



Cochrane Engineering



Cochrane Engineering (Pvt) Ltd

HV ELECTRIC BOILER

A TECHNICAL
OVERVIEW OF THE
HIGH VOLTAGE
ELECTRODE BOILER



THE BOILER IS FULLY
AUTOMATIC, AND
REQUIRES MINIMAL
OPERATOR INPUT.

OVERVIEW & BENEFITS

The High Voltage (HV) boilers are constructed to cater for voltages up to 15KV and for a power output ranging from 6 to 50 MW, (that is approximately 9 to 75 ton/hour of steam). Standard operating pressures are 15 and 25 bar, though designs up to 32 bar gauge are possible. The boilers are constructed with a high resistance neutral point as the inner vessel is insulated from the pressure vessel.

The construction and main features of the boiler are illustrated in fig. 1. Inside the pressure vessel (item 1) there is an open tank (item 2) mounted on top of insulators. The Electrodes extend down into this tank and it is there that steam is generated. The Electrodes are fixed and the steam output is regulated by the changing water level.

The bottom dished end of the pressure vessel acts as a water storage container. This water is continually pumped up into the inner vessel by the circulation pump (item 4). Water which is not evaporated runs back into the outer vessel through a control valve (item 5). The level in the inner tank is regulated with this valve.

BENEFITS

- **The boiler itself is small in size**, allowing it to fit into a building with the plan area of your garage rather than a multi-story building.
- **Operating the boiler is simple and clean**, the floor will not be damaged and the most noise in the boiler room will come from the circulating and boiler feed water pumps. There is no coal handling, and associated dust, as well as no emissions of the green house gasses, grits and acid gasses.
- **The boiler can be started quickly**. From a cold boiler you can have a full head of 10 bar steam in 90 mins.
- **Inspection requirements are greatly simplified, and maintenance straightforward**, so that the availability of this steam boiler plant is high.
- **The boiler is up to 99% efficient**, the only losses being by heat conduction from the boiler pressure vessel shell.
- **The steam is of high quality**.
- **The boiler has an excellent response to load**. the plant can decrease the load by 30% per minute, and the boiler will regulate accurately maintaining pressure. The boiler will automatically increase load at the rate of 10% per minute.
- **The turndown ratio is particularly attractive**, as the boiler can be turned down as standard to 5% of the rated capacity and still maintain its high efficiency.
- **Safety**. The boiler pressure is inherently safe, unlike most other boiler types. If there is no water in the boiler, no current is passed through the electrodes, and there is no steam produced. There is no possibility of overheating taking place.

The boiler is earth protected, and the high voltage cable connections are within a locked cage. This can be further isolated.

The voltage supply is usually 11 Kv.

There are two pressure switches that trip the main breaker if the pressure rises above the control limits, as well as two safety valves along with regulation codes.

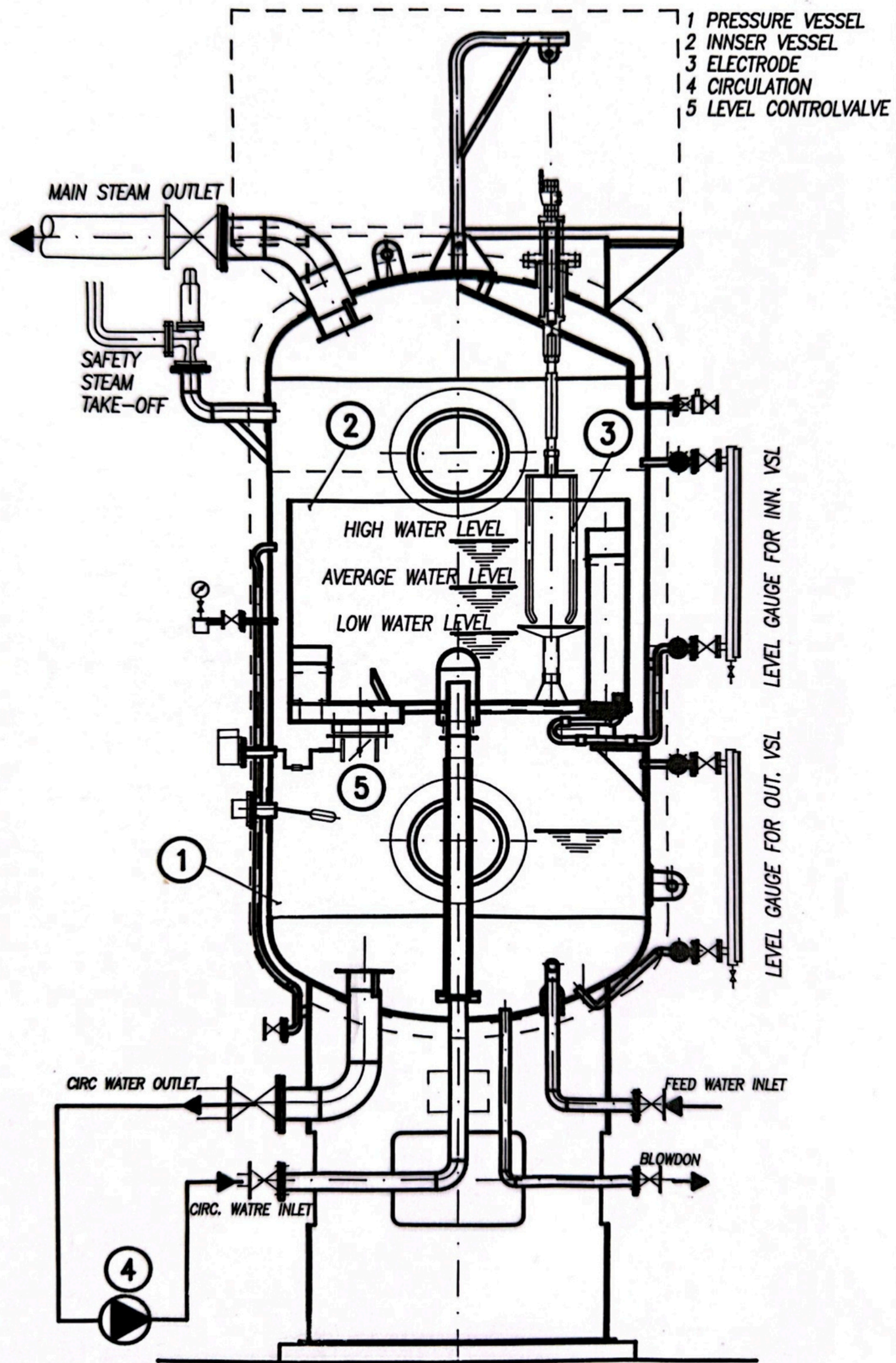
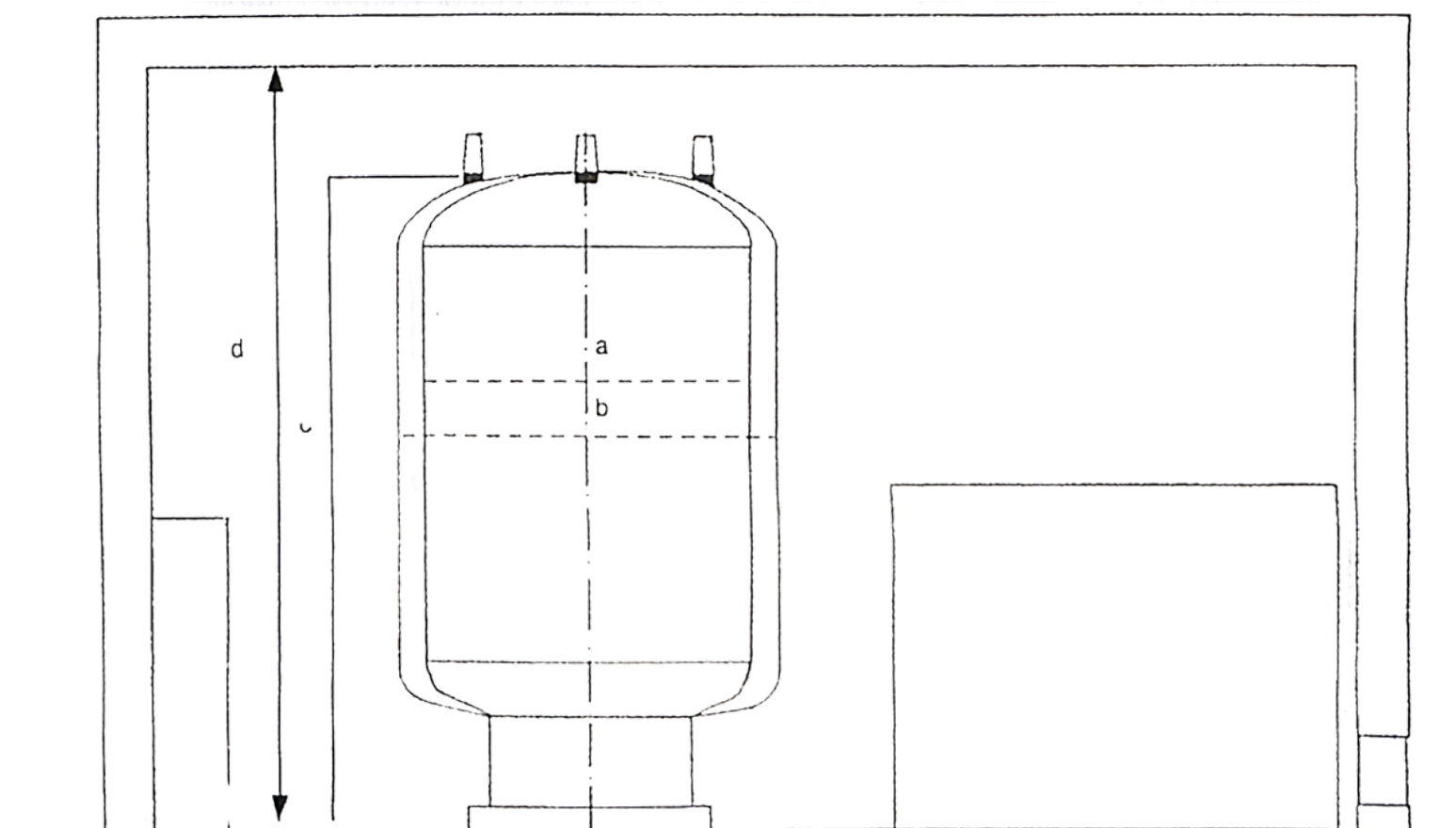


FIG.1 - HIGH VOLTAGE BOILER

CIRCULATING PUMP FOR ELECTRODE BOILER

Main Data

OUTPUT, MW	6	12	16	20	25	35	42	50
MAKE								
TYPE								
Diameter, mm - a	1800	2000	2100	2200	2500	2700	3000	3300
- b	2000	2300	2400	2500	2800	3000	3300	3600
Height, mm - c	3300	4900	5400	5500	5500	5900	6200	6200
- d (1)	5300	6900	7400	7500	7500	7900	8200	8200
Transport weight (2) (tonnes)	3,0	5,0	6,0	7,0	8,5	10	12	15
Pressure test weight (2) (tonnes)	8	18	22	24	32	40	45	55
(1) Applies to boilers with design pressure of about 12 bar. 10, 15 & 17 Bar also available. (2) Recommended ceiling height. Can be reduced.								



Boiler Comparison

Comparison of say a 20 MW, 30 T/hour 10 bar boiler						
Parameter	Fossil fuel fired boilers				Element	Electrode
	Fire tube			Water tube		
	Coal	Oil	Gas	Coal		
Maintenance outages	Regular	Better			Good	Minimal
Size of boiler	Large	Smaller	Very large		< 2 MW	Compact
Refractory maintenance <i>After sale</i>	Considerable				None	
Start up from cold (hours)	8 to 12	6 to 8	6 to 8	5	1.5	1.5
Response to load variations	Slow	Better		20% per min.	Difficult	30% per min.
Control range (%) <i>% of capacity</i>	35 to 100			15 to 100	In steps	5 to 100
Thermal efficiency (%)	75	80	85	90	95	99
Safety	Low water level danger					Safe
Steam quality	Carry over possible			Good	< 2 MW	Good

Head Office

49 Tilbury road,
Willowvale, Harare.

Contact us

engineering@cochrane.co.zw
+263 772 140 982/7



Over

65 years
experience