FEEDWATER HEATER

Vertical Channel Down Mounting type

Vertical Channel Up Mounting type

Horizontal Mounting type

TIE RODS AND SPACERS

U-TUBES

SHELL

TUBE SUPPORTS

DESUPERHEATING ZONE BAFFLES

WATER LEVEL

DESUPERHEATING ZONE SHROUD

STEAM INLET

HEATER SUPPORT

FEEDWATER OUTLET

IMPINGEMENT BALE

DRAIN INLET

SHELL SKIRT

FEEDWATER INLET

CHANNEL

DRAIN OUTLET

WATER LEVEL

PROTECTIVE SHIELD

DRAIN INLET

DRAIN INLET

DRAINS SUBCOOLING ZONE ENCLOSURE

OPTIONAL DRAINS SUBCOOLING ZONE BY-PASS

DRAINS SUBCOOLING ZONE BAFFLES
FEEDWATER HEATER

General
A feedwater heater is defined as a shell and tube type unit which heats feedwater or condensate passing through its tubes by means of steam or condensate on the shell side. Feedwater heater are used in a regenerative steam cycle to improve the gain. This is accomplished by extracting steam at various points from the turbine and condensing it using boiler feedwater. The resultant heating of the feedwater reduces the fuel. Since the work lost by extracting the steam is derived from sensible heat, i.e. no change of phase, the much greater latent heat recovered in the feedwater heater by changing phase from steam to water results in a net energy gain. Without a feedwater heater, the latent heat is wasted or thrown out in the main condenser or cooling tower. Therefore, feedwater heaters also help to reduce thermal pollution.

Zone & Type
- Desuperheating Zone (DSH zone)
  The desuperheating zone removes a portion of the sensible heat of the superheated extraction steam to elevate the temperature of the feedwater.
- Condensing Zone
  The condensing zone is the major internal section of all feedwater heaters. A large amount of tube surface area, held in place by tube support plates, condenses all of the incoming steam and additional steam produced by flashing of incoming drains, if any. In the process of condensing the steam, entrained non-condensible gases must be continuously removed in order to prevent blanketing of surfaces, resulting in loss of performance and corrosion.
- Drain Subcooling Zone (DC zone)
  The drain subcooling zone reduces the temperature of the drains leaving the condensing zone below the saturation temperature by transferring heat to the entering feedwater.

Operation principle
In case of 3zone type feedwater is heated 3times in total. Firstly, the feedwater is heated drainingcooling zone from 191.75°C to 195.52°C (At that time condensed water is stripped from 228.02°C to 197.35°C). Second is condensing zone. Third is Desuperheating Zone.

Steam distribution dome
The diameter of straight condensing heaters, as well as two zone(integral drains subcooler) heaters, is greatly dependent on the location of steam nozzles and the resultant size of the steam distribution dome within the shell. The maximum flow point along the longitudinal axis of the heater should be no greater than the steam inlet nozzle velocity given in formula.

Steam nozzle location
- Single nozzle heaters
  The steam nozzle should be located on the thermal centerline of the bundle.
- Multi nozzle heaters
  The ideal location for nozzles located along the length of the heater shell is on the respective thermal centerline for the section of the bundle to which the nozzle rovides steam.