

# ELECTRICALLY HEATED BOILERS AND THEIR OPERATION



Occupational Safety and Health Branch  
Labour Department

# ELECTRICALLY HEATED BOILERS AND THEIR OPERATION

Owners of electrically heated boilers must take note of the following when using the boilers:

- The boilers must be registered with the Boilers and Pressure Vessels Division (BPVD) of the Labour Department (LD).
- The boilers must be inspected periodically for safe operation.
- All boilers must be issued with valid certificates of fitness.
- The operation of the boilers must be under the direct supervision of a competent person.

## Registration and Examination

The owner must apply to the BPVD of the LD for registration of the boiler, and to obtain a registration number, at least 30 days before putting the boiler into operation.

Before a boiler is put into use, the boiler and its accessories must be inspected by an appointed examiner. The safety valve must be properly sealed and a certificate of fitness is required.

The boiler must be properly maintained and inspected by an appointed examiner every 14 months. Re-issuance of a certificate of fitness is required. Operating a boiler without a valid certificate of fitness is an offence and the owner on conviction is liable to a maximum fine of HK\$50,000.

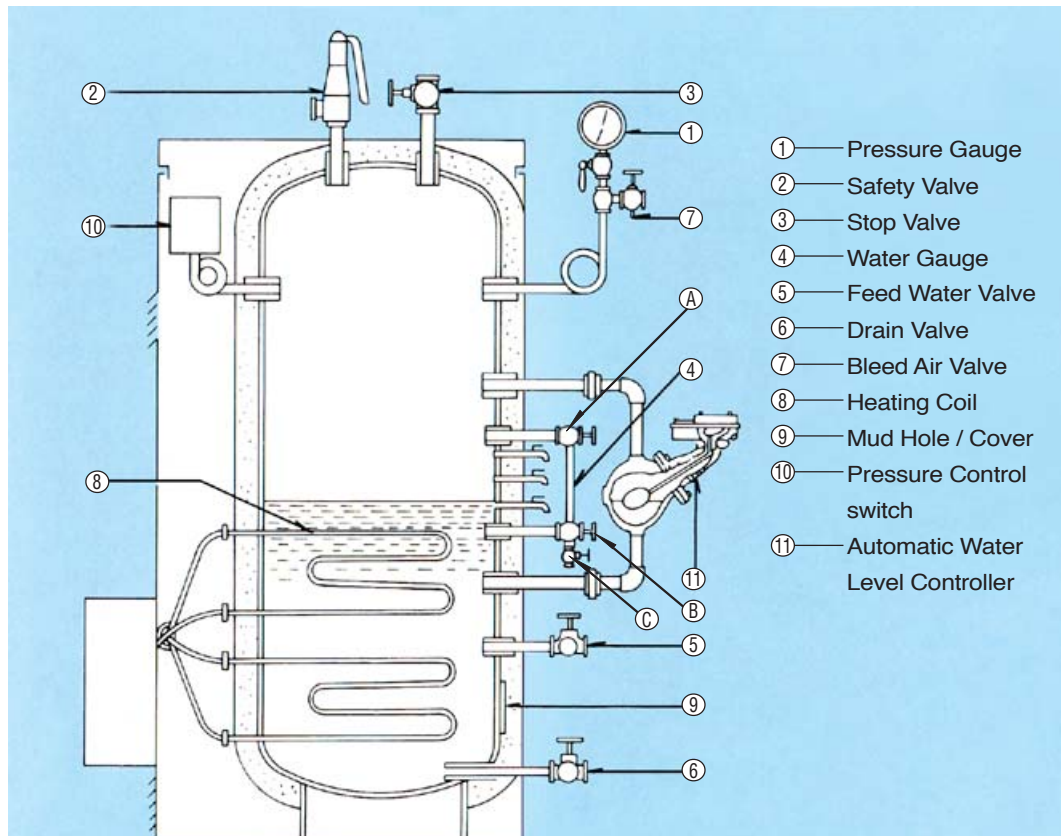
## Competent Person

An operating boiler will generate high-pressure steam. If the boiler is not properly managed and maintained, it can lead to serious accidents with loss of lives and property. Therefore, the Boilers and Pressure Vessels Ordinance (BPVO) stipulates that only a competent person issued with a certificate of competency by the BPVD of the LD is eligible for operating boilers.

Under Section 49 of the BPVO, operating a boiler without the direct supervision of a competent person is an offence. The owner is liable to be prosecuted subject to a fine up to HK\$50,000.

## Electrically Heated Boilers and their major accessories

Electrically heated boilers use electric heating coils to boil water into high-pressure steam. This kind



Automatically Controlled Filament Type Electric Steam Boiler

of boilers can be classified into the automatically controlled and the manually controlled types. Basically, the designs are similar with some common types of accessories, such as the safety valve, pressure gauge, water gauge, valves, pressure switch and low water level alarm.

The main difference between the two types of boilers is that the automatically controlled boiler features an automatic water level and steam pressure control system.

## Operation of Electrically Heated Boilers

### ● Starting up

1. Check the validity of the certificate of fitness and ensure that the maximum permissible working pressure (MPWP) of the boiler is the same as that indicated on the pressure gauge by a red line.
2. Check that the drain valve is closed.
3. Open the water cock and the steam cock of the water gauge and close the drain cock.
4. Open the water inlet valve of the water tank. The water level should remain at above half-gauge level automatically.
5. The filter of the feed water system should be removed regularly for checking and cleaning.
6. Shut the steam outlet stop valve and open the air vent.
7. Turn on the power switch. The water pump will automatically pump water to about half-gauge level (it will stop pumping automatically).

If the boiler is the manually controlled type, the water pump shall be manually controlled by a competent person.

8. Switch on the heater at low heating rate. The boiler will generate steam gradually when the electric current flows through the conductor.
9. Shut the air vent when steam comes out of the air vent. Switch to high heating rate. The steam pressure will gradually increase to the working pressure level.
10. Check the water gauge, the safety valve and each automatic controller to ensure that they are in good working conditions.
11. The steam outlet stop valve can now be opened to supply steam. Be careful to open the valve slowly. The condensate inside the steam pipe should be drained to prevent water hammering.

### ● Testing of water gauge

Under normal conditions, the steam cock (cock A) and the water cock (cock B) should remain open with the drain cock (cock C) in closed position.

1. Open cock C. Cock C is not clogged if steam and water come out from it smoothly.
2. Close cock A and open cocks B and C. Cock B is not clogged if water comes out from cock C smoothly.

3. Close cock B and open cocks A and C. Cock A is not clogged if steam comes out from cock C smoothly.

If all the cocks are unclogged, the water gauge is in normal working condition.

### ● Causes of "false water level" indication

1. If cock A or the steam pipe is shut or clogged, the steam pressure inside the boiler will push up the water level of the water gauge so that it is higher than the actual water level of the boiler. At this point of time, the water gauge is not showing the correct water level. The phenomenon is known as "false water level" indication.
2. If cock B or the water pipe is shut or clogged, steam will condense inside the upper part of the glass tube of the water level gauge. At this point of time, the water gauge is not showing the correct water level, resulting in "false water level" indication.

The water gauge is very important to the safe operation of the boiler. It should be frequently tested, especially during shift change.

### ● Steam pressure relief testing of the safety valve

1. Close the steam outlet stop valve.
2. Adjust the steam pressure switch so that the pressure is higher than the relief pressure.

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3. Switch to high power and watch the pressure gauge. When the MPWP is reached, the safety valve should open automatically to release steam. This indicates that the safety valve is in proper functioning condition. (MPWP is shown in the certificate of fitness.)
  4. If the safety valve does not open automatically when the MPWP is exceeded, the boiler must be shut down immediately. The lifting gear should be used to release the steam and reduce the pressure inside the boiler. At the same time, notify an appointed examiner to inspect the boiler.

#### ● **Testing of pressure switch**

The pressure cut off switch should be frequently tested to ensure that it is in good order. Close the steam outlet stop valve to allow the steam pressure to build up to the preset level. Check that the pressure switch whether it can effectively cut off the electric current for the heating coil.

#### ● **Testing of low water level cut off switch**

This switch also requires frequent testing to ensure proper functioning. Shut down the water pump. Let the column of water inside the boiler drain out through the water gauge drain valve to lower the water level. Check whether the switch can effectively cut off the electric current for the heating coil.

#### ● **Points to note when using electrically heated boilers:**

1. Accidental contact with a boiler with electric leakage or a short circuit will result in electric shock which can be fatal. The risk of electric shock is particularly high in the case of wet conditions or insulation failure.
2. The insulation of the electric circuit of the boiler should be kept in good condition. Pay attention to the extent of abrasive wear, fracture and damage. An insulation test should be conducted when necessary to ensure that the motor is without leakage.
3. Earth wires should be connected properly.

#### **Handling of boiler fire**

1. Raise the fire alarm or call for help. Notify the factory staff of the fire.
2. Turn off the main power switch of the boiler room immediately. Shut down the boiler and the fans/exhaust fans.
3. Find out what causes the fire. A fire sparked off by electric leakage can be put out by a fire extinguisher suitable for such purpose. If it is a fuel fire, the appropriate fire extinguisher should be used.

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## Points to note for owners and workers:

- No worker is allowed to operate a boiler without a certificate of competency.
- Do not remove the lead seal of the safety valve randomly or attempt to adjust the setting of the safety valve to increase the steam pressure. Such dangerous acts can cause the boiler to get overloaded and explode, resulting in injuries and deaths.
- In case an accident happens to a boiler or its accessories with the risk of loss of life or property, the boiler must be shut down immediately. The owner should report the accident to the Authority within 24 hours, otherwise he is liable to prosecution and a maximum fine of HK\$10,000.

For other enquiries such as application for certificate of competency, boiler registration and safe operation of boilers, please contact the BPVD of the LD at:

### **Boilers and Pressure Vessels Division**

**Unit 01-02, 20/F, Millenium City 6,  
392 Kwun Tong Road, Kwun Tong,  
Kowloon**

**Telephone: 3107 3458**

## Complaints

If you have any complaints about unsafe workplaces and practices, please call the LD's occupational safety and health complaint hotline at 2542 2172.

