Thermal Fluid Heaters & Thermal Fluid Vaporizers

BSB 0600-04

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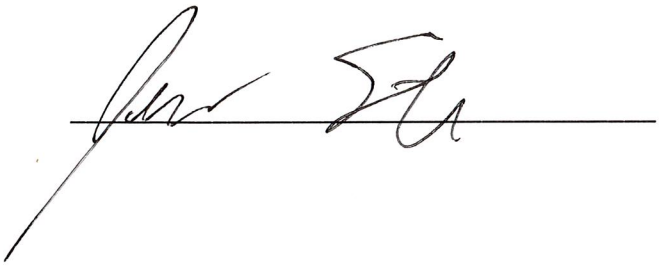

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BOILER SAFETY BUREAU

STANDARD OPERATING PROCEDURE

Division/Bureau: Standards & Inspections/Boiler
Document name: Boiler Procedure 0600-04
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1.0 Purpose

1.1 This procedure provides specific requirements for safety inspections on Thermal Fluid Heaters, and Thermal Fluid Vaporizers. This procedure is not all inclusive and is intended to enhance the NCDOL-BSB and other inspection agencies operating in the state of North Carolina with guidelines for the inspection of these objects.

2.0 Scope

2.1 This procedure applies to jurisdictional items requiring inspection. These items include:

Thermal fluid heater- A closed loop liquid phase heater in which the thermal fluid is heated but no vaporization takes place.

Thermal fluid vaporizer- a heater in which the thermal fluid is vaporized within the pressure system.

Thermal fluid- a fluid, other than water, that is chemically stable over a larger temperature range and is specifically designed for use as a heat transfer fluid.

3.0 Personnel Responsibilities

3.1 The Bureau Chief has the overall responsibility for the implementation of this procedure.

3.2 The Assistant Bureau Chief is designated as the primary document custodian, and is responsible for the control and review of this document.

3.3 All Boiler Safety Bureau personnel are responsible for ensuring that only the most current applicable procedures and attachments are used in the performance of work functions.

4.0 Health and Safety Issues

4.1 This procedure is intended to promote the safety of the inspectors conducting the inspections, as well as that of the employees and public where these objects are located.

5.0 Procedure

5.1 Attachment 1 checklist for this procedure should be utilized to provide guidance for the inspection of these objects.

5.2 Inspection of Thermal Fluid Heaters

5.2.1 An external inspection shall be performed at each certificate inspection. The inspection shall be completed annually while the object is in operation.

5.2.2 An emergency fuel shutoff switch shall be installed per 13 NCAC 13.0420(c)

5.2.3 Pressure gage, visible from the work platform, shall be installed so that it shall indicate the pressure in the heater while in operation. Range of the pressure gage shall conform to 13 NCAC 13.0407.

5.2.4 Temperature gage (Thermometer), visible to the work platform, shall be installed at or near the outlet connection so that it indicates the temperature of the fluid. Range of the temperature gage shall conform to 13 NCAC 13.0410.

5.2.5 A Thermal fluid temperature operation control shall be installed ***that will*** shut down the fuel supply when the system reaches a preset operation temperature.

5.2.6 A High temperature limit safety switch shall be installed on the fluid heater outlet to prevent the thermal fluid from exceeding the maximum allowable temperature of the fluid. The setpoint should be set no higher than the maximum temperature specified by the fluid manufacturer, or heater design, whichever is lowest. The control shall cause a safety shutdown and lockout.

5.2.7 Instrumentation that visibly indicates fluid flow shall be installed to ensure proper flow of the thermal fluid through the heater during operation. Instrumentation that monitors or indicates differential pressure across the heater system may be used and shall be visible and easily read from the operating floor. The instrumentation shall have provisions for shutdown of the heat source to the heater in the event of a low flow condition to prevent overheating during operation.

5.2.8 A drain fitted with a stop valve shall be installed to allow the thermal fluid to be drained when needed.

5.2.9 At least one Pressure relief device (PRD) shall be installed in the upright position, ***(spindle is vertical)***, to prevent over pressurization. The PRD installed shall be suitable for the intended thermal fluid and service. It shall be marked with "PTFH" and be a fully enclosed type with no lifting lever. The inlet connection to the PRD shall not be less than NPS ½ (DN15) and shall be provided with suitable discharge piping. Pressure relief devices shall be removed, inspected, and tested annually, or as provided in NBIC Part 2 ***2.5.8.*** In no case shall the removal, inspection, and testing of the PRD exceed five years.

5.2.10 PRD discharge shall be as short and straight as possible and shall be arranged to avoid undue stress on the PRD. PRD discharge piping shall be designed to provide adequate drainage and prevent the thermal fluid from collecting in the discharge piping flow path or at the outlet of the PRD. The possibility of solidification of fluid leakage into the discharge piping shall be considered.

5.3 Inspection of Thermal Fluid Vaporizers

5.3.1 An external inspection shall be performed at each certificate inspection. The inspection shall be completed annually while the object is in operation.

5.3.2 Thermal fluid vaporizers shall meet the inspection criteria as the Thermal fluid heaters as above in 5.2.2 thru 5.2.5.

5.3.3 A gage glass shall be installed and shall be of the flat glass type with forged steel frames. Gage cocks shall not be used.

5.3.4 A low fluid level switch shall be installed to ensure the appropriate minimum level of fluid in the tank per manufacturer's recommendation. The control shall shutdown the fuel supply if the fluid falls to the lowest visible part of the gage glass.

5.3.5 A suitable drain valve of the globe or angle type may be used instead of the blowoff valve required in ASME B31.1.

5.3.6 At least one PRD shall be installed in the upright position, so the spindle is vertical to prevent over pressurization. The PRD installed shall be suitable for the intended thermal fluid and service. It shall be marked with "PVG" and be a fully enclosed type with no lifting lever. Pressure relief devices shall be removed, inspected, and tested annually.

5.3.7 A rupture disk bearing the ASME Certification Mark with the "UD" may be installed between the PRD and the vaporizer to minimize the loss by leakage of the material. The maximum pressure for the rupture disk shall not exceed the opening set pressure of the PRD or the MAWP of the vaporizer.

5.4 Expansion Tank Requirements

5.4.1 For closed loop systems, an expansion tank shall be installed to prevent volumetric expansion as the temperature of the thermal fluid increases.

5.4.2 The expansion tank shall be connected upstream of the fluid pump and shall be compatible with the thermal fluid, and system design temperatures and pressures.

5.4.3 The expansion tank shall be sized to accommodate the fluid expansion of the entire system.

5.4.4 Expansion tanks that are vented to the atmosphere are not required to be ASME certified or have a PRD installed. These expansion tanks are exempt from inspection.

5.4.5 Expansion tanks that are closed to the atmosphere are required to be constructed to ASME Section 1 or ASME Section VIII, Division 1 with the Certification Mark, unless exempt by NC law. However, in all cases the expansion tank shall be rated for service conditions.

5.4.6 Expansion tanks that are closed the atmosphere shall have:

5.4.6.1 A totally enclosed liquid service PRD in accordance with ASME Section 1 or ASME Section VIII Div. 1. PRD discharge shall conform to 5.5.5 of this procedure.

5.4.6.2 A low fluid level switch to ensure the appropriate minimum level of fluid in the tank per manufacturer's recommendation. The control shall shutdown the pump and burner.

5.4.6.3 A site glass or other liquid-level indicator shall be installed to indicate fluid level in the tank during operation.

5.4.6.4 A drain valve for means of draining the expansion tank to a safe location.

5.5 Thermal Fluid Requirements

5.5.1 Thermal fluids are flammable and leaks within the system can result in damage to the system. The fluid for the system shall be selected by a competent person based off the manufacturers recommendations. A Material Safety Data Sheet (MSDS) shall be available.

5.5.2 Thermal fluids can become more viscous, and solidification of the fluid is possible which prevents sufficient fluid flow through the system.

5.5.3 Thermal fluids shall be clean and in proper condition for operation. Any fluid added to the system must be clean and of the proper specification.

5.5.4 Testing of the thermal fluid shall be completed per the manufacturers guidelines to ensure the condition of the fluid is safe for continued operation.

5.5.5 PRD Discharge of the thermal fluid shall be connected to a closed, vented storage tank with solid piping (no drip pan elbow) and the inlet located to prevent the liquid from siphoning back into the system. The storage tank should be located as close to the system as possible and means for indicating liquid level shall be provided. Capacity of the storage tank should be sized in accordance with the heater manufacturer's recommendation and should consider the volume of the fluid within the system.

6.0 Customer Service Requirements

6.1 This procedure is intended to provide the customer, be it the public, employees of the Bureau, or other State agencies, with the most efficient service, information, training and assistance possible.

7.0 Data and Record Management

7.1 The inspector shall document the inspection, conditions noted, and any violations on the inspection form, BB-101, ***or in the Bureau's inspection database.***

7.2 Fees assessed for the inspection shall conform to 13 NCAC 13.0213.

7.3 Records shall be maintained in accordance with the Functional Schedule for North Carolina State Agencies as adopted by State Archives, a Division of the North Carolina Department of Natural and Cultural Resources.

INSPECTION CHECKLIST FOR THERMAL FLUID HEATERS & VAPORIZERS

NC#: _____ NB#: _____

Name of Manufacturer? _____

What is the MAWP of the vessel? _____

What is the set pressure of the relief valve on the vessel? _____

What is the date of vessel manufacture? _____

	Thermal Fluid Heater	Thermal Fluid Vaporizer	Expansion Tank
Pressure Gage			
Temperature Gage			
Thermal Fluid Temperature control			
High Temperature limit safety switch			
Fluid Flow Instrumentation			
Fluid low level switch			
Gage Glass			
Emergency Stop			
Pressure Relief Device			
Fully Enclosed PRD			
Rupture disk (if applicable)			
PRD inlet greater than ½			
Drain Valve			
Discharge piping*			
No Copper, Copper alloys, brass, bronze, Aluminum, or cast-iron materials			

Thermal Fluid tested per the fluid manufacturer's recommendations?

PRD removed, inspected, and tested annually, ***or in accordance with SOP 0600-04, 5.2.9***?

*Discharge piping shall be connected to a closed vented storage tank with solid piping. If Storage tank is located outside, it shall be located so water cannot collect in the vessel.