

# High Voltage Jet Type Electrode Steam Boilers

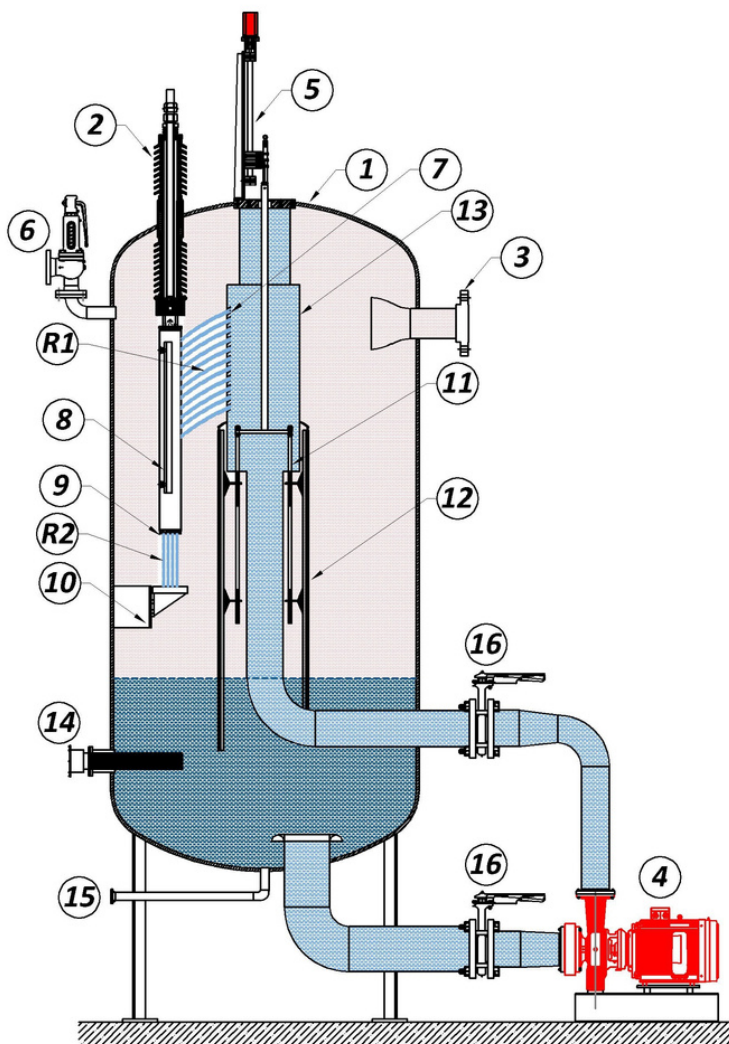
## 4.16 KV to 25 KV

### EXCLUSIVE FEATURES

- ACME has been manufacturing the CEJS high voltage jet boilers since 1980.
- These custom built, high quality boilers incorporate many unique design features.
- The CEJS range is from 6MW to 53MW, at voltages up to 25 kV, 3 phase, 4-wire,
- The standard power feed includes both inside and outside insulators and quartz tubing, all rated for 25KV and used no matter the voltage of the boiler.
- The jet nozzles include guiding vanes for the definition of the jets, both at upper and lower levels.
- The reversible target plates are enclosed in a box in order to avoid splashing which could lead to a short circuit.
- The CEJS requires only 4 loops of control, three of which could be preset.
- Capacity control is 0-100% and full power can be reached from hot standby in approximately 1 minute.
- The CEJS operates at high conductivity leading to reduced blowdown percentages.



## Model CEJS cross sectional diagram



1	Pressure Vessel
2	Power Passages
3	Steam Outlet
4	Recirculation Pump
5	Motorized Drive System
6	Pressure Safety Valves
7	Nozzle Stock
8	Electrode Target Plate
9	Nozzle Plate
10	Counter Electrode
11	Control Sleeve
12	Control Linkage
13	Collection Pipe
14	Stand-by Heater
15	Bottom Blowdown/Drain
16	Isolating Valves
R1	Current Path
R2	Current Path

## Operation Principles for Electrode Boilers

Electrode boilers utilize the conductive and resistive properties of water to carry electric current and generate steam. An A.C. current flows from an electrode of one phase to the neutral. The second jet flows from the electrode to the counter electrode.

Since the water has electrical resistance, the current flows generate heat directly in the water itself. The more current (amps) that flows, the more heat (BTU) is generated, and more steam is produced. Almost 100% of the electrical energy is converted into heat with no stack or heat transfer losses.

Low water protection is absolute since the absence of water prevents current from flowing and the electrode boiler from producing steam.

Unlike conventional electric boilers or fossil fuel boilers, nothing in the electrode boiler is at a higher temperature than the steam produced itself.

There is *no loss* in conversion efficiency, however, and simply cleaning the electrodes will restore full boiler capacity. There can be no heat build-up in the electrodes, therefore, no electrode burnout, and no danger to the boiler itself.

## How the Model CEJS works

Water from the lower part of the boiler is pumped by the recirculation pump (4) up the collection pipe (13) to the nozzle stock (7). The water is forced through the jets of the nozzle stock to strike the electrode target plate (8) creating an electrical current path (R1). The unevaporated water flows from the electrode through the nozzle plate (9) to strike the counter electrode (10), creating a second current path (R2). Control of the boiler output is accomplished by raising or lowering the control sleeve (11) which diverts the water from selected jets directly back to the lower portion of the boiler. The control sleeve is moved electrically by the control motorized drive system (5) which, in turn, is positioned by the electric motor according to boiler pressure and load control system. This control system will hold steam pressure and match boiler output to system requirements.

The stand-by heater (14) is used to maintain the water temperature at a pre-set level in order to reduce start-up time.

A proportioning feedwater regulator (not shown) maintains a constant water level in the boiler. A load monitoring system prevents the electric demand from exceeding boiler capacity and enables the boiler to be manually set at levels lower than its full kw rating.

The boiler is also controlled by an automatic demand control system.

To shut off the boiler simply stop the recirculation pump.



# SELECTION TABLE FOR JET TYPE ELECTRODE STEAM BOILERS

Model No.	Max. KW at 125 psig			Lbs/Hr based on feed water at 212°F		
	6.9 KV	13.8 KV	25 KV	6.9 KV	13.8 KV	25 KV
600	1,500	6,000	7,500	5,050	20,400	25,500
900	2,250	9,000	9,400	7,550	30,600	32,000
1,200	3,000	12,000	12,400	10,100	40,800	42,160
1,800	4,500	18,000	18,800	15,100	61,200	64,000
2,400	6,000	24,000	28,800	20,150	81,600	96,000
3,000	7,500	30,000	32,000	25,200	102,000	108,800
3,600	9,000	36,000	37,600	30,200	122,400	127,900
4,200	10,500	42,000	47,000	35,300	142,800	160,000
5,000	-	-	53,000	-	-	180,200

*Other voltages are available on request.*

## Performance

### High Performance

Converts almost 100% of the electrical energy into heat. Rapid response achieves full load within 15-20 minutes from cold start; within *one minute* from hot start. Automatic load and pressure controls provide linear control over the full output range, from 0 to 100% to match output to system requirements.

### Economical Installation

Fuel lines, storage and handling equipment, economizers, and emission control equipment are not required, saving on capital expenditures.

### Lower Operating Costs

Simple to operate and maintain, *all* electrical energy is converted to heat. Automatic controls reduce the requirement for dedicated operating personnel. No complex pollution or combustion control equipment to operate and maintain.



View from bottom of Boiler  
with 9 Electrode Boxes



Parallel Water Jets - from Nozzle Stock  
to Electrode Target Plates

### Solves Energy Problems

For areas affected by allocations or interruptions of natural gas and costly oil supplies, electrode boilers provide a dependable source of steam. Offers a clean, easier-to-use alternative to fossil fuels. Allows users to take advantage of lower energy rates during daily or seasonal off-peak periods.

### Safer Operations

No combustion hazards because there are no flames, fumes, fuel lines, or storage tanks. No low water danger since the current cannot flow without water. No problems with heat buildup or electrode burnout even if scaling should occur. Thermal shock is eliminated.

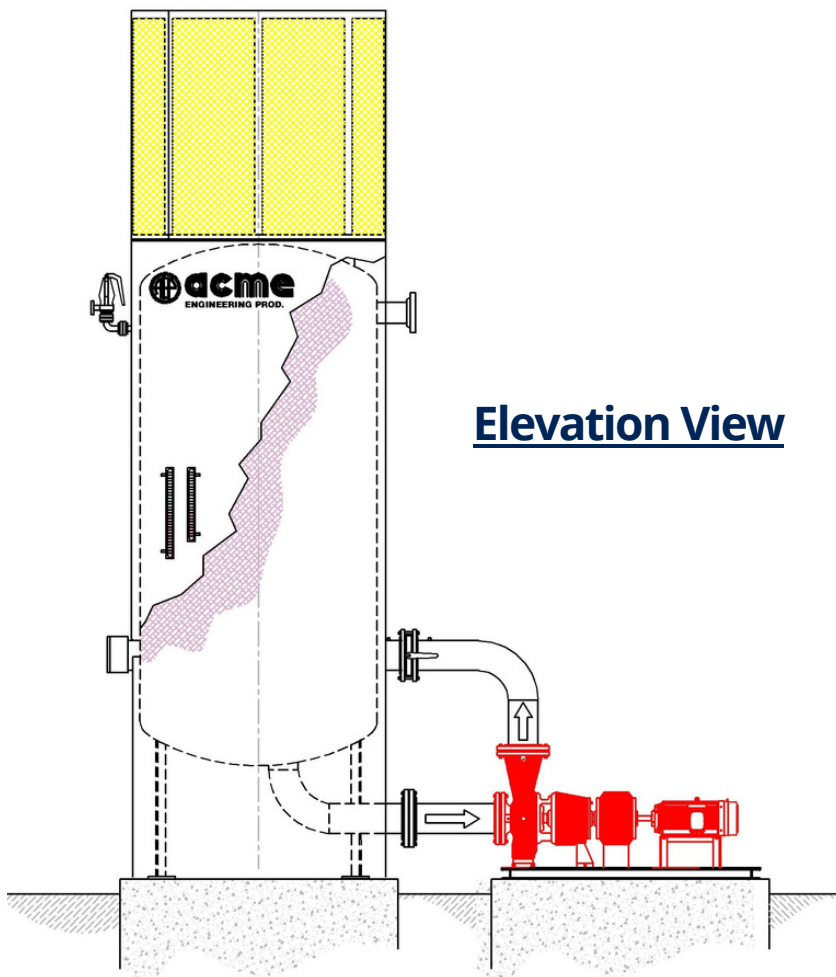
### Minimal Maintenance

The absence of excessive temperatures and burnout assures long operating life. Electrode boilers have a minimum number of components and electrical controls. With fewer parts and no fuel residues, cleaning and maintenance requirements are reduced. A simple control system provides maximum reliability.

### Pollution-Free

Without combustion, the operation of the CEJS boilers is quiet, clean, and emissions-free. Problems associated with other energy sources such as noise, fuel fumes, fly ash, large stacks, do not exist for ACME Electrode Boilers.

# STANDARD EQUIPMENT FOR MODEL CEJS



**Elevation View**

## Mechanical

- Pressure vessel, A.S.M.E. design, CRN - pressure vessel registration certificate.
- Manway.
- Sheet metal jacket and thermal insulation.
- Boiler recirculation pump.
- Water column and sight gauge.
- Cage surrounding high voltage connections.

## Plumbing

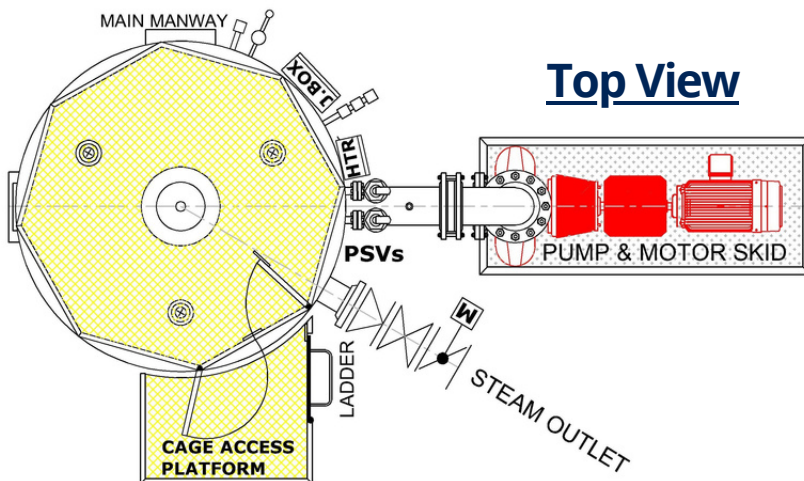
- Steam valve, stop and check.
- Back pressure regulating valve.
- Safety valve(s).
- Surface blowdown valves.
- Chemical feed fitting.
- Modulating feedwater valve, with stop valve and check valve.
- Flow control valve for conductivity sampling line.
- Boiler blowdown valve(s).
- Boiler vent line.

## Control

- Free standing control panel.
- Pre-programmed electronic processor.
- Shield position indicator HMI.
- Boiler pressure gauge.
- System pressure gauge.
- Operating pressure control.
- High-pressure limit.
- Water level controller.
- High and low water cut-offs.

## Optional Items

- Interconnections with supply circuit switchgear.
- Special valves.
- Special instrumentation.
- Chemical feed systems.
- Steam separators.
- Water treatment equipment.
- Higher steam pressures.
- Superheater.
- Separator.
- Deaerator.
- Feed water system.
- Blowdown tank.
- Heat-exchangers, steam to water.
- Steam injectors system.



**Top View**



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