NTI - Mandatory Service and Inspection Program

(For T-Series boilers only)

Overview

The Mandatory Service and Inspection Program has been initiated by NTI to help aid heating technicians in performing a complete and proper service and inspection of all Trinity boiler installations that have been in operation for more then one year. The procedures outlined below, are required to ensure the safe and reliable operation of the Trinity boiler:

1. Combustion Chamber Cleaning, including inspection of boiler internals.
2. Flue Pipe Connector replacement (parts including with package).
3. Installation of Optional Exhaust Pipe Condensate Drain (if applicable).
4. Flue gas combustion check.
5. Flame proving circuit operation.

1. Procedure for Cleaning Trinity Combustion Chamber

Take this opportunity to inspect the internals of the boiler including the condition of the burner and the ceramic insulation at the front and back of the combustion chamber.

The following components may be required to properly clean and service the boiler:

1) **PN 83112** – "Trinity Divider Plate Insulation (c/w washer & screw)": This part is used on all Trinity boilers, it's purpose is to insulation the secondary portion of the boiler's heat exchanger from the heat of the primary heat exchanger. It is necessary to remove the insulation, to avoid damage, during the cleaning process, if it is damaged it is very important to replace it to avoid excessive flue gas temperatures.
2) **PN 82059** – "Trinity Igniter": Used on all T-Series boilers, the igniter is very brittle, NTI recommends having a spare igniter on hand when performing the cleaning procedure.
3) **PN 82673** – "Trinity "T" Cleaning & Burner Door kit": Consists of the gaskets necessary to remove the burner door to access the combustion chamber for cleaning.
4) **PN 82379** – "T150 Burner Assembly": If there is damage to the burner, of a T150, or if the boiler serial number is lower then 02T-2152, replace the burner assembly. *Note: assembly comes complete with gaskets included in PN 82673.*
5) **PN 82381** – "T200 Burner Assembly": If there is damage to the burner, of a T200, or if the boiler serial number is lower then 02T-2152, replace the burner assembly. *Note: assembly comes complete with gaskets included in PN 82673.*

To maintain peak operating performance of any heat exchanger it is important that the heat exchanging surfaces be kept clean and free of foreign debris, which will act as an insulator and an obstruction to the efficient exchange of heat. Failure to clean the Trinity heat exchanger will result in the following problems:

1) Increase in stack temperature.
2) Blocked combustion passages.
3) Reduction in heating capacity.
4) Rough ignition.
5) Ignition failure.
6) Heat exchanger failure.

The main factors contributing to the build-up of dirt in the Trinity heat exchanger are as follows:

1) Cleanliness of the combustion air.
2) Sulfur content in the gas.
3) Level and frequency of condensation forming in the heat exchanger.
4) Amount of burner operation.

The build up of burnt dust and cooked-on Sulfur residue generally only occurs in the primary side of the boilers heat exchanger. The same build-up does not occur in the secondary side of the boilers heat exchanger due to the lack of direct heat from the burner acting as a catalyst and due to the presence of condensation acting to flush away any such possible build-up. This same phenomena can occur in the primary heat exchanger if it is also producing condensate, however, this generally only occurs in applications where the supply water temperature is often below 100°F while the burner is operating.

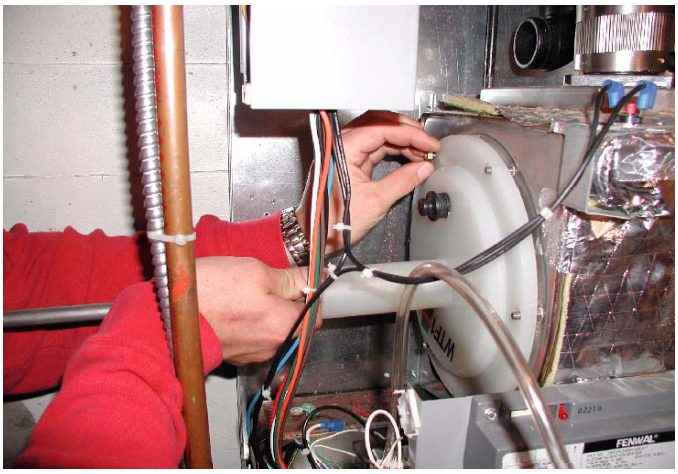
The rate of build-up will vary in every application due to variations in the above-mentioned factors. However, it is important that the boiler primary heat exchanger (combustion chamber) be checked for build-up at-least once every two heating seasons or sooner if the boiler has been converted to operate with LP Gas. Once you have established the rate of build up for each installation, you will be able to develop a cleaning schedule.

The cleaning procedure is as follows:

1) Turn off gas and power supply to unit.
2) Remove cover, and disconnect fresh-air intake pipe and gas line.
3) Remove the left side panel and the igniter and flame probe. (Be careful not to break the igniter)
4) Remove wiring harnesses and tubes from combustion blower and gas valve assembly. (Carefully label the proper location for each tube removed)
5) Remove the burner door assembly, complete with blower and gas valve, from the heat exchanger.
6) Document or photograph the heat exchanger and record the duration of service. (This will aid in developing a cleaning schedule)
7) Using an Allen, or hex head key, remove the insulation from the back of the combustion chamber. Replace if necessary.
8) Vacuum out the loose combusted dust deposits and debris from the heat exchanger. Use a nylon or other nonmetallic brush to loosen surface deposits. Vacuum out again if necessary.

9) If you have an NTI cleaning wand Pn. 82721 you may install the wand onto the boiler where the burner door was located.
10) Remove the condensate trap and allow the tube to drain straight into a bucket.

11) Connect wand to pressure washer, and begin to wash. Push wand in and out repetitively while washing. Continue until the water exiting the condensate drain is clear. Wash for at least 5 minutes, osculating trigger frequently. If not clean after door is removed, brush again to removed caked on material and repeat the process.



If a cleaning wand is not available, a bucket half filled with warm water and a sponge can be used. Remove condensate trap as described above and place an empty bucket under the condensate drain. Place towels in the bottom of the boiler cabinet and over the boiler controls. Soak the tubes with the sponge then scrub with the nylon brush. Continue to until passages are free and clear.

12) Re-apply the burner door and if necessary replace the gaskets. To properly seal the burner door assembly boilers with serial numbers lower then 02T-2152 kit #82379 for T150's or kit #82381 for T200s may be required. For other T-series boilers kit #82673 should be used.
13) Reconnect the wiring harnesses, combustion air intake and gas piping, check for gas leaks.
14) Properly reinstall the condensate trap.

2. <u>Flue Pipe Connector Replacement (PN83220)</u>

Parts included with package:

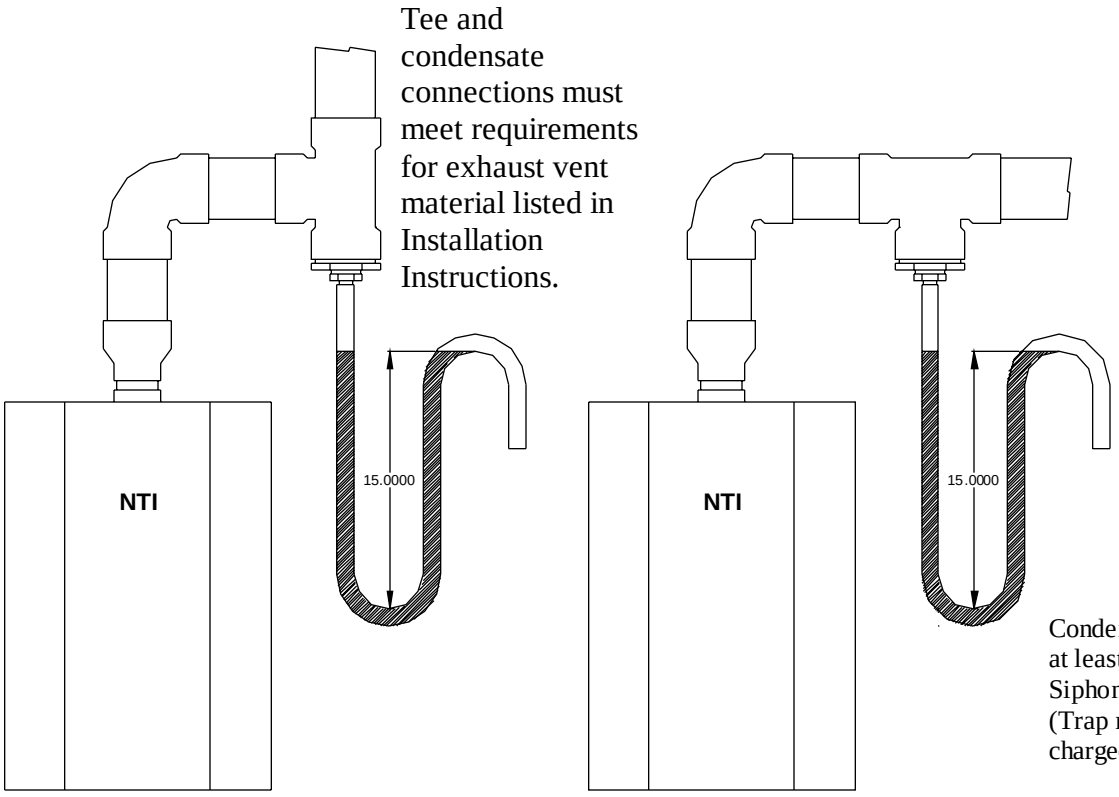
- 82267: Flange Flue Coupling (c/w Rigid ABS Adapter)
- 82809: Smoke-hood Gasket (Viton)
- 4 – 82348: #8-32 Brass Nuts
- 4 – 83221: #8 Stainless Steel Washers
- 81541-1: Foil faced insulation

It is possible, due to the Sulfur content in the Gas combined with strain applied by the exhaust venting, that the Silicone seal between the Flanged Flue Coupling and the boiler Smoke-hood will fail. Therefore, it is important to update the Flue-Pipe Connector and gasket with the parts provided. If the foil faced insulation underneath the Smoke-hood has been damaged, it can be replaced with the piece provided.

<u>Important:</u> The replacement Flue-Pipe Connector comes with a rigid 2" ABS coupling cemented in place verses the rubber MJ coupling that came on the boiler. It is important that the proper cement is used to connect the exhaust pipe to the ABS coupling.

3. <u>Exhaust-Pipe Condensate Drain (If Applicable)</u>

(Note: Only required in applications with excessive amounts of condensate being formed in the exhaust vent pipe)



When operated in the condensing range the Trinity boiler generates a significant amount of condensate. After exiting the boiler more condensate is extracted from the flue gases via the cool walls of the exhaust pipe. If the exhaust vent is considerably long or in a location that is relatively cool, NTI recommends installing a condensate drain tee, complete with trap, close to the exhaust connection of the boiler to evacuate excess condensate formed in the flue pipe (See above figures).

4. Combustion Check

With the boiler operating at the full firing rate perform a combustion analyses by inserting the probe from a combustion analyzer into the flue gases. NTI recommends sampling from the condensate drain or at the exhaust termination. **Note: If the technician chooses to make a hole in the flue pipe, it is his responsibility to ensure it is properly sealed upon completing the test.**

For best performance the combustion results should fall within the following ranges when operating at full firing rate:

Gas	Natural	LP
CO_2 (%)	8-9.5	9-10.5
CO (ppm)	50-150	50-150
Line (Inches H_2O)	4-9	9-12

Before making adjustments to correct the combustion results, it is important to verify that the line pressure is within the above listed specifications while the burner is operating at full firing rate.

If the combustion results fall outside the ranges listed above, correct the gas input to the burner by adjusting the "Gas Input Screw" on the Gas Valve Venturi Manifold, see installation instructions. Turn Input Screw in or clockwise to decrease CO, and CO_2 levels. Contact NTI if combustion results cannot be set according to the table above.

Upon completing combustion test at full fire, operate the burner to the minimum firing rate and ensure that the burner operates smoothly and that the combustion results are within the specifications listed above. The CO concentration should be lower at lower firing rates; if it is higher then 150ppm or the CO_2 is out of spec, contact NTI.

5. <u>Flame Proving Circuit Check</u>

1. Check, and if necessary, adjust combustion to the proper level as per the above.
2. Check flame signal strength at maximum and minimum firing rates. If the signal is lower then 2.0µA at either rate, change the position of the flame probe relative to the flame by removing the flame probe and bending as shown in the figure. When bending of the flame probe is required, start by bending it 1/8" further away from the flame, see diagram.
3. Ensure the heat exchanger is installed level or slightly sloping toward the condensate drain. Also ensure the condensate drain is free flowing. If the condensate drain becomes plugged, moisture will build-up in the heat exchanger causing an electrical short of the flame probe to ground, which results in flame lock-out.
4. Under many operating conditions the combustion chamber will become humid. To reduce the likelihood of the flame probe "shorting" to ground, remove the cement from the base of the flame probe, if it exists, and ensure the flame probe hole is free of debris, which will contribute to the likelihood of a "short".