

# MSC Guidelines for Fired Thermal Fluid Heaters

Procedure Number: E1-28

Revision Date: April 20, 2018

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## References

- a. 46 CFR Part 52 – Power Boilers
  - b. 46 CFR Part 54 – Pressure Vessels
  - c. 46 CFR Part 63 – Automatic Auxiliary Boilers
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## Contact Information

If you have any questions or comments concerning this document, please contact the Marine Safety Center by e-mail or phone. Please refer to Procedure Number: **E1-28**.

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## Responsibilities

The submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements; this includes a complete bill of materials, component technical data sheets, and arrangement plans. The submission shall be made in triplicate.

The MSC branch chief shall assign the level of review to be conducted. The MSC staff engineer shall conduct the appropriate level of review per this work instruction and submit the associated correspondence to the branch chief for signature.

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## General Guidance

As per the applicable parts of Table 54.01-5(a) in 46 CFR Subchapter F, for all fired thermal fluid heaters, design is addressed in Part 52, and automatic control in Part 63.

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## Design Review (46 CFR 52)

Submit required plans as per 46 CFR 52.01-5. Plans and calculations must be certified by a registered Professional Engineer as meeting 46 CFR Part 52 and Section I of the ASME Code.

- Required items:
    1. Calculations for all pressure components
    2. MAWP
    3. Hydrostatic/Pneumatic testing pressure
    4. Steam capacity
    5. Joint design and method of attachment
    6. Bill of materials meeting ASME Section I and Part 52 as modified
    7. Diagram of assembled components of system
  - Designed, inspected, tested and stamped in accordance with Section I of the ASME Code as modified by 46 CFR Part 52 per 52.01-2.
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## Review of high risk items

- Fusible plugs must comply with 46 CFR 52.01-50.
  - Materials shall meet the requirements in 46 CFR 52.01-90.
  - The design shall comply with 46 CFR 52.01-95.
  - Openings and reinforcements shall comply with 46 CFR 52.01-100.
  - Piping, valves and fittings shall comply with 46 CFR 52.01-105:
    1. Piping within the jurisdiction of the ASME Code shall comply with ASME Code Section I (PG-58 and PG-59) with modifications in 46 CFR 52.01-105.
    2. Piping outside the jurisdiction of the ASME Code shall comply with 46 CFR Part 56 piping requirements.
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- ❑ Water-level indicators and pressure gauges shall comply with 46 CFR 52.01-110:
    1. Check for compliance with ASME Code Section I. (PG-60)
    2. Modifications shall comply with 46 CFR 52.02-110.
  - ❑ Safety valves and safety relief valves shall comply with 46 CFR 52.01-120.
  - ❑ Special requirements for boilers fabricated by welding, per 46 CFR Subpart 52.05:
    1. Boilers fabricated by welding shall comply with ASME Section I. (PW-1 through PW-54)
    2. Boilers and components shall be heat treated per PW-38 and PW-39. (46 CFR 52.02-15)
    3. Radiographic & ultrasonic examination shall comply with 46 CFR 52.05-20.
    4. Attachment welds shall comply with 46 CFR 52.05-30.
    5. Circumferential joints in pipes, tubes and headers shall comply with 46 CFR 52.05-45.
  - ❑ Fire heated thermal fluid heaters must be fitted with a control which prevents the heat transfer fluid from being heated above its flash point. (46 CFR 52.25-15(b))
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## **Review of calculations, documentation and installation details**

- ❑ Review design calculations and verify that the calculations are correct (in accordance with ASME Section I and ANSI B31.1).
  - ❑ Manufacturer's data report shall be available to the Marine Inspector as per 46 CFR 52.01-145.
  - ❑ Certification by stamping: All boilers shall be stamped for compliance with the ASME Code as required by 46 CFR 52.01-140.
  - ❑ Boiler support details shall be approved by the OCMI per 46 CFR 52.01-130:
    1. At least 18" distance between TFH and deck.
    2. At least 24" between back of boiler and fuel compartment.
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## **Controls and test procedures review (46 CFR 63)**

- ❑ Submittal of test procedures and certification report as per 46 CFR 63.10-1 must include:
    1. Detailed instructions for operationally testing each automatic auxiliary boiler, its controls, and safety devices.
    2. A certification report by the manufacturer for each automatic auxiliary boiler containing:
      - a. A statement that the system complies with CG-510 of ANSI/ASME CSD-1-2004, “Controls and Safety Devices for Automatically Fired Boilers.”
      - b. A statement that the boiler system complies with the control and safety device requirements in 46 CFR Part 63.
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## **Controls**

- ❑ An electric control used to shut down the boiler shall comply with 46 CFR 58.01-25. Fuel supply must be stopped to the fuel burning equipment. (46 CFR 63.15-1(d))
- ❑ Mercury tube actuated controls are prohibited. (46 CFR 63.15-1(e))
- ❑ Following emergency safety trip, air-flow to the boiler must not automatically increase. Post purge must be accomplished manually. (46 CFR 63.20-1(a))
- ❑ Low fire interlock must insure low fire start when variable firing rates are used. (46 CFR 63.20-1(b))
- ❑ Water level controls and low water cutoff controls shall comply with 46 CFR 63.20-1(c).
- ❑ Alarms shall comply with the requirements of 46 CFR 63.15-7.

## **Fuel System (46 CFR 63.15-3)**

- ❑ Fuel oil piping shall comply with 46 CFR 56.50-65.
  - ❑ Materials shall comply with 46 CFR Part 56. Cast iron, malleable iron other heat sensitive materials (including bronze) are prohibited.
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- ❑ Piping shall comply with pressure classification design criteria found in 46 CFR 56.04-2.
- ❑ Fuel pumps shall meet the performance and test requirements of ANSI/UL 343.
- ❑ Fuel heating devices are permitted provided a high temperature limit device is installed per 46 CFR 63.15-3.
- ❑ Natural gas fuel is prohibited unless specifically approved by the MSC.
- ❑ Strainers shall be installed in the fuel supply line. (46 CFR 63.15-5)

**Small Automatic Auxiliary Boilers** (<400,000 Btu/hr) shall meet the following additional requirements (46 CFR 63.25-1):

- ❑ Visual indicators indicating when the low water cutoff is activated shall be provided.
  - ❑ An air pre-purge cycle of 4 changes in the combustion chamber and stack shall be provided. This cycle shall not be less than 15 seconds. Ignition must occur only before or simultaneously with the opening of the fuel valve.
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## **Piping System** (46 CFR 56)

General requirements for piping that fall outside those found within Part 52.

- ❑ Pipe maximum allowable working pressure (MAWP) shall not be greater than the internal design pressure calculated using ANSI-B31.1.
  - ❑ System MAWP shall be designed to the lowest component's MAWP. (46 CFR 56.07-10(a))
  - ❑ The pressure design of piping components shall comply with the material requirements of 46 CFR 56.07-10(e). Material selection shall meet 46 CFR 56.60-1(a) with allowable stresses indicated in ANSI-B31.1. The temperature of the material for allowable stress determination shall be the system maximum operating temperature.
  - ❑ The design pressure of steam piping connected to the heater shall not be less than the safety valve pressure setting per 46 CFR 56.50-15.
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- ❑ Steam piping (except for heating) may not pass through passageways, accommodation spaces, or public spaces.
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## Additional General Requirements

- ❑ Installation tests for piping systems shall comply with the requirements of 46 CFR 56.97-40.
  - ❑ All components shall operate satisfactorily in the marine environment with a momentary roll of 30°, a list of 15° and permanent trim of 5° with it installed in a position as specified by the manufacturer. (46 CFR 63.15-1)
  - ❑ Inspection and testing of the boiler shall meet Part 61. (46 CFR 63.15-9)
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## Plan Approval Extension

- ❑ On a case-by-case basis, the Marine Safety Center may endorse previously approved plans for extension to another vessel. Plan approval extension requests must be made by the recipient of the original approval and/or owner of the original plans.
  - ❑ Requests must include the original approval letter, a list of plans to be extended, the certification required by 46 CFR 50.20-15, and a new certification and reporting statement that satisfies 46 CFR 63.10-1.
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## Disclaimer:

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the Marine Safety Center (MSC), the unit responsible for implementing this guidance.

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