



SAFETY ASSESSMENT  
FEDERATION

# Guidance

Completing in service examination  
(working/supplementary) on shell  
type boilers with multiple fuels

REFERENCE: PEC 12  
ISSUE: 03  
DATE: 14/12/2022

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**DOCUMENT INFORMATION:**

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<b>REFERENCE:</b>	PEC 12
<b>ISSUE:</b>	03
<b>DATE:</b>	14/12/2022
<b>PREPARED BY:</b>	Pressure Equipment Technical Committee (TC 1)
<b>APPROVED BY:</b>	TC 1

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**DOCUMENT HISTORY RECORD:**

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<b>ISSUE:</b>	<b>DATE:</b>	<b>CHANGE DETAIL:</b>
02	27/04/2021	Document review
03	14/12/2022	Now includes multi fuel boilers

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## SITUATION

The testing of shell type boiler protection after the out of service examination is an essential part of the certification of the plant for further use. However, it can be common practice that when testing the flame failure device for burners operating on dual fuels the functional test is completed on the primary fuel only. This could affect the safety of the boiler as the device is not tested on the secondary fuel. Additionally, accumulation tests would normally be carried out using the primary fuel.

## GUIDANCE

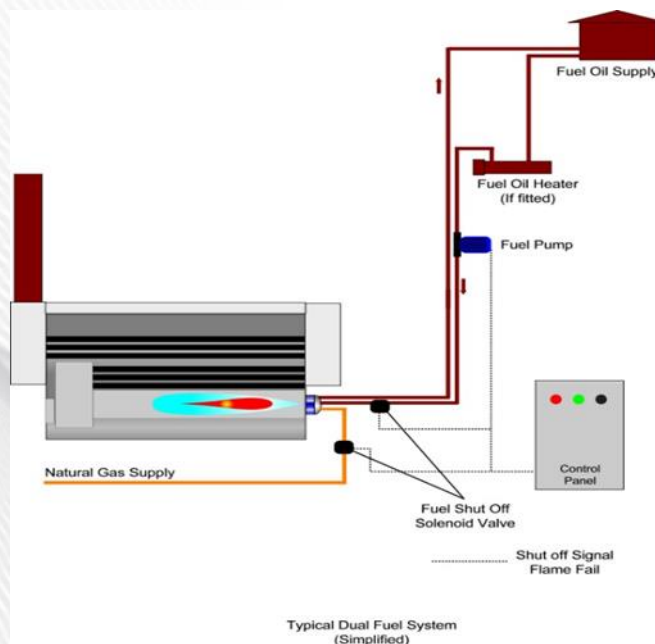
This document gives guidance on:

- The in-service testing of flame failure devices with dual fuel firing
- Accumulation testing of dual fuel boilers

### 1. Flame failure testing on dual fuel boilers

The most common type of burner fuel combination is the natural gas and oil. Other fuels may need to be considered such as waste.

A range of boilers exists that are configured to handle waste heat from generators (e.g. reciprocating gas engines) in addition to the primary fuel. The waste heat is often processed in a separate tube bank in the shell boiler to the ones containing the primary fuel. These can be found in biogas or energy-from-waste plant and are termed Composite Boilers.



The testing of the flame failure device on one fuel should cut off the fuel supply to both fuel systems. However, though the trip circuit is often the same, each fuel will have its own solenoid valve to stop the flow of fuel to the burner. Due to the duplication of the valves, it is possible that the solenoid on the fuel not in use may not function correctly in service and this could lead to a dangerous situation if the user of the plant starts to use the alternative fuel.

For Composite Boilers the flame failure test should also confirm that all heat sources to the boiler are put into a safe condition (e.g. Tripped, lockout, diverter valve, etc).

The Competent Person (Inspection) should have the user simulate a flame failure with the primary fuel and ensure that the unit shuts down correctly and that the burners go to the lock out condition. The Competent Person should then ask the user to demonstrate that the secondary fuel supply has been shut off.

**Note:** An electrical test may not prove that the valve closes mechanically. If this cannot be demonstrated then the flame failure circuit should be re-tested by the user when the boiler is operating on the secondary fuel.

## 2. Accumulation testing of dual fuel boilers.

Dependent on the type and configuration of the boiler, if accumulation testing is required then consideration should be made to ensure the superheater isn't overheated and, if necessary, control measures put in place to prevent damage. Accumulation tests need not be carried out on a routine basis at each in-service examination. Accumulation tests should be carried out when:

- A. A new safety valve is installed.
- B. A change has been made to the safety valve discharge pipework.
- C. Changes to the firing system have been made.
- D. Additional or improved insulation has been fitted.

The basis for requiring an accumulation test is where any change to the steam generating capacity of the boiler or relief capacity of the safety valve(s) may affect their ability to protect the system.

An accumulation test may attract the attention of anyone working in the area due to the prolonged discharge of steam from the safety valve(s). Ensure that other people in the vicinity of the boiler under test are aware of the test and where required precautions taken to ensure their safety.

The Competent Person should ensure that the user knows that the test must be completed with the boiler operating on the fuel that gives the highest evaporative rate.

Check that the discharge pipework is fitted with suitable supports to carry the reaction forces when the valve opens.

Prior to carrying out the accumulation test it should be proven that the water level alarms and gauge glasses operate correctly and that the burner will shut off safely if the second low level alarm is triggered.

The accumulation test should be carried out with the boiler under full firing conditions, the stop (crown) valve closed, the feed pump stopped and the correct water level within the boiler.

The boiler water level must be safely maintained above low water level and feed water may need to be supplied to the boiler during the test. The amount of water supplied should be the minimum required to maintain a safe working level.

The safety valve should start to open at or below the safe operating limit. The firing should continue until there is no further increase in pressure or until the boiler pressure rises to the maximum accumulation permitted by the design code (e.g. 110% of the Safe Operating Limit for boilers to BS EN 12953, however ASME I power boilers are limited to 106%).

Generally, the test should not run for longer than 15 minutes to prevent damage to the safety valve. A maximum pressure rise, after the initial lift at the set point, of less than the maximum code permissible value above the safe operating limit means the accumulation test is acceptable.

Failure of the accumulation test will require changes to the relief capacities/pipework arrangement or adjustment of the burner.

Some plant may need careful consideration when determining the maximum heat input for test purposes. Where gas firing is used as a supplementary fuel with a waste heat boiler the maximum steam generation will occur with both systems operating.