

## K-02: Repair Heat Exchanger

### SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Flow valves must be closed during repair. Ensure that there is no possibility that a valve will be opened.
- Heat exchanger plates have sharp edges. Wear gloves to protect hands.

### EQUIPMENT

- tape measure or steel scale
- sockets and wrenches suitable for shroud and stack bolts
- pressure washer
- replacement plates or gaskets, as necessary
- 1-inch impact wrench

### RESOURCES

- Superchanger Installation and Operation Manual
- installation prints

### Repair Heat Exchanger

1. Investigate reported leaks or performance deficiencies.
  - Look under the heat exchanger for leaking water.
  - Check the alarm system for alarms on furnace water temperature or makeup flow.
2. Investigate the possibility of tightening the plate stack if the symptom is an internal leak.
  - Remove the heat exchanger shroud.
  - Measure the stack length. The stack length is the distance between the end plates on both sides, top and bottom. The four measurements should be within 1/4-inch.
  - Count the number of plates between the end plates.

- Consult the heat exchanger prints. If the number of plates specified in the prints is the same as the number actually in the heat exchanger, use the print dimensions for the maximum and minimum stack length. See the figure below.

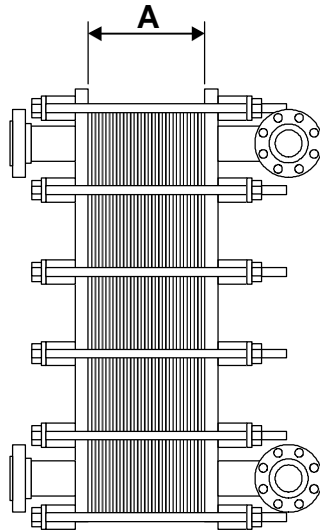


TABLE IV

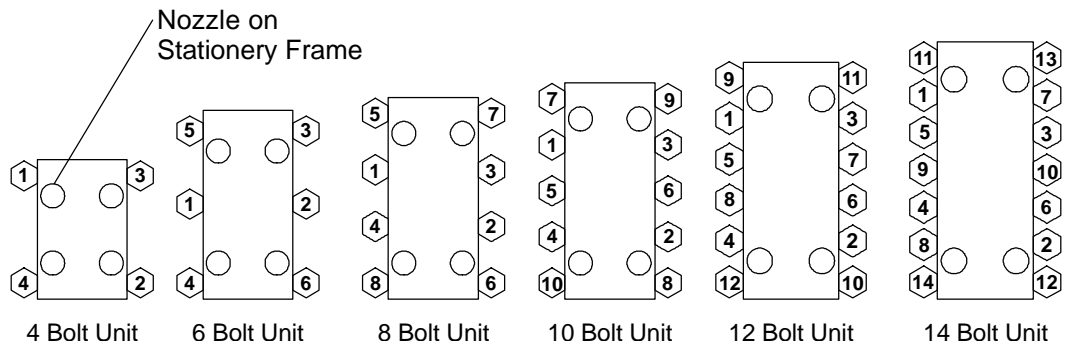
Plate Type	A Max	A Min
06-T18;06-T28;06-T98	(0.165354)N	(0.165354)N
06-T10;06-T20;06-T90	(0.173228)N	(0.173228)N
UX-416;UX-426;UX-496	(0.157480)N	(0.157480)N
UX-418;UX-428;UX-498	(0.165354)N	(0.165354)N
UX-410;UX-420;UX-490	(0.173228)N	(0.173228)N

N = Number of Plates

#### Maximum and Minimum Stack Length from Print

- If the number of plates is not the same as in the prints, use Table IV on page 4 in the manufacturer's Installation and Operation Manual to calculate the maximum and minimum stack length.
- If any of the four measured dimensions is larger than the maximum stack length, tighten the heat exchanger stack bolts to bring the stack length down to the maximum limit.

- See page 17 of the manufacturer's Installation and Operation Manual for the recommended bolt tightening sequence. See the figure below.



### Bolt Tightening Sequence

- If the leak persists, tighten the bolts, in increments, keeping all four measurements within 1/4-inch, while monitoring the leak.
  - Do not tighten to reduce the stack length below the minimum dimension.
3. Shut down and disassemble the heat exchanger if you detect any of the following conditions:
- An external leak cannot be eliminated by tightening the heat exchanger stack bolts.

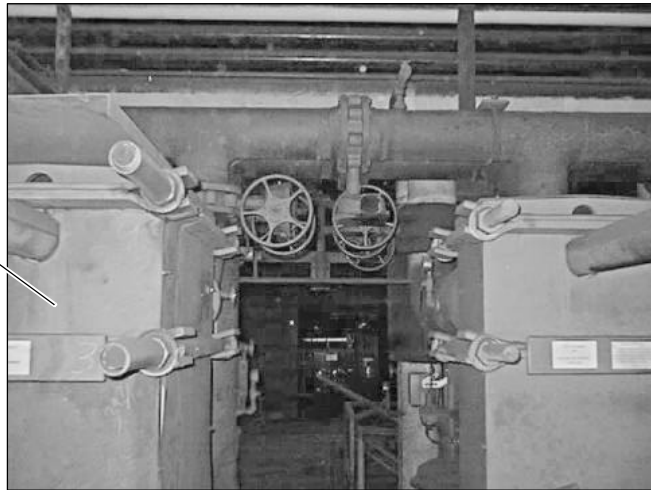
Note: The control tower operator gets the alarms, not the tradesman.

- The alarm system on the furnace shows a makeup water flow condition (losing excessive amounts of water).
- The alarm system on the furnace shows that the water going to the furnace is too hot (over 110 degrees). The mill water flow control is set correctly and fully open (heat exchanger maybe plugged, on a line plugged).

4. Shut down and disassemble the heat exchanger.
  - Using flow valves, connect both mill water and furnace water sides of an auxiliary heat exchanger in parallel with the heat exchanger to be repaired. Open the two mill water valves on the auxiliary side first, and then the two furnace water valves. See the figure below.



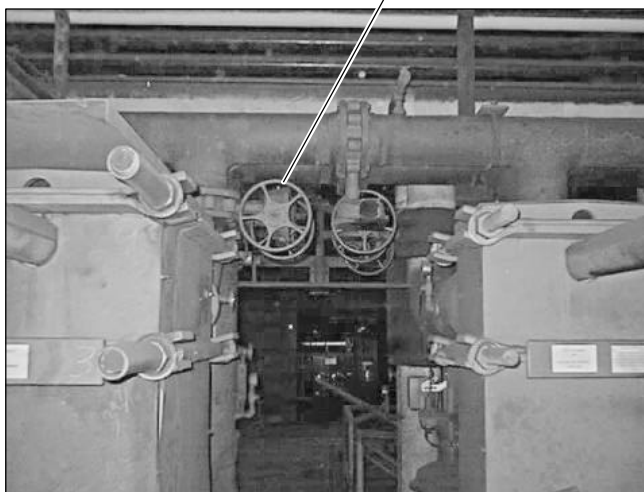
Heat Exchanger



#### Flow Valves

- Closing inlet valves on both the mill water and furnace water lines and then the outlet valves to isolate the heat exchanger being worked. See the figure below.

Valves



#### Inlet and Outlet Valves, Mill Water, and Furnace Water

- When all flow to the heat exchanger is shut off, open drain valves and vent valves on both sides of the heat exchanger. See the figure below.

Drain and Vent Valve



#### Heat Exchanger Drain Valve

- If necessary, unscrew the pressure gauge installed in some vent valves.
  - Remove the heat exchanger shroud.
  - Loosen the heat exchanger stack bolts, and pull the moveable end plate back out of the way to provide access to the plates.
5. Repair the external leak.
- Separate the plates only at the leak.
  - Remove the plate with the leaking gasket.
  - Replace the gasket using Pliobond 30 or other approved adhesive between the gasket and the plate. Consult with Engineering for an alternative adhesive.
  - Replace the plate in the stack, being careful not to damage the adjoining plate gasket or allow contamination on the replaced or the adjoining gasket.





6. Inspect all plates and passages if the problem is an alarm indicating furnace water makeup flow or high temperature furnace water.
  - Replace any corroded or damaged plates.
  - Clean and scrape out all flow passages.
7. Reassemble the heat exchanger.
  - Be sure the plate type and orientation are correct for the plate position in the stack. See pages 2, 6, 7, and 10 through 14 in the manufacturer's Installation and Operation Manual.
  - Be sure all plates and gaskets are clean before assembling the stack, and that gaskets are firmly glued in position on the plates.
  - Slide the moveable end plate onto the stack.
  - Tighten the stack bolts according to the tightening sequence, keeping all dimensions within 1/4-inch as the bolts are tightened.
  - Tighten to just under the maximum stack length dimension stated in step 2.
  - Close drain valves.
  - Replace any removed gauges.
  - Open flow valves slowly to both sides of the heat exchanger allowing air to vent.
  - When both sides of the heat exchanger are full, close the vent valves.
  - Open all flow valves to the heat exchanger fully.
  - Close flow valves to the auxiliary heat exchanger.
8. Inspect the heat exchanger for external leaks. If there are no leaks, replace the shroud.
9. Monitor heat exchanger operation, verifying acceptable pressures, flows, and temperatures.