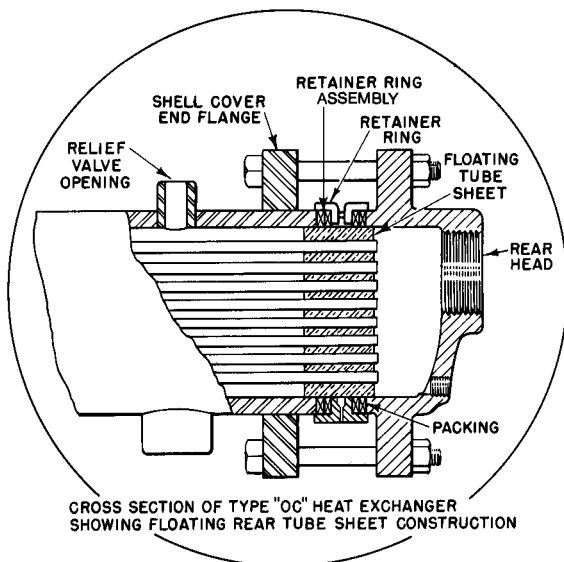


Illustration No. 3 – Cross section of type "OC" Heat Exchanger showing rear tube sheet construction. (See packing retainer detail)



Illustration No. 4 – Prying off retainer rings.

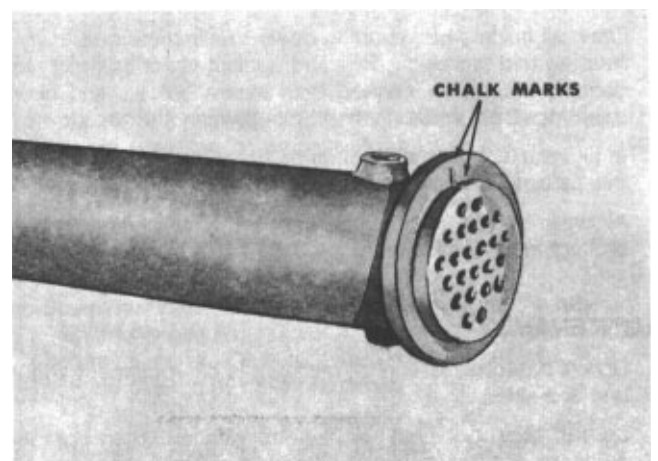


Illustration No. 5 – Marking of tube sheet and shell flange.

- c. Remove packing (G) and retaining rings (H). It may be necessary to tap lightly on the retainer rings for starting their removal. More detail of floating tube sheet is given in Illustration No. 3. Illustration No. 4 shows the method of prying retainer rings off. If tapping is necessary, be sure to tap evenly about the circumference so the retainer ring does not bind on the floating tube sheet.
- d. Mark tube sheet (B) and shell flange for later re-alignment. Illustration No. 5.
- e. Use chain jack. One suitable is Coffing Hoist, Model MA-15 $\frac{3}{4}$ ton capacity. Place short piece of 4x4 hardwood (oak) between chain of jack and floating tube sheet (E). See Illustration No. 1. Use longer 4x4 pieces as bundle is removed. Support the bundle by lifting or resting on the stationary tube sheet (B), as bundle is pushed out. Illustration No. 6.

10. Replacing the tube bundle:

The tube bundles for models ACA, GC, MEA, MEAH and OC (the packed floating tube sheet units) can be replaced using the tools and reverse procedure given for bundle removal. Usually, the bundles ACA, GC, MEA and OC, can be shoved back into the shell (C) manually without the use of the chain jack.

It may be necessary to use the chain jack when replacing MEAH bundles.

CAUTION: Model MEAH (which has the long steel horizontal baffle (N) with the rubber baffle sealing strips (O) adhered to the horizontal baffle):

The rubber baffle strips (O) are sealing strips between the shell (C) and horizontal baffle (N). The rubber baffle strips (O) must curl along the shell (C) towards the shell's liquid inlet connection. The liquid pressure forces the rubber baffle strips against shell and seals it. This is shown in Illustration No. 7.



Illustration No. 6 – Removal of tube bundle showing method of tube bundle support.

NOTE: When replacing heads use a torque wrench.

- On heads (front heads) with gaskets, tighten $\frac{1}{2}$ " diameter bolts to 40 ft. lbs. and $\frac{5}{8}$ " diameter bolts to 80 ft. lbs. If the gasket joint still leaks, tighten in 5 ft. lbs. increments until leak stops.
- On heads with packing (rear heads), tighten initially to 50 ft. lbs. If the packing still leaks tighten in 5 ft. lbs. increments until leak stops. Do not exceed 100 ft. lbs. on the bolts for the packed heads.

*The above torque values apply to well lubricated nut bearing surfaces.

All bolted joints should be tightened uniformly and in a diametrically staggered pattern as illustrated below:

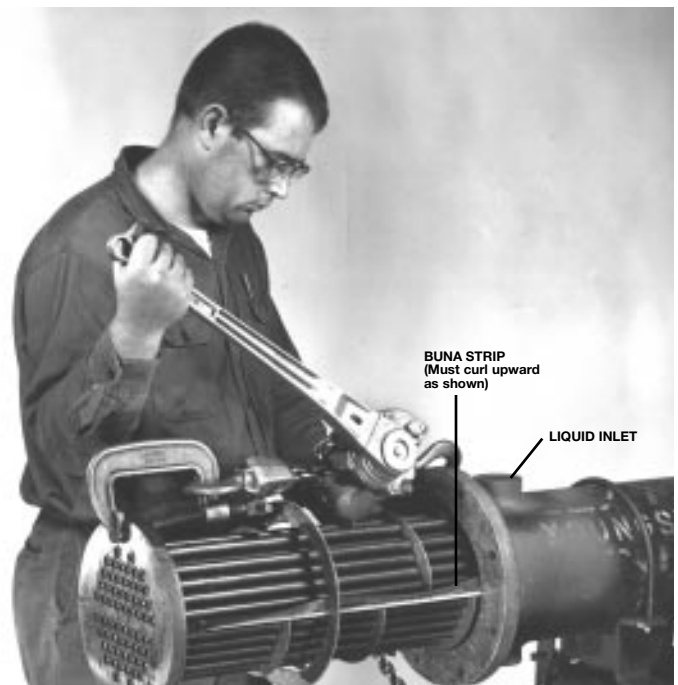
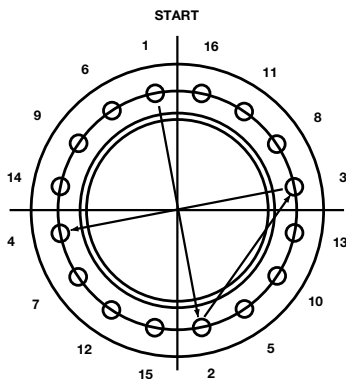
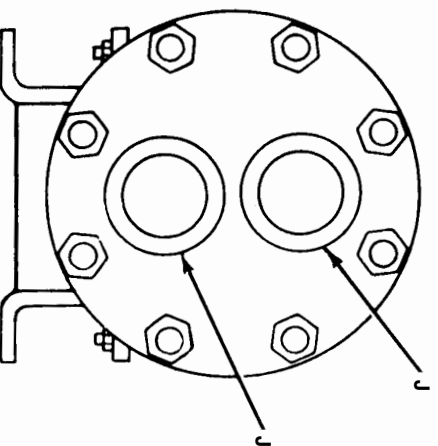
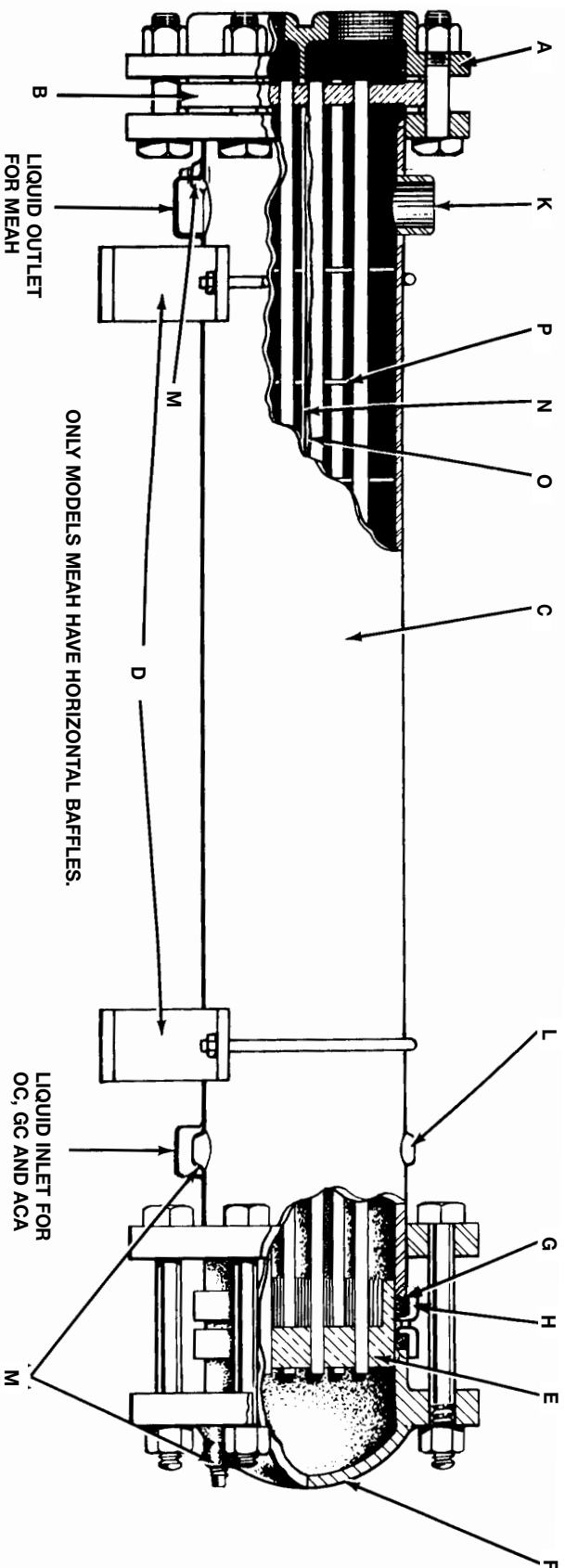


Illustration No. 7 – Position of rubber baffle strips and liquid inlet in relation to each other when assembling unit.

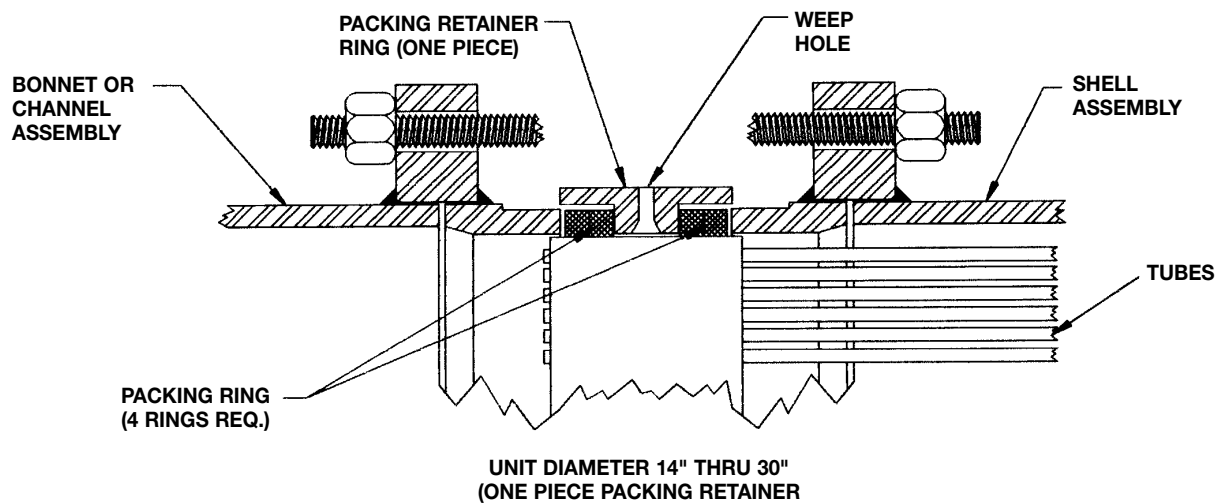
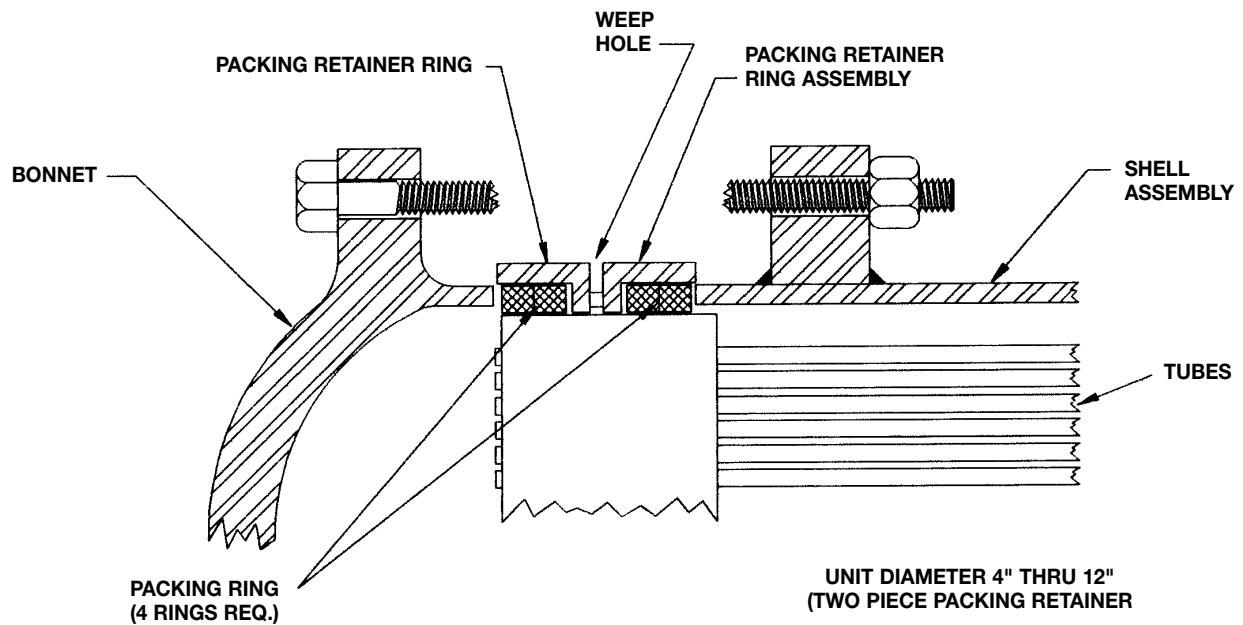
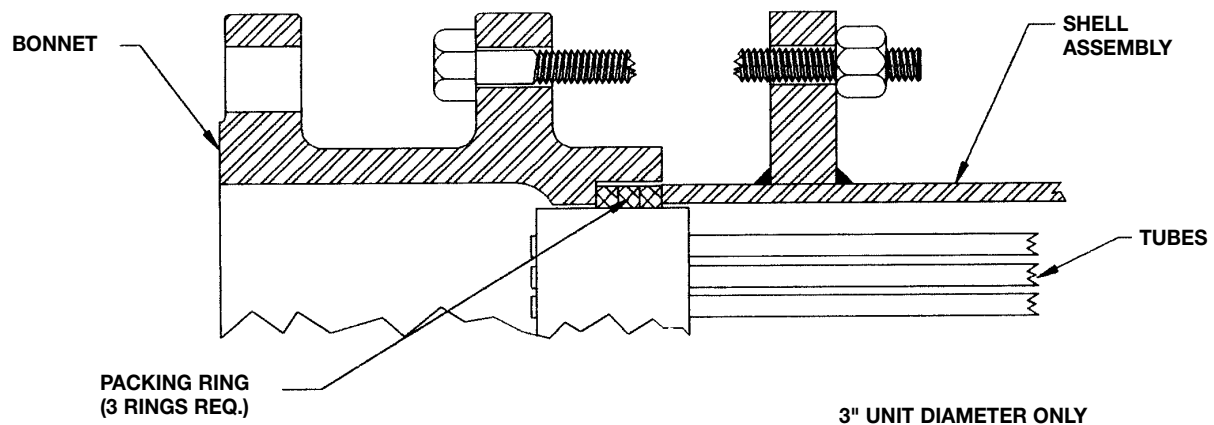
PARTS LIST **MODELS MEAH, OC, GC AND ACA HEAT EXCHANGERS** **(BONNET HEAD)**



- | | |
|---|--|
| A - FRONT HEAD | J - HEAD CONNECTIONS |
| B - STATIONARY TUBE SHEET | K - SHELL CONNECTIONS |
| C - SHELL | L - RELIEF VALVE OPENING |
| D - SADDLES | M - DRAINS |
| E - PACKED FLOATING TUBE SHEET | N - HORIZONTAL STEEL BAFFLE (TYPE MEAH ONLY) |
| F - REAR HEAD | O - RUBBER BAFFLE STRIPS (TYPE MEAH ONLY) |
| G - PACKING | P - VERTICAL SEGMENTAL BAFFLES |
| H - PACKING RETAINER RING (SEE PACKING RETAINER DETAIL) | |

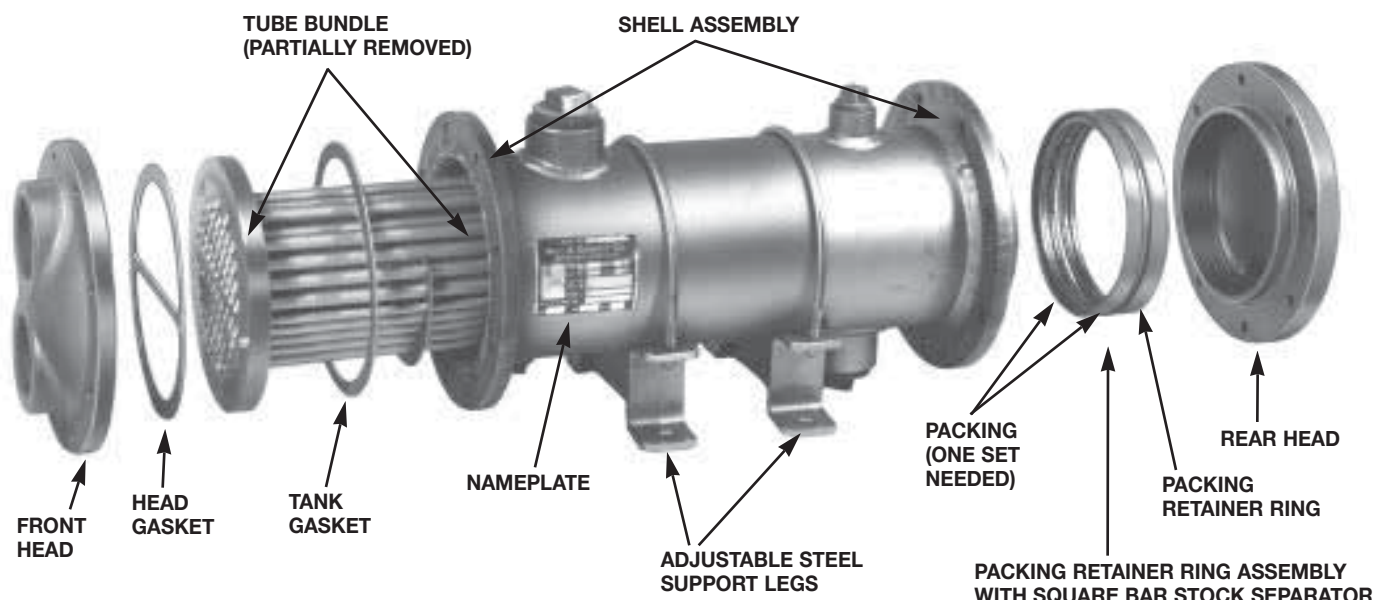
1. When ordering give complete nameplate data and part name.
2. Types OC, GC and ACA have no horizontal steel baffle.

PACKING RETAINER DETAIL



MODEL OC

THIS TWO PASS TYPE OF MODEL OC IS REPRESENTATIVE
OF THE MODELS MEA, ACA, GC AND MEAH



When ordering replacement parts give names of
part, catalogue and factory number from nameplate.

INSTRUCTIONS FOR INSTALLATION OF RUBBER BAFFLE STRIPS (Horizontal Baffle Seals)

The following is the procedure for installing rubber strips on MEAH heat exchanger tube bundles:

1. After removing the tube bundle from the casing, remove old strips and tie down plate at stationary tube sheet. (Tie down plate is not on all models.)
2. Remove all grease and dirt and clean to bare metal.
3. Apply a one inch wide coat of adhesive to both the steel baffle and the rubber baffle strips. (Bell & Gossett uses Barge cement.)
4. After the adhesive becomes "tacky," press the rubber strip firmly into place. Make sure the strip is flush against the stationary tube sheet.
5. Allow the adhesive to set up for about one hour, replace the tie down plate and replace the tube bundle into the casing.

For further information, contact Bell & Gossett Heat Transfer Products, 175 Standard Parkway, Cheektowaga, NY 14227,
Phone (716) 862-4171 — Facsimile (716) 862-4176.

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