

# PACKAGE & FIELD ERECTED BOILER BURNER WORKSHOP

*Presented by*

*Zeeco Power Group – Zeeco Connecticut*



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# Package Boilers



What is a “Package Boiler”?

A fully shop-fabricated boiler which is shipped complete to a site via semi-truck or railcar

- Fan, safety valves and other appurtenances may be field assembled
- Boiler width is fairly standard and restricted to some degree
  - Capacity is obtained by lengthening the boiler/furnace

# Package Boilers



There are several types and configurations of Package Boilers

- Fire-tube
- Water-tube
  - Marine Boilers
- Hot Water Generators
- Fired Air Heaters

# Fire-Tube Boilers

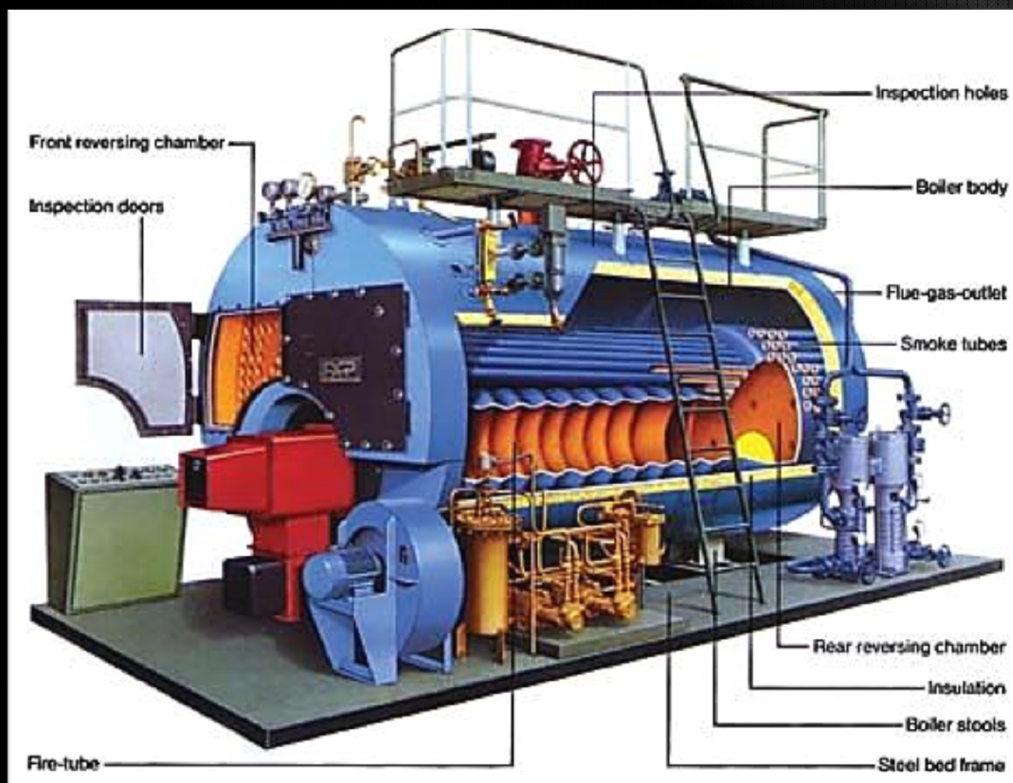


These are generally small boilers with ratings typically between 250 and 500 horse power

The notable thing with fire-tube boilers is that the hot combustion gases pass through the inside of the tubes which are surrounded by boiler water

By design cannot contain superheater surfaces

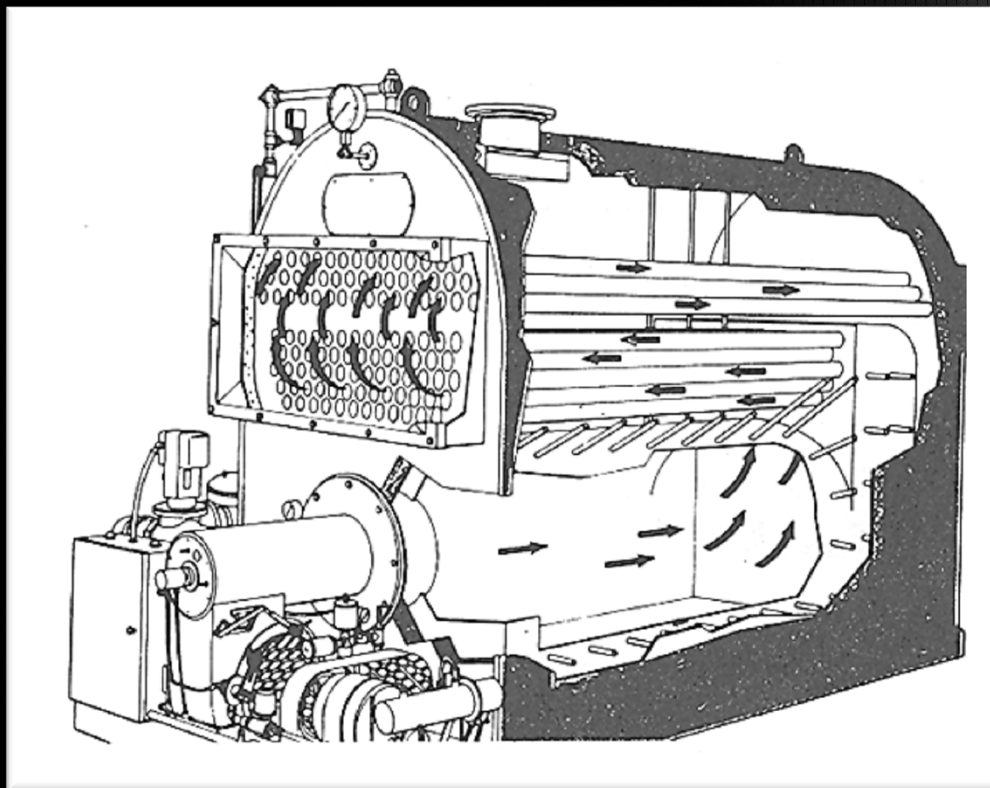
# Firetube Boiler



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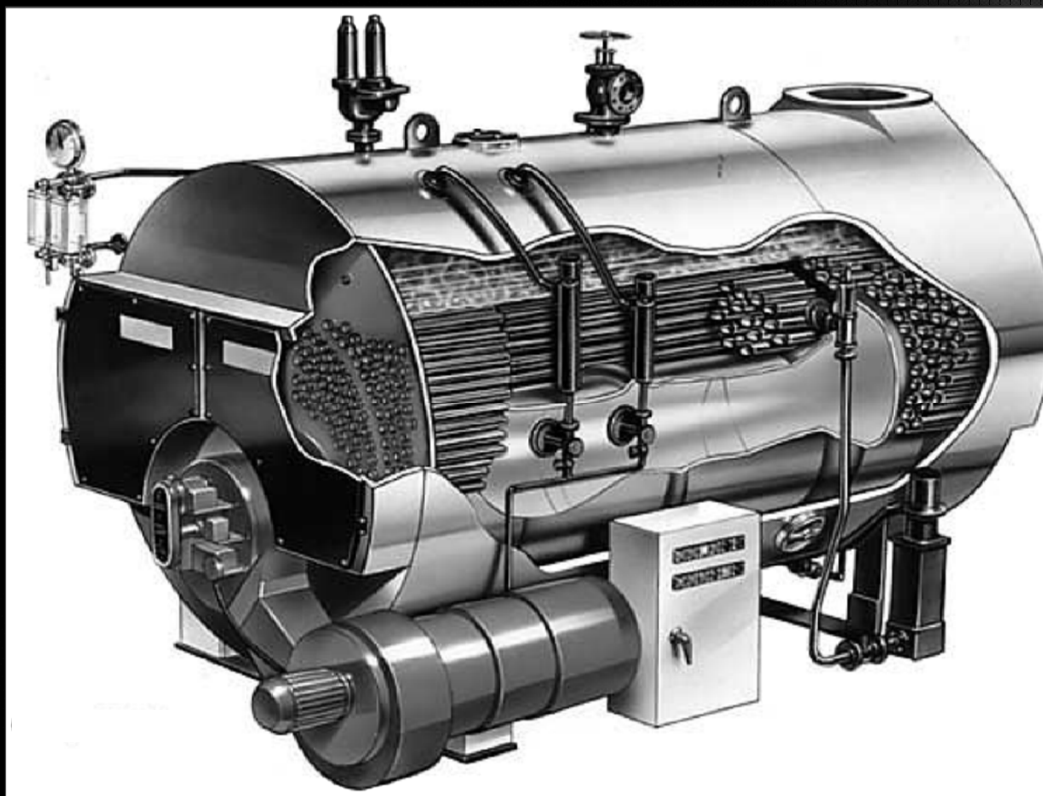
# Firetube Boiler Gas Path



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# Firetube Boiler Cross Section View



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# Hot Water Generators



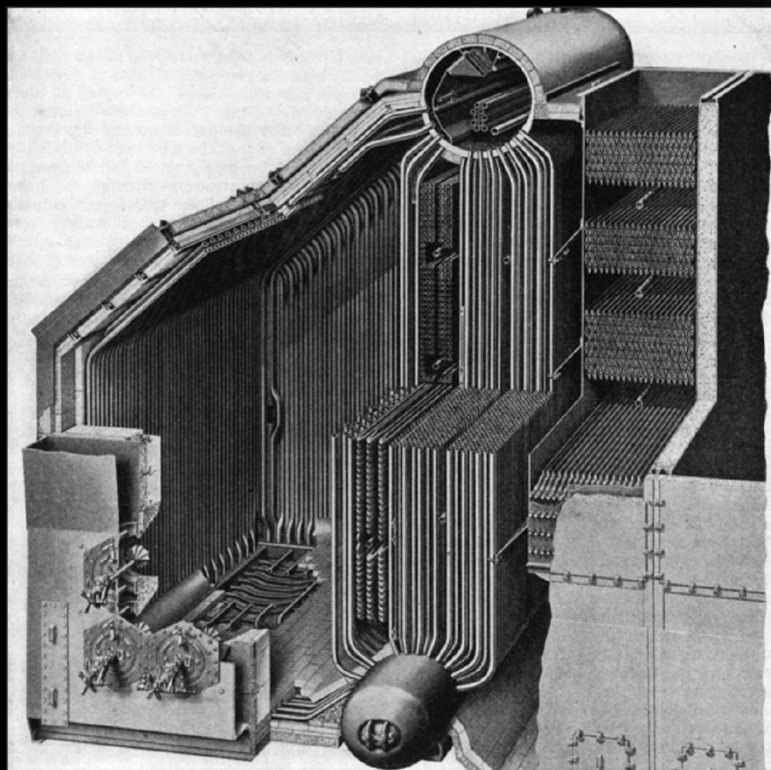
As the name implies, there is no steam generated by these “boilers”

Water is heated to a control setpoint [typically between 380-400<sup>o</sup> F] and generally circulated around a loop with a plant or facility

In all other regards, these boilers are typically operated in the same manner as steam generating boilers



# Marine Type Boiler



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# Water-Tube Boilers



Typical range 30,000 Lb/Hr to 250,000 Lb/Hr

Transfers heat to the boiler water via radiant and convective heat transfer

- Radiant heat transfer occurs in furnace
- Convective heat transfer occurs in back passage of boiler

# Water-Tube Boilers



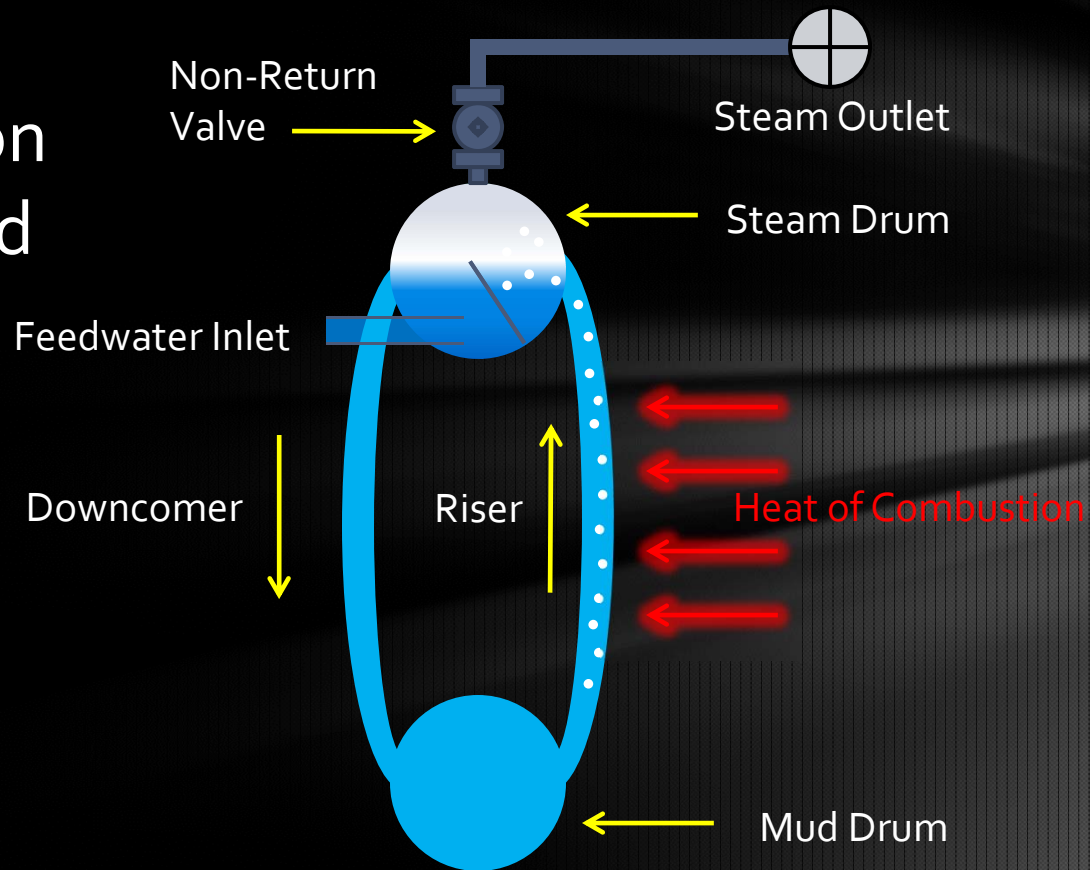
## Saturated Steam

- Water is boiled and steam vapor exits through top of steam drum
  - separators and other drum internal devices prevent water carry-over

## Superheated Steam

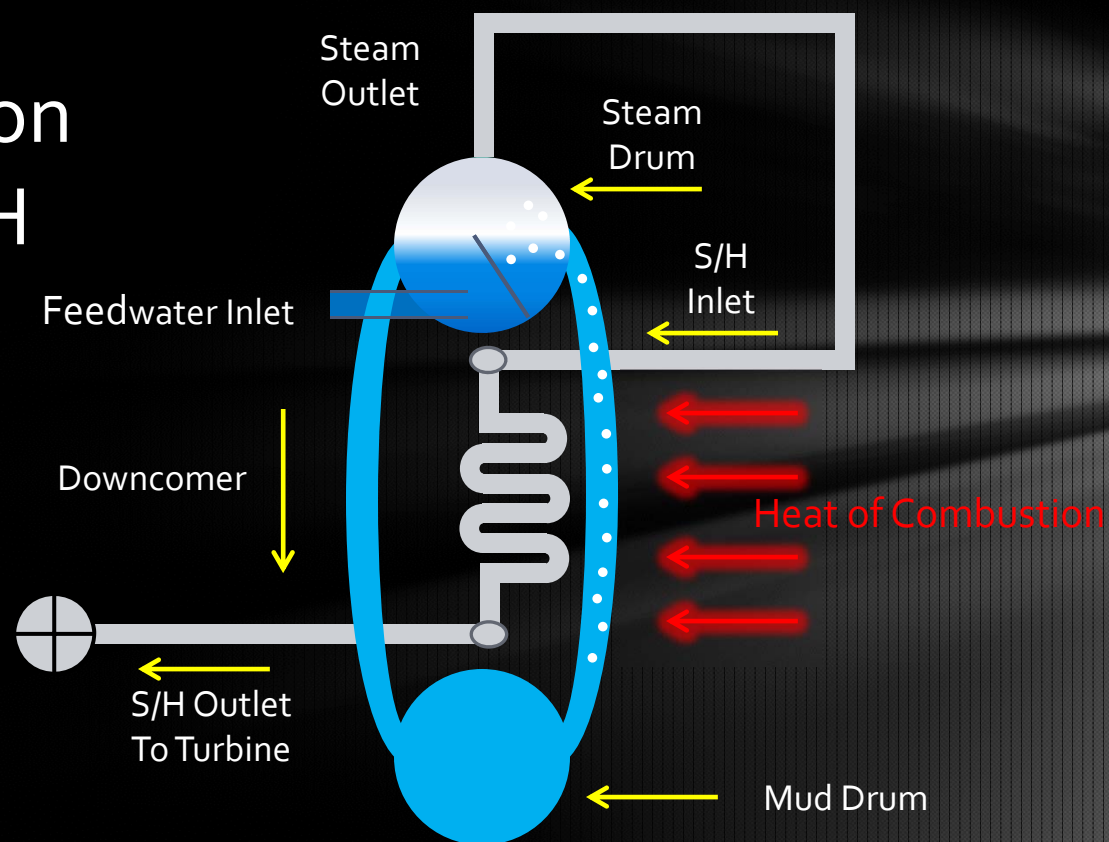
- Steam exits as noted above but then is routed back through a pipe header that returns to boiler convective pass for additional heating to remove ALL remaining moisture

# Boiler Circulation Saturated





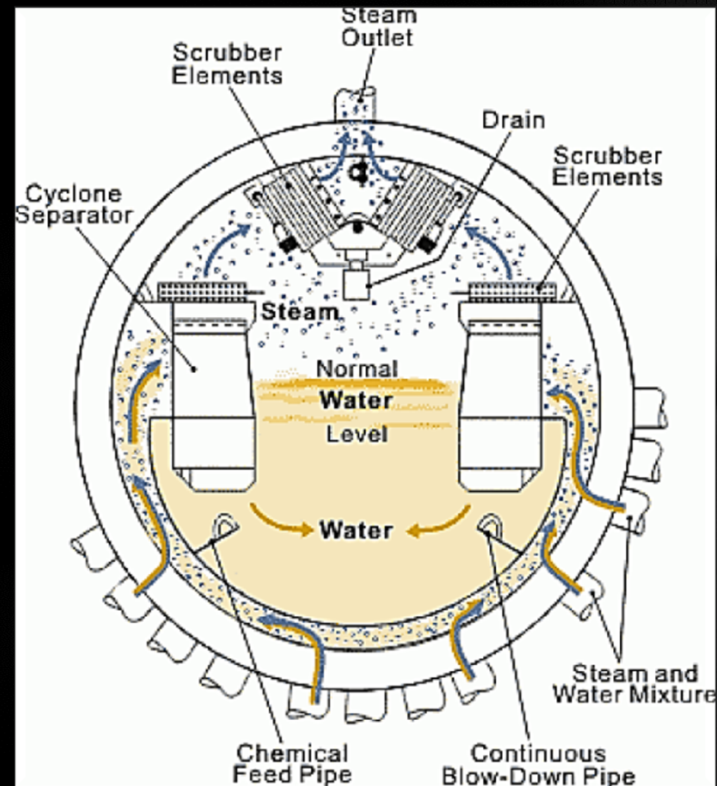
# Boiler Circulation with S/H



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# Steam Drum Internals



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# Water-Tube Boilers



There are several types of water-tube package boilers

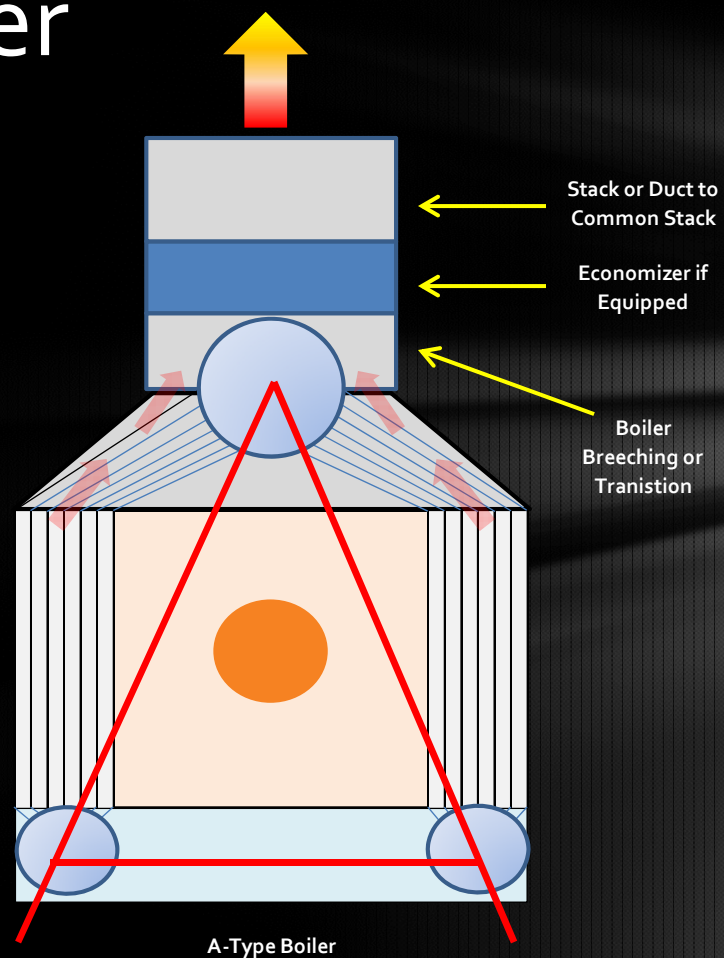
A-Type

D-Type

- Right-hand
- Left-hand

O-Type

# A-Type Boiler

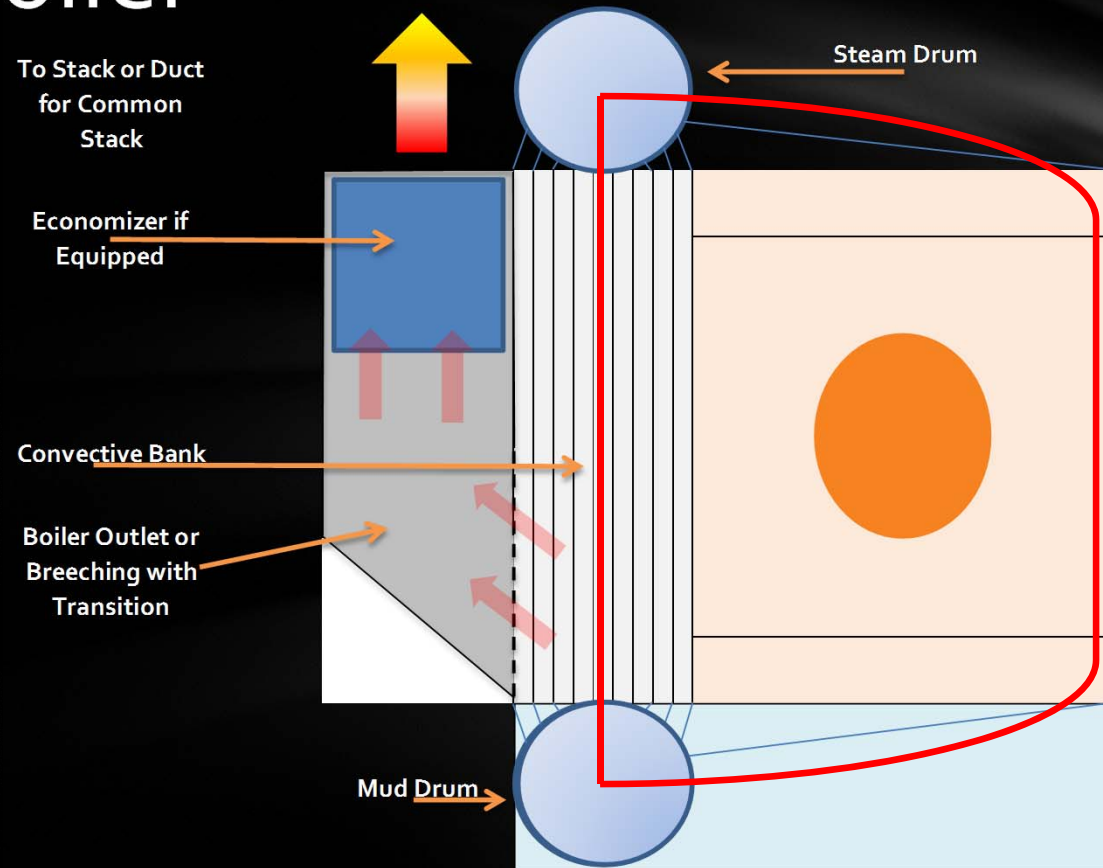


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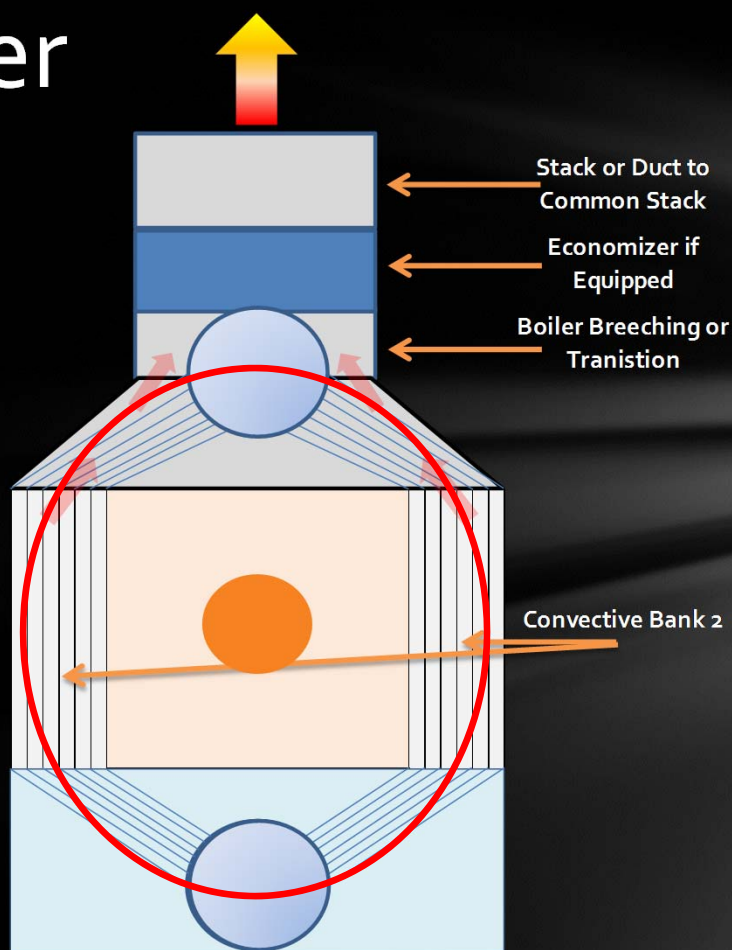
# D-Type Boiler



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# O-Type Boiler

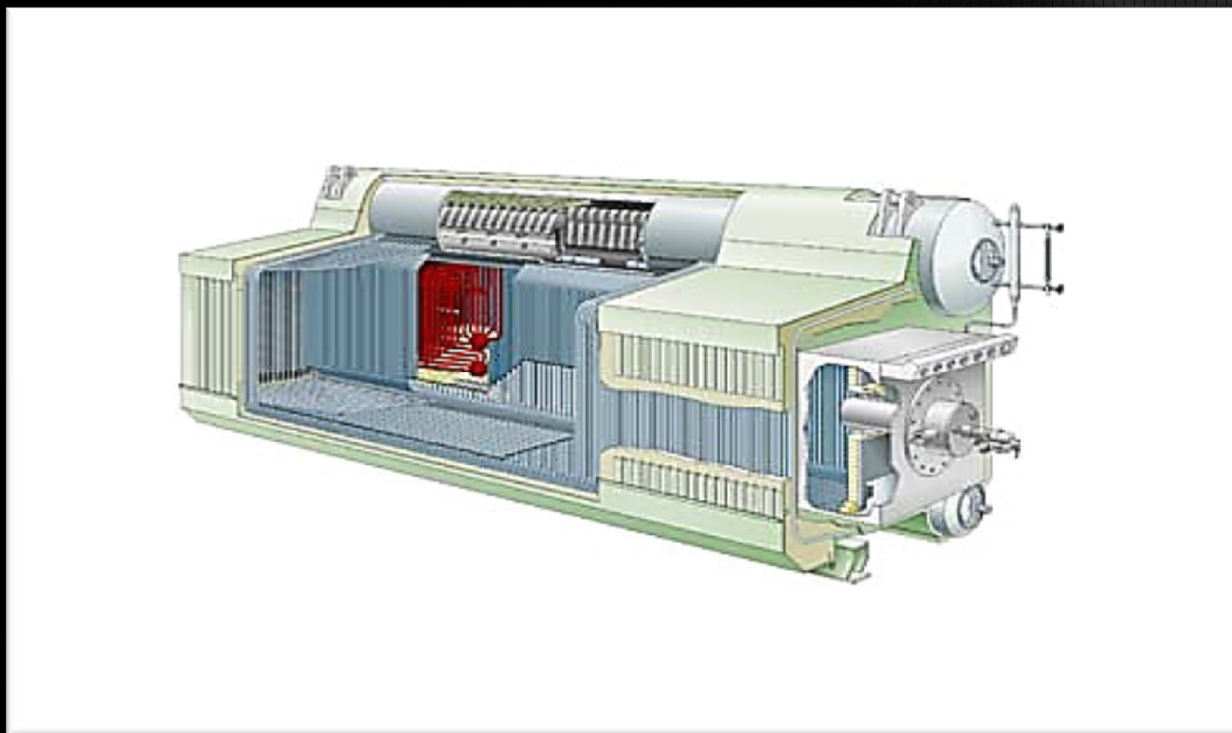


O-Type Boiler

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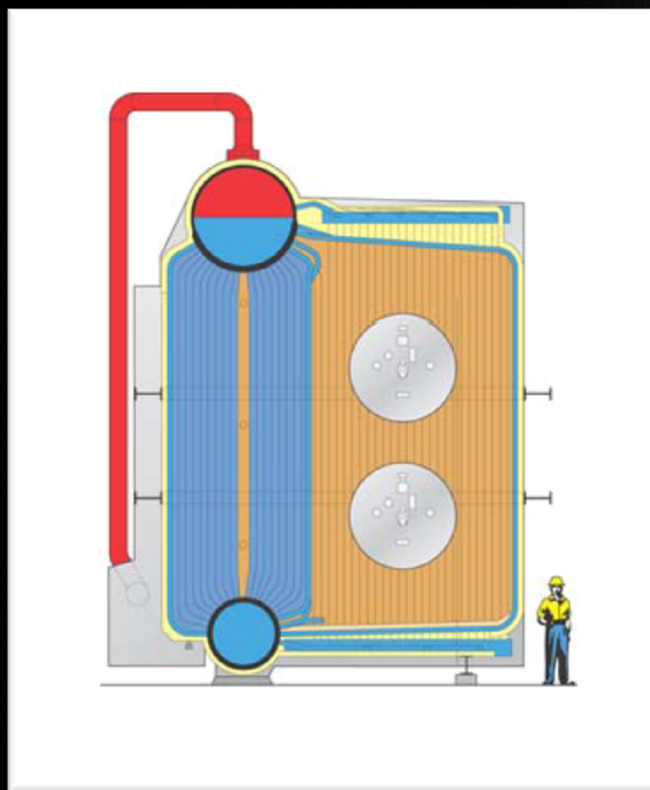
# D-Type Package Boiler



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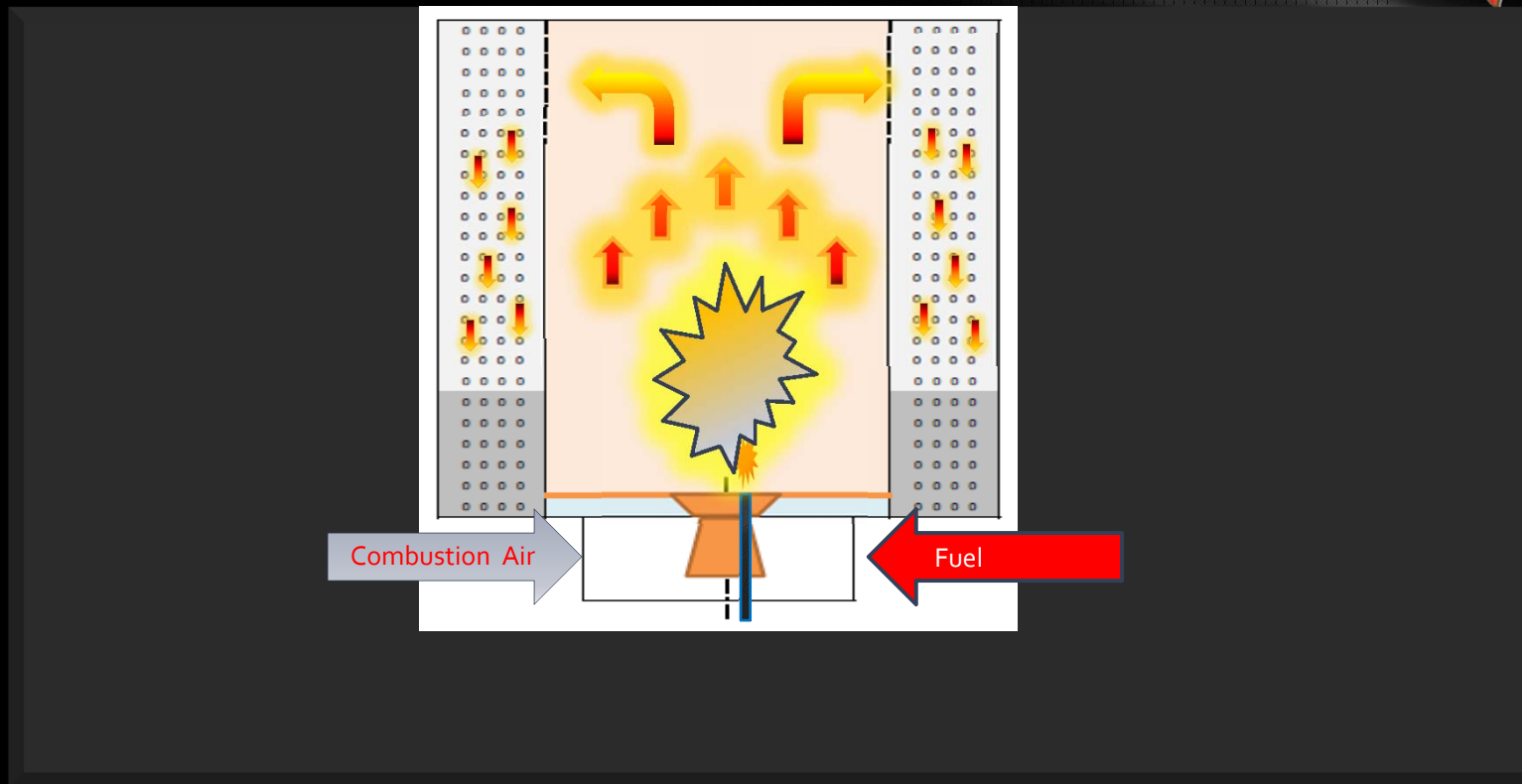
# D-Type Unison Fired



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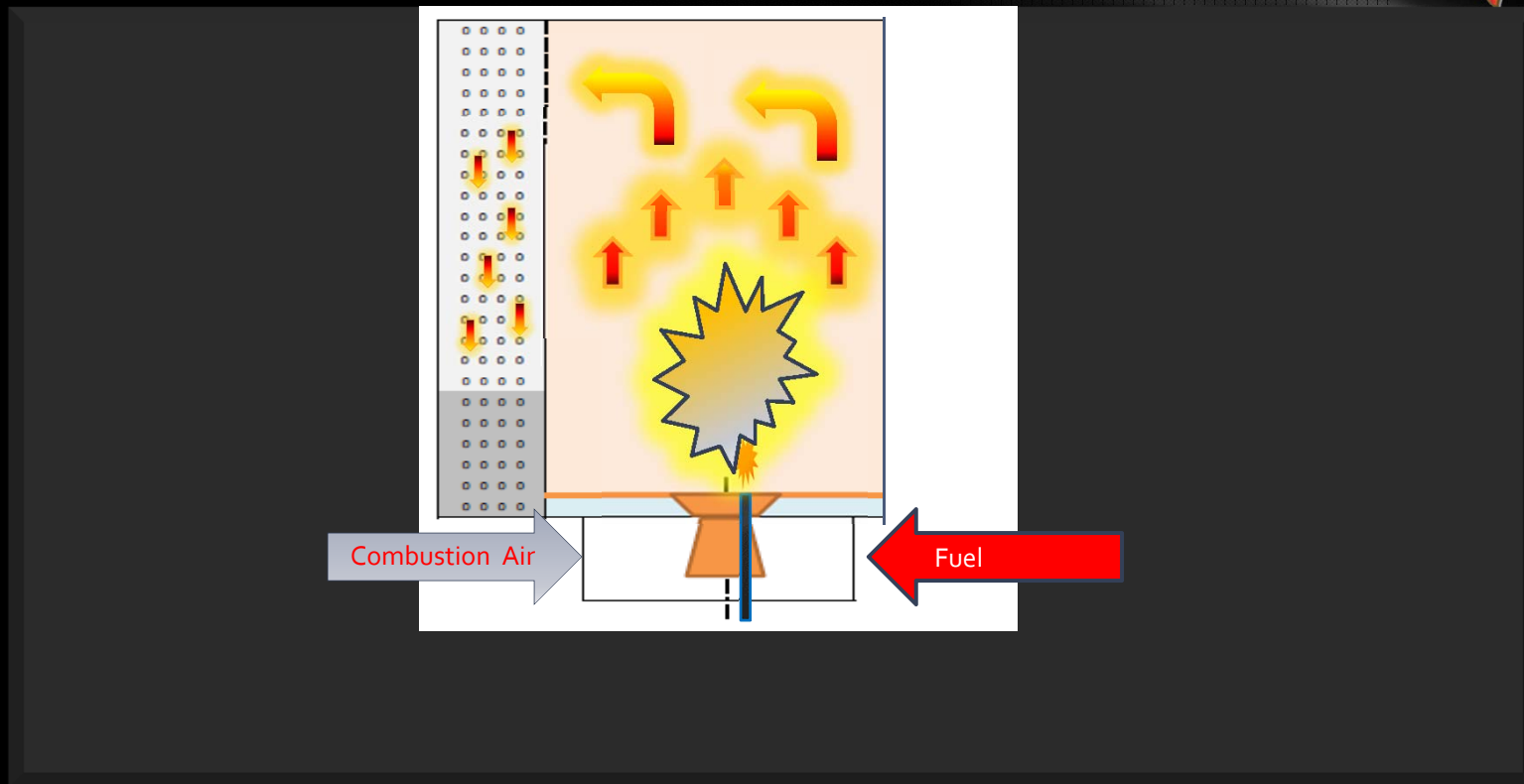
# A & O Type Boiler Plan View



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# D Type Boiler Plan View



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# Field Erected Boilers



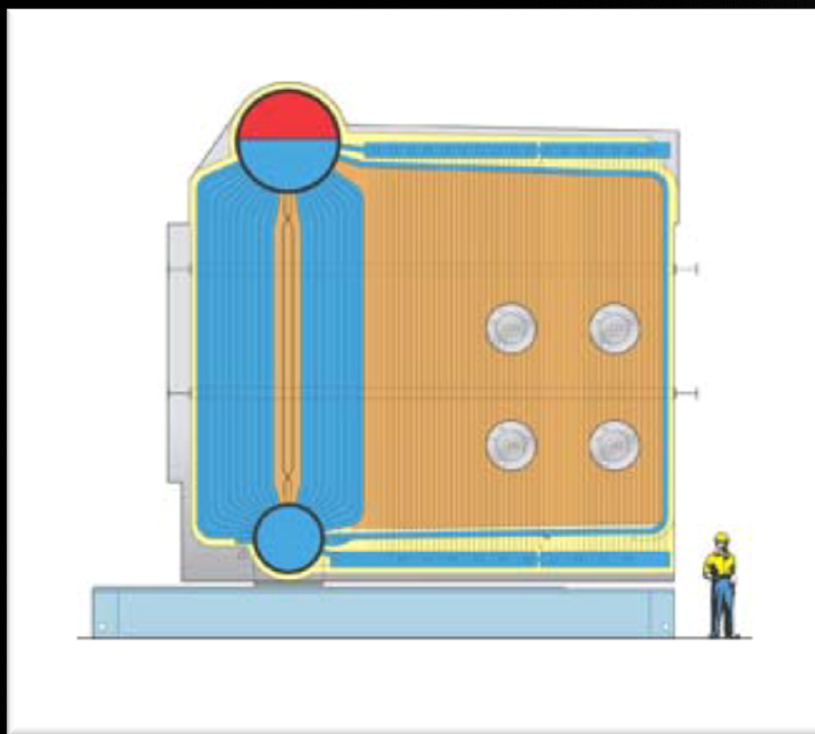
Large Industrial

Utility Boilers

Generally greater than 300,000 Lb/Hr

Great variety in configuration and application

# Industrial D-Type Boiler

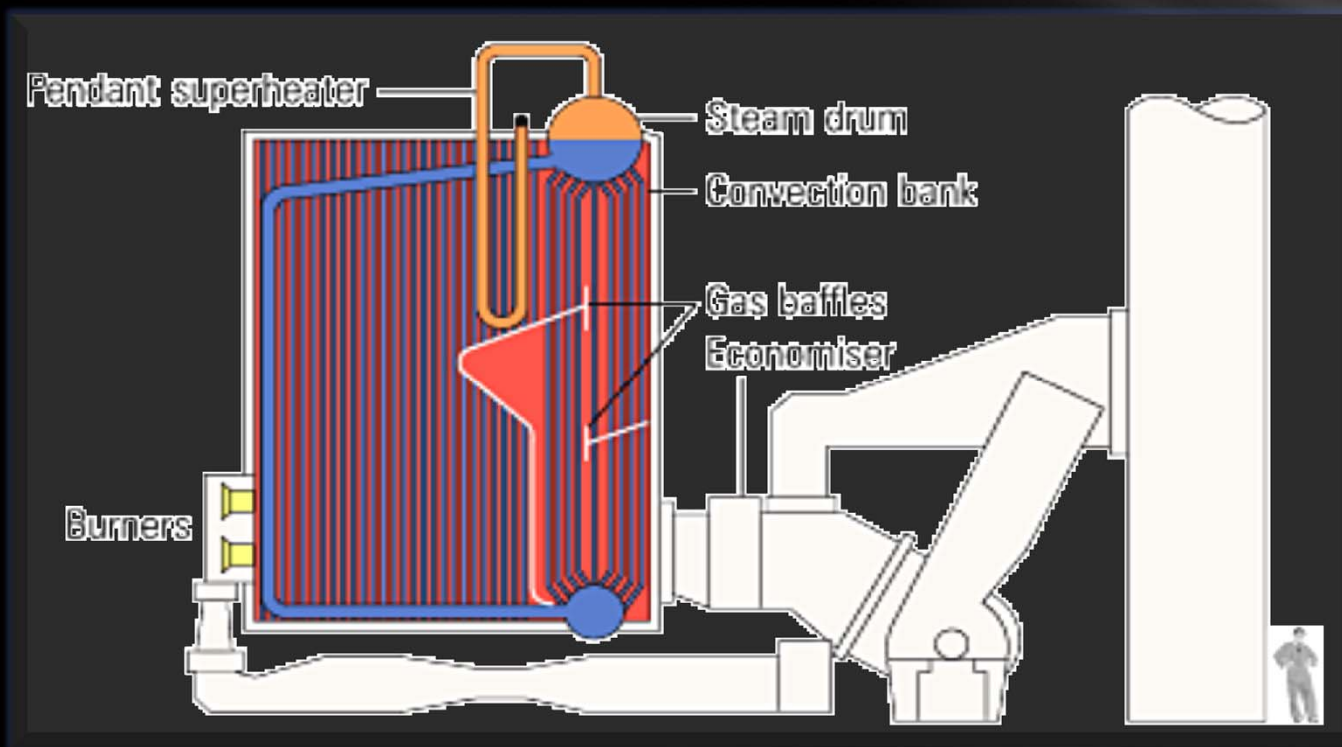


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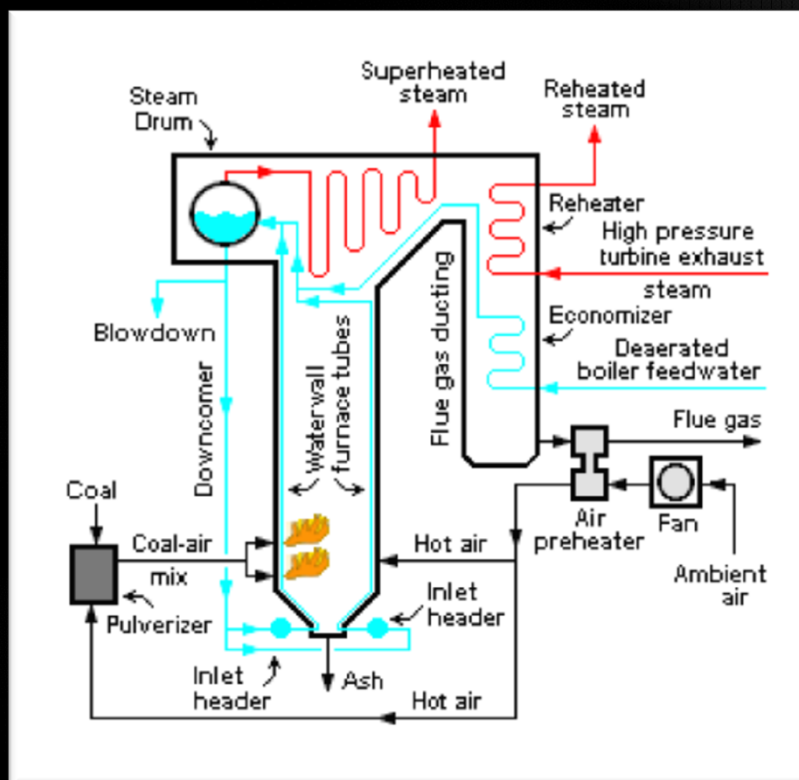
# Sideways D-Type Boiler



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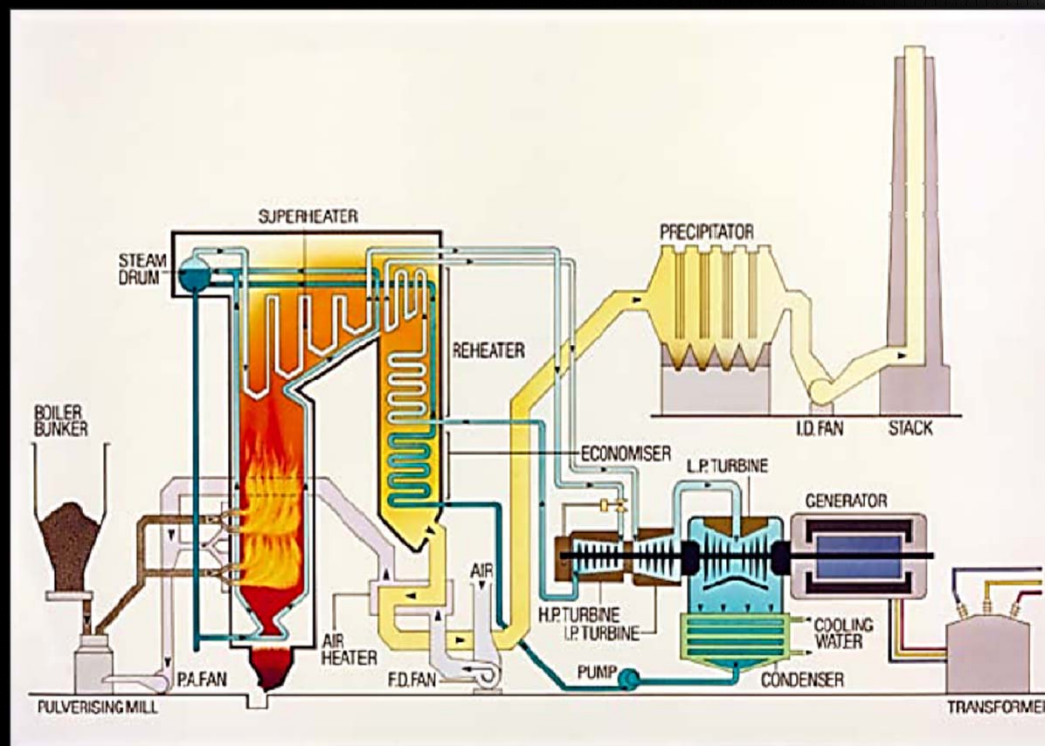
# Utility Boiler Schematic



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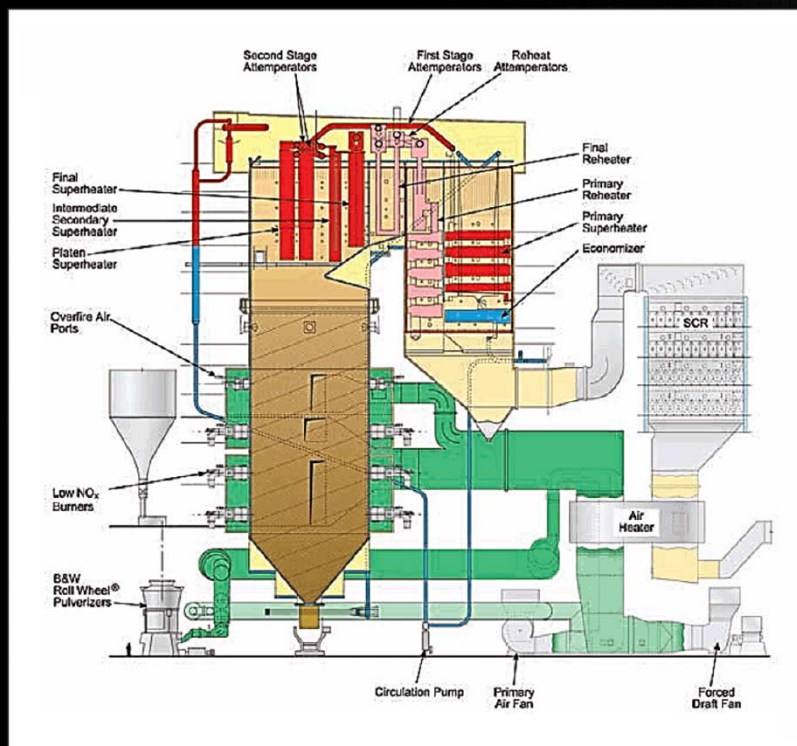
# Subcritical Boiler Schematic



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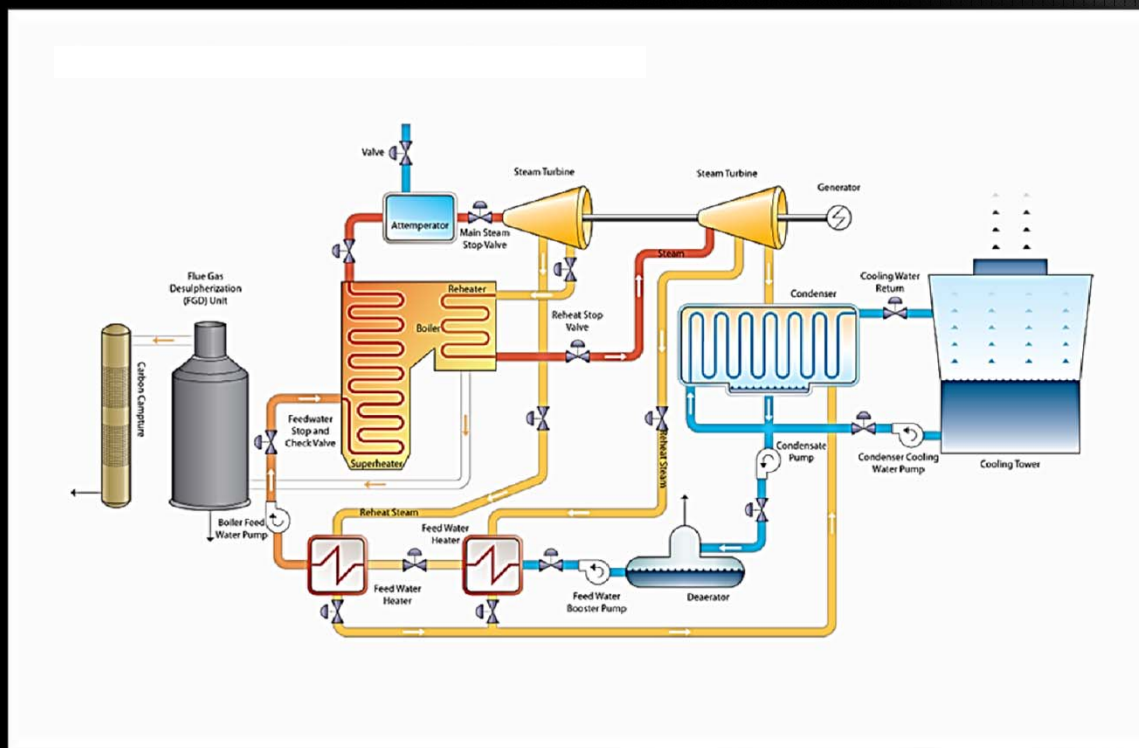
# Supercritical Boiler



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# Supercritical Schematic



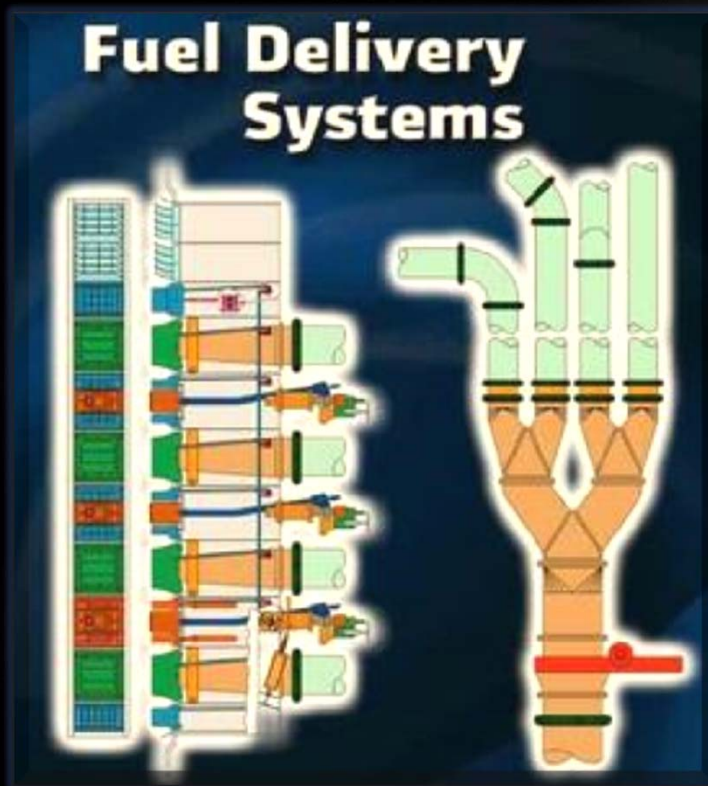
# Tangentially Fired Boiler



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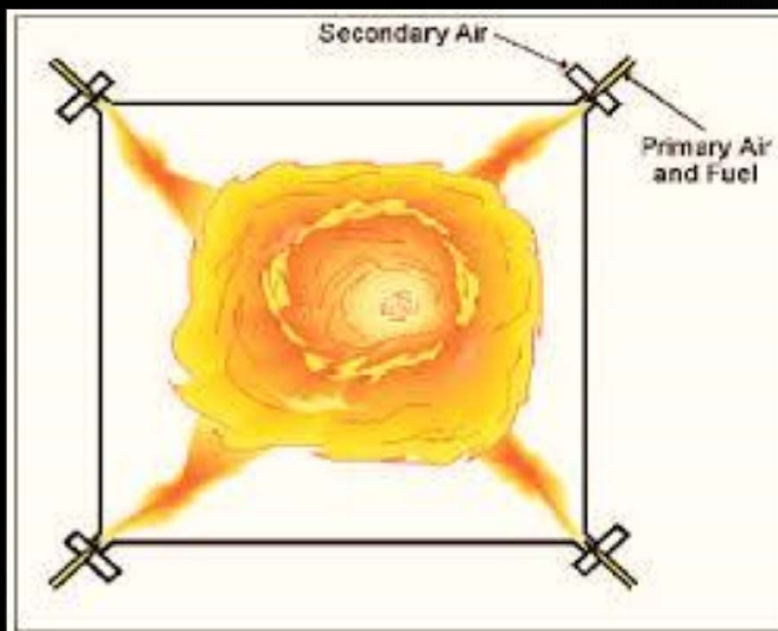
# T-Fired "Burners"



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# Fireball Inside T-Fired Boiler



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