Q-05: Replace Retort Tubes and Install Media / Catalyst

SAFETY FIRST

- ☐ Follow all Caterpillar facility safety standards when performing this task.
- ☐ Wear a respirator when disposing of and installing the catalyst.
- ☐ A ladder must be used to access the top of the generator.

EQUIPMENT

- ☐ basic Maintenance Mechanic hand tools
- ☐ air wrench
- ☐ hoist
- ☐ ladder
- ☐ 150 pounds of catalyst
- ☐ ceramic balls
- ☐ ceramic rope
- ☐ FiberFrax caulking

RESOURCES

- ☐ Caterpillar Plant Engineering Standards for Piping Color Code (Page B1.7.1)

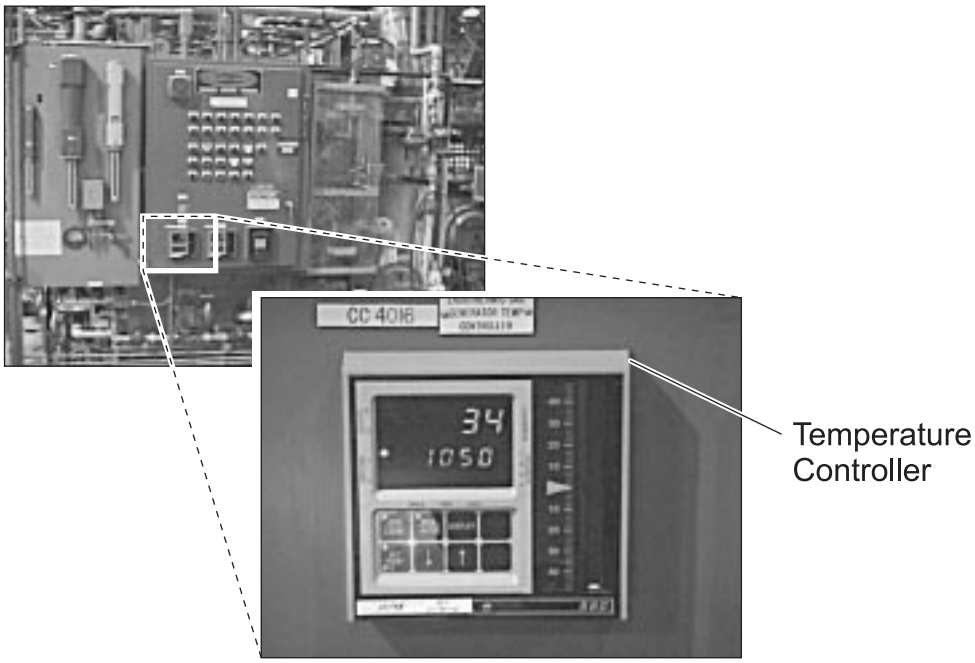
Replace Retort Tubes and Install Media Catalyst

1. **Verify that there is 150 pounds of catalyst available to perform this task.**

2. **Make sure the hoist is set up above the generator being serviced.**

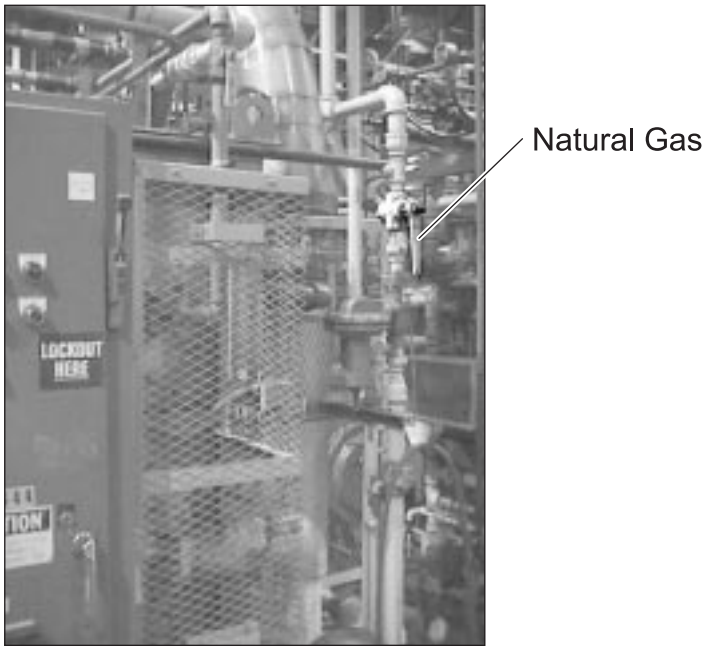
3. Verify that the generator is shut down and cooled down.

☐ Check the temperature controller and verify that it is at least 34°C +/- 5°C.

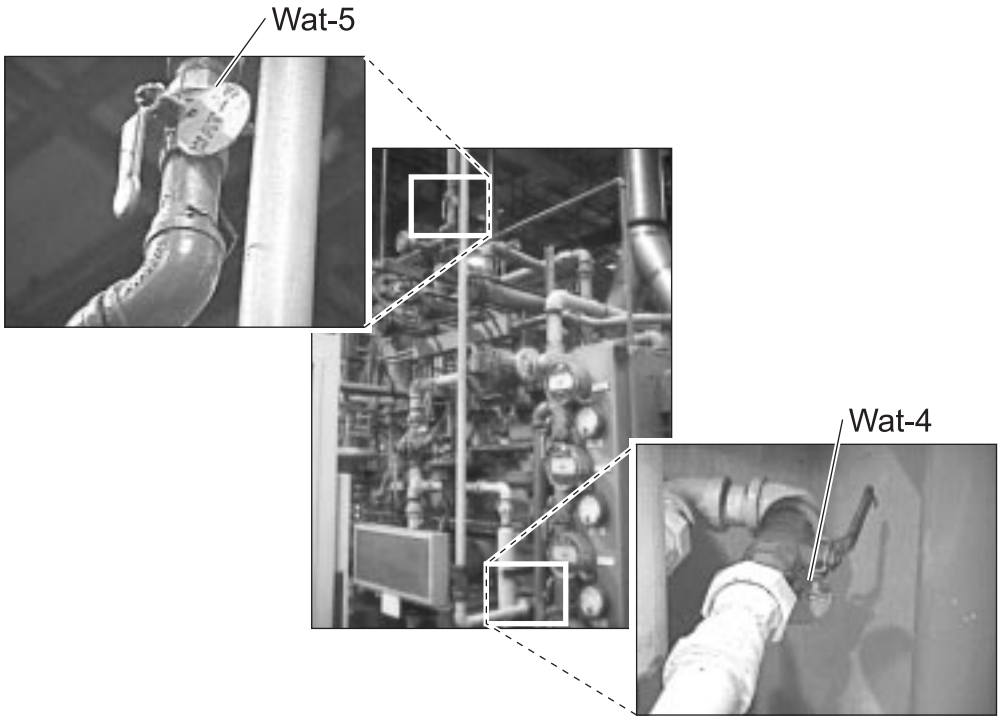


4. Lockout/tagout the control panel and follow the documented ZMS procedures.

5. Verify that the natural gas is shut off.



6. Turn off the water supply.

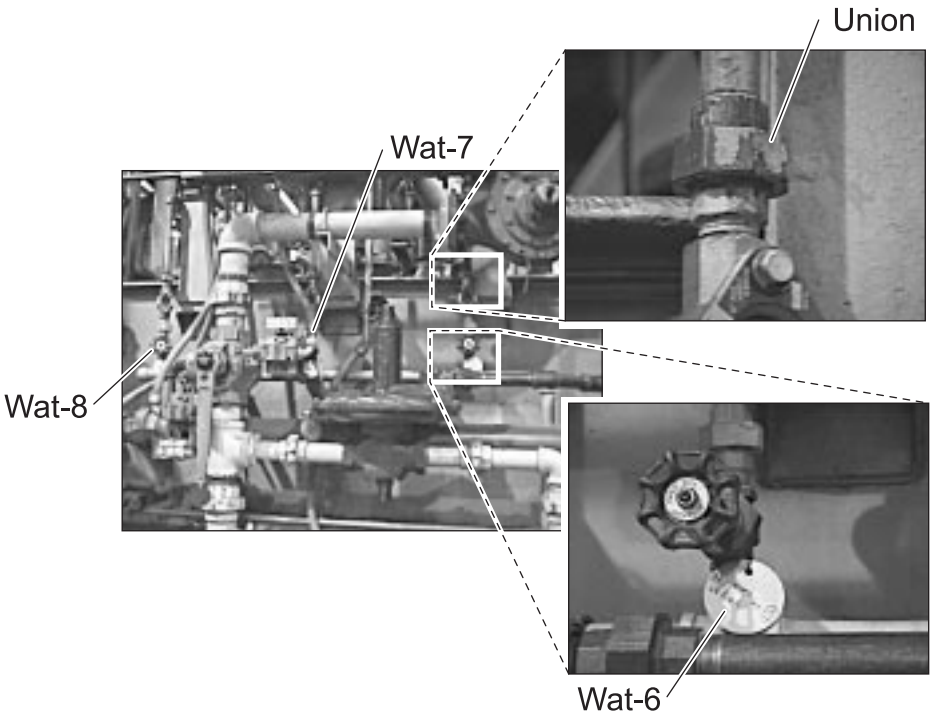


Supply (WAT-4) and Return (WAT-5) Disconnects

- ☐ Turn off the supply valve marked WAT-4.
- ☐ Use a ladder to reach and shut off the return valve marked WAT-5.

7. Drain the water from the supply side.

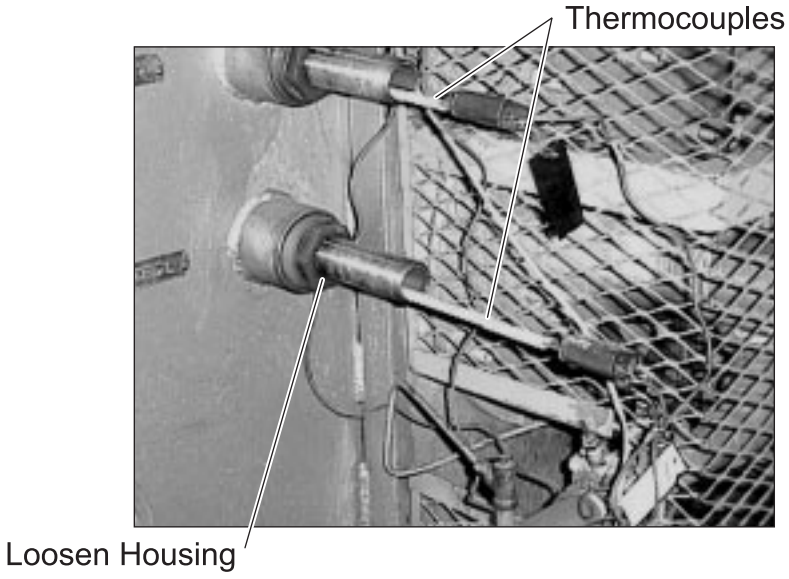
☐ Use two pipe wrenches and open each of the unions above the valves marked WAT-6, WAT-7, and WAT-8.



WAT-6, WAT-7, and WAT-8 Locations

☐ Allow the water to drain onto the floor.

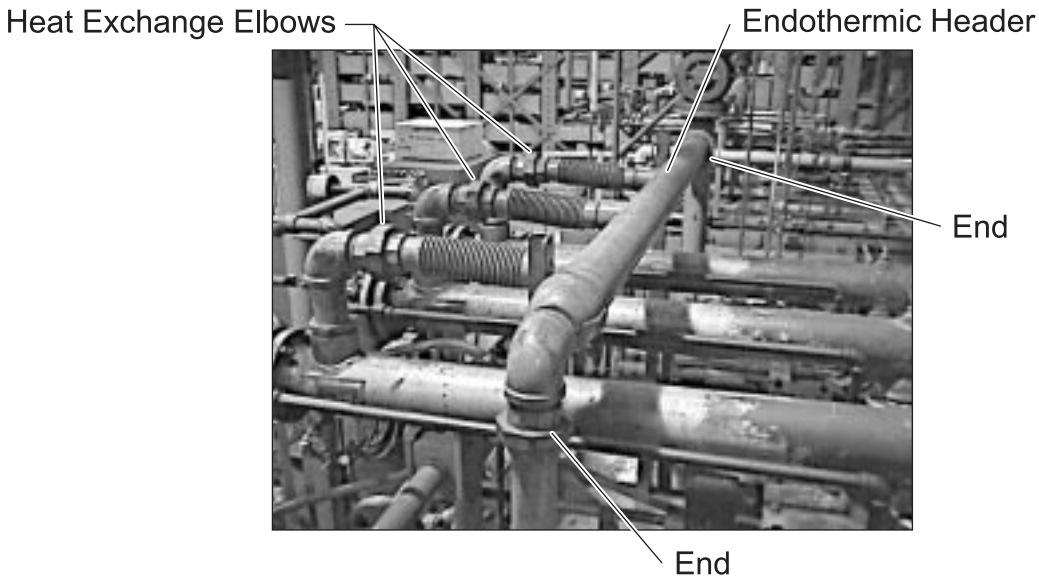
8. Remove the thermocouple protection housings.



☐ Use a pipe wrench to remove both tubes.

9. Remove the endothermic header.

- ☐ Use two pipe wrenches to disconnect the header at each heat exchange elbow and at both ends.



- ☐ Use a hoist or hand the header to an assistant to place on the floor, out of the way.

10. Disconnect the water return pipes at the ends of the gas cooling heat exchangers.

- ☐ Use two pipe wrenches to disconnect all three pipes.
- ☐ Slide the disconnected return pipes away from the heat exchangers.

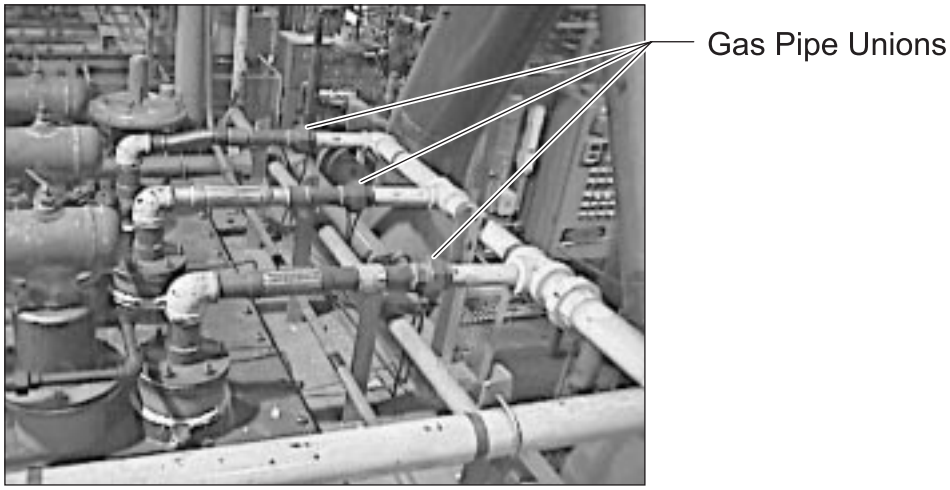
11. Disconnect the water supply pipes below the gas cooling heat exchangers.

Note: The other ends of the supply pipes were disconnected in step 6 when you drained the water.

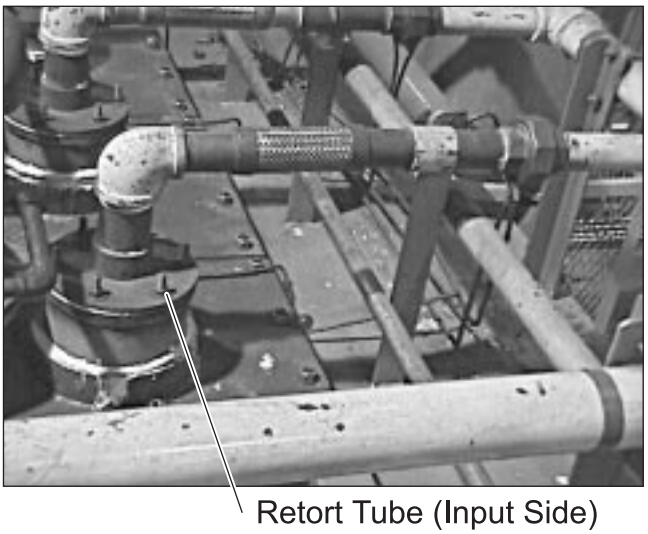
- ☐ Use two pipe wrenches to disconnect all three pipes.
- ☐ Slide the disconnected supply pipes away from the heat exchangers.

12. Disconnect the gas pipes.

- ☐ Disconnect each of the gas pipes from the union.



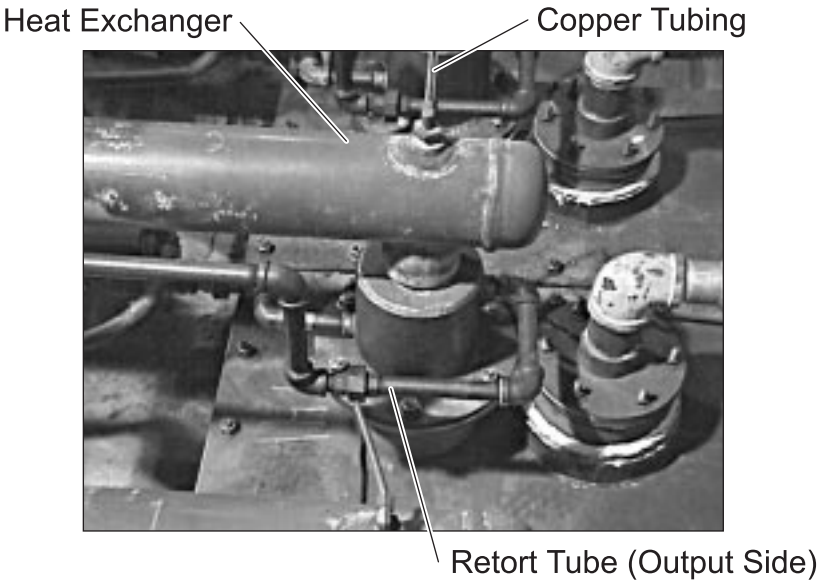
- ☐ Using the air wrench, remove the nuts from the input side of the retort tube.



- ☐ Retain all hardware for re-connection.
- ☐ Move the gas pipes out of the way.

13. Disconnect the gas cooling heat exchangers.

- ☐ Remove the copper tubing on top of the heat exchanger.
- ☐ Use the air wrench and remove all the nuts from the output side of the retort tube.

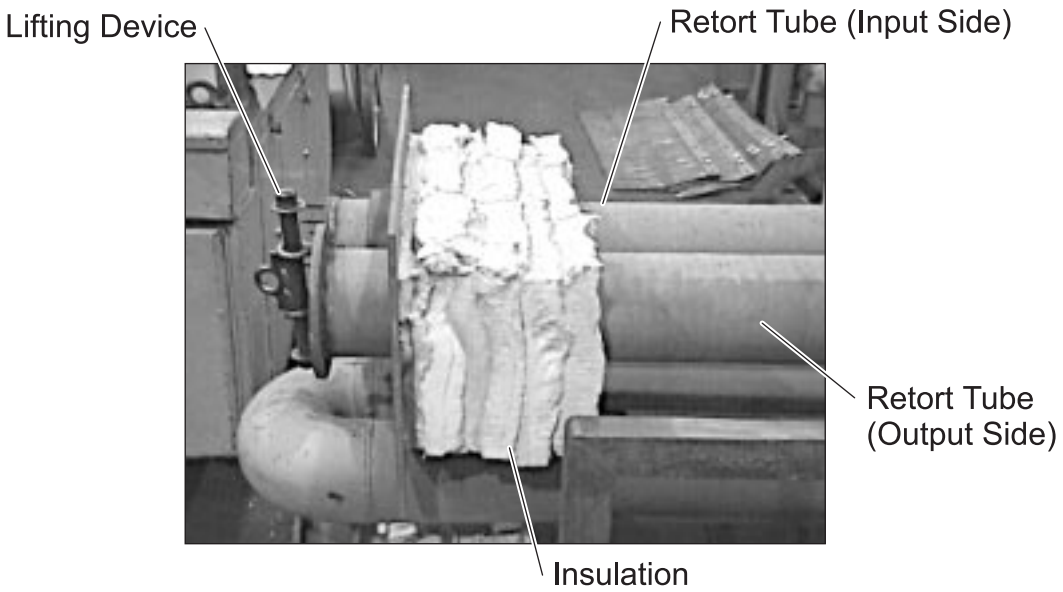


14. Remove the gas cooling heat exchangers.

- ☐ Connect each heat exchanger to a hoist.
- ☐ Lower the heat exchangers to the floor.

15. Remove the retort tubes.

- ☐ Connect the lifting device for the retort tube to the outlet side as shown.



- ☐ Rig the lifting device to the hoist.

Caution: Be sure you removed the thermocouple protection tubes as documented in step 8.

- ☐ Carefully lift the retort tube out of the generator and onto the floor.

16. Dispose of the catalyst.

- ☐ Connect the retort tube to the hoist in the shop.

Note: A respirator must be worn during catalyst disposal. Catalyst contains dust.

- ☐ Connect the retort tube to the hoist, and empty the catalyst in a waste disposal container.

17. Inspect the empty retort tubes.

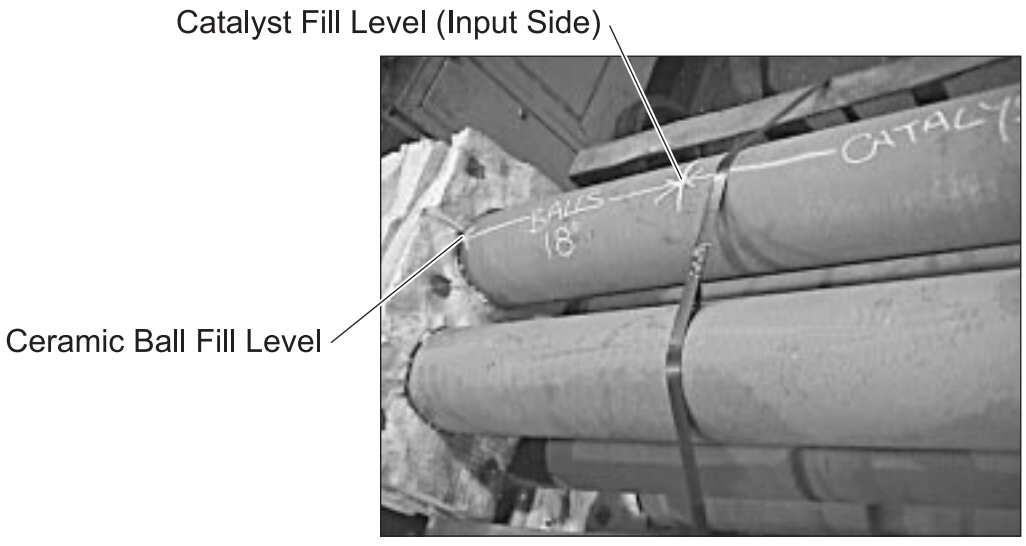
- ☐ Look for worn thin spots or holes in the retort tubes.
- ☐ Replace the retort tubes as needed.

18. Install the catalyst.

Note: Wear a respirator to install the catalyst.

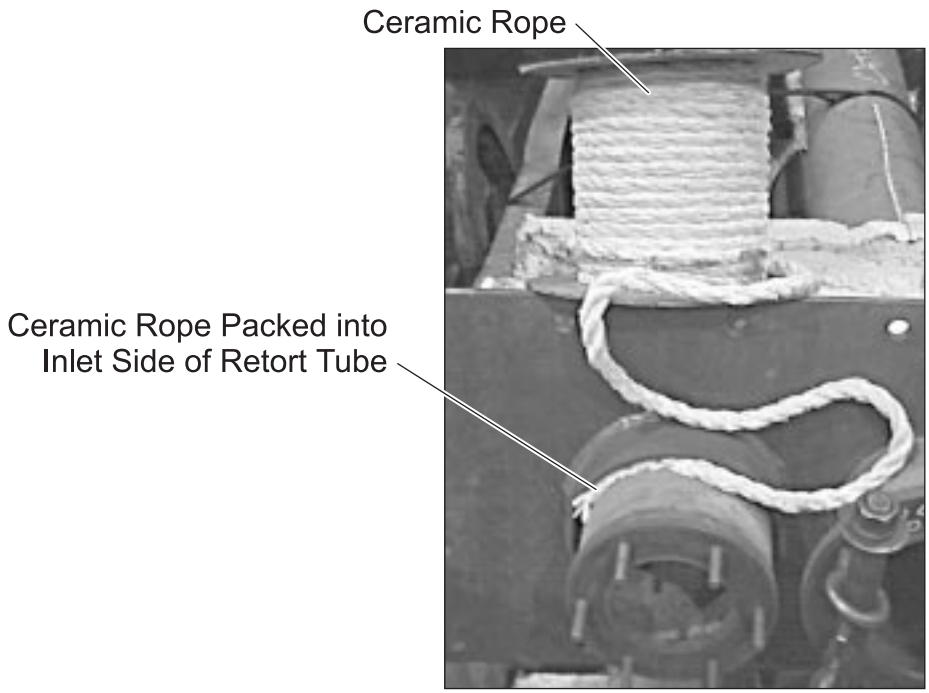
- ☐ Pour catalyst into the outlet side of the retort tube until it is approximately level with the bottom of the insulation, as shown below.

- ☐ Pour catalyst into the inlet side of the retort tube until it is 18 inches below the bottom of the insulation.
- ☐ Fill the inlet side with ceramic balls until even with the bottom of the insulation.



19. Install the ceramic rope.

- ☐ Pack the ceramic rope around the inlet side of the retort tubes.
- ☐ Leave approximately a 1/2" gap around the ceramic rope for caulking.



20. Apply FiberFrax caulking over the ceramic rope.

- ☐ Fill in the 1/2" gap around the ceramic rope.

21. Install the retort tubes.

22. Connect the gas cooling heat exchangers.

- ☐ Connect the copper tubing onto all three retort tubes.
- ☐ Wrench-tighten all the nuts on the inlet side of all three retort tubes.

23. Connect the gas lines.

- ☐ Wrench-tighten all the nuts on the outlet side of all three retort tubes.
- ☐ Verify that the unions are all wrench-tight.

24. Connect the supply side water lines.

- ☐ Make sure all three unions are wrench-tight.

25. Connect the return side water lines.

- ☐ Make sure all three unions are wrench-tight.

26. Connect the endothermic header.

- ☐ Make sure all three heat exchange unions and both header unions are wrench-tight.

27. Connect the water supply.

- ☐ Make sure the fittings are wrench-tight.

28. Turn on the water supply.

- ☐ Check for and repair any water leaks.

29. Install the thermocouple protection tubes.

30. Turn on the gas supply.

- ☐ Check for and repair any gas leaks.

31. Remove the lockout/tagout and restore ZMS.

32. Ask the Checker to start the generator and verify operation.