



Heat Exchangers

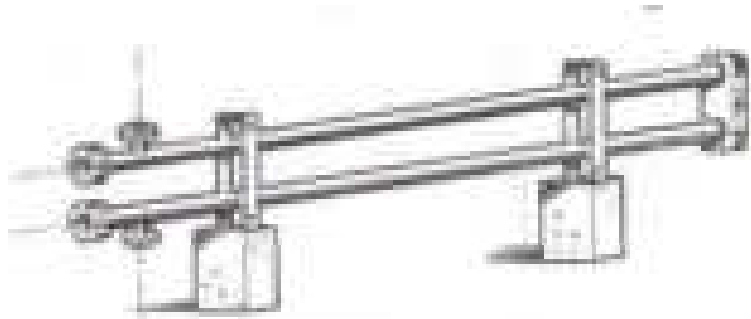
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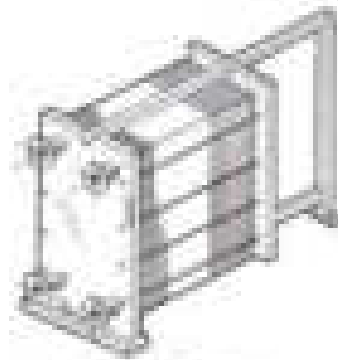
Heat Exchangers

- Heat exchangers are one of the most common pieces of equipment found in all plants.
- Heat Exchangers are components that allow the transfer of heat from one fluid (liquid or gas) to another fluid.
- In a heat exchanger there is no direct contact between the two fluids. The heat is transferred from the hot fluid to the metal isolating the two fluids and then to the cooler fluid.

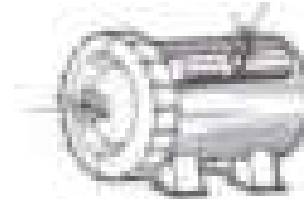
Types of Heat Exchangers



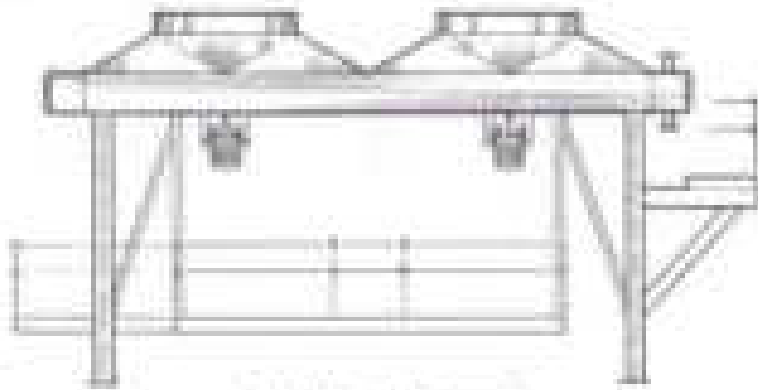
d. Double Pipe Exchanger



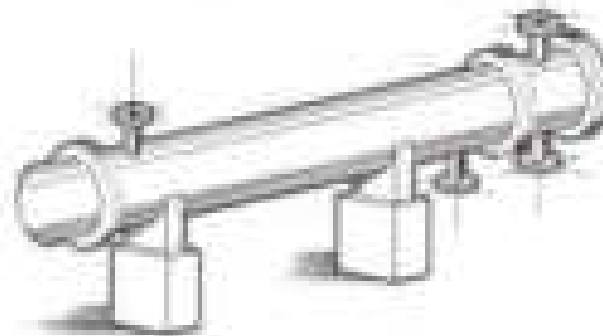
b. Plate Exchanger



c. Spiral Exchanger

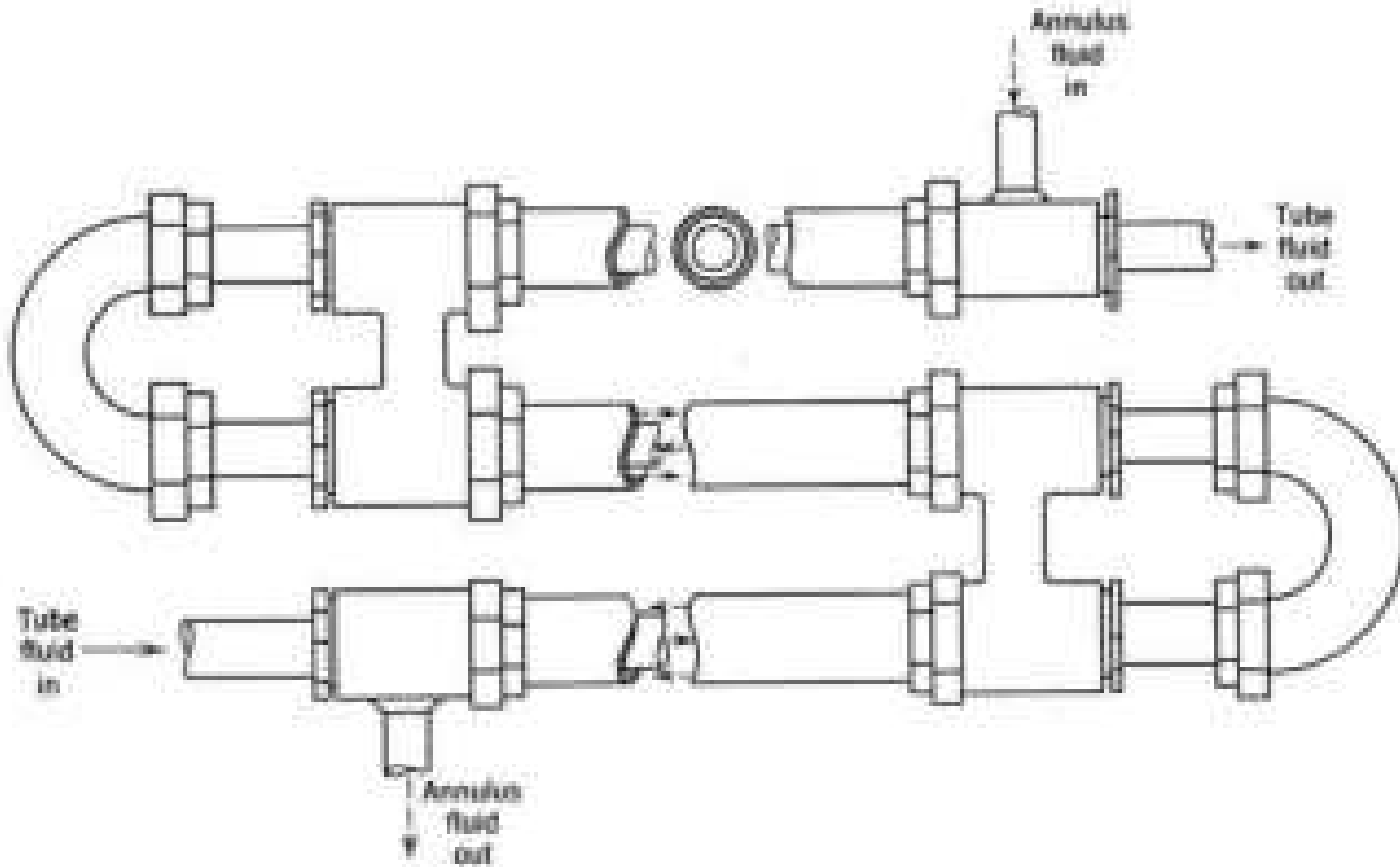


e. Air Cooled Exchanger



a. Shell and Tube Exchanger

Double-Pipe Exchanger

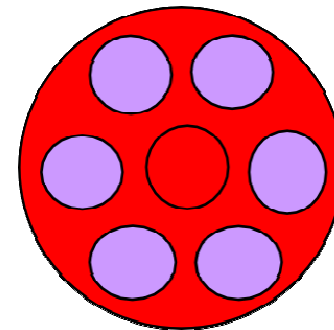


Double Pipe

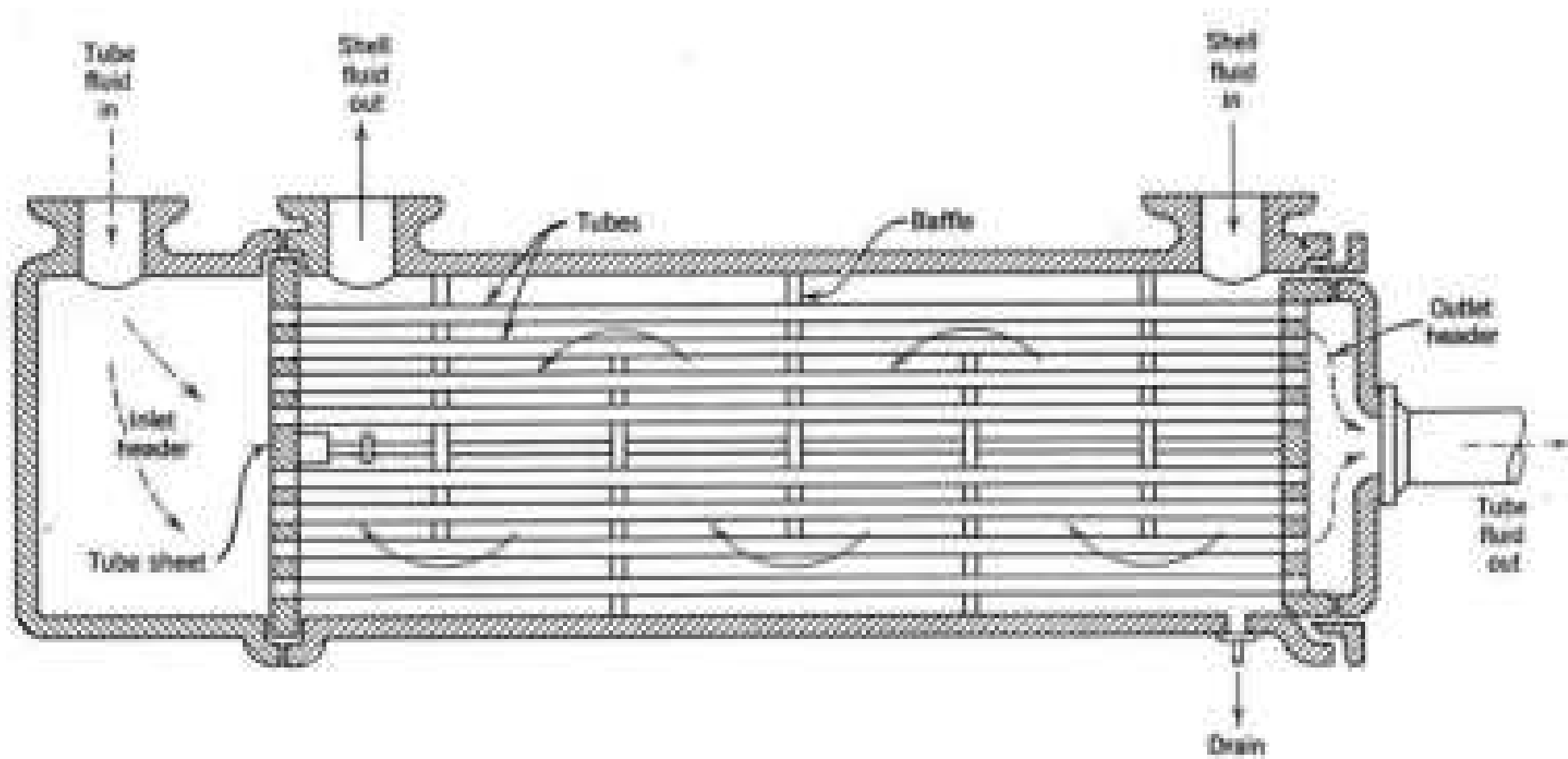
Simplest type has one tube inside another - inner tube may have longitudinal fins on the outside

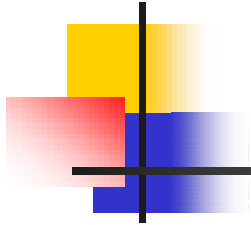


However, most have a number of tubes in the outer tube - can have very many tubes thus becoming a shell-and-tube



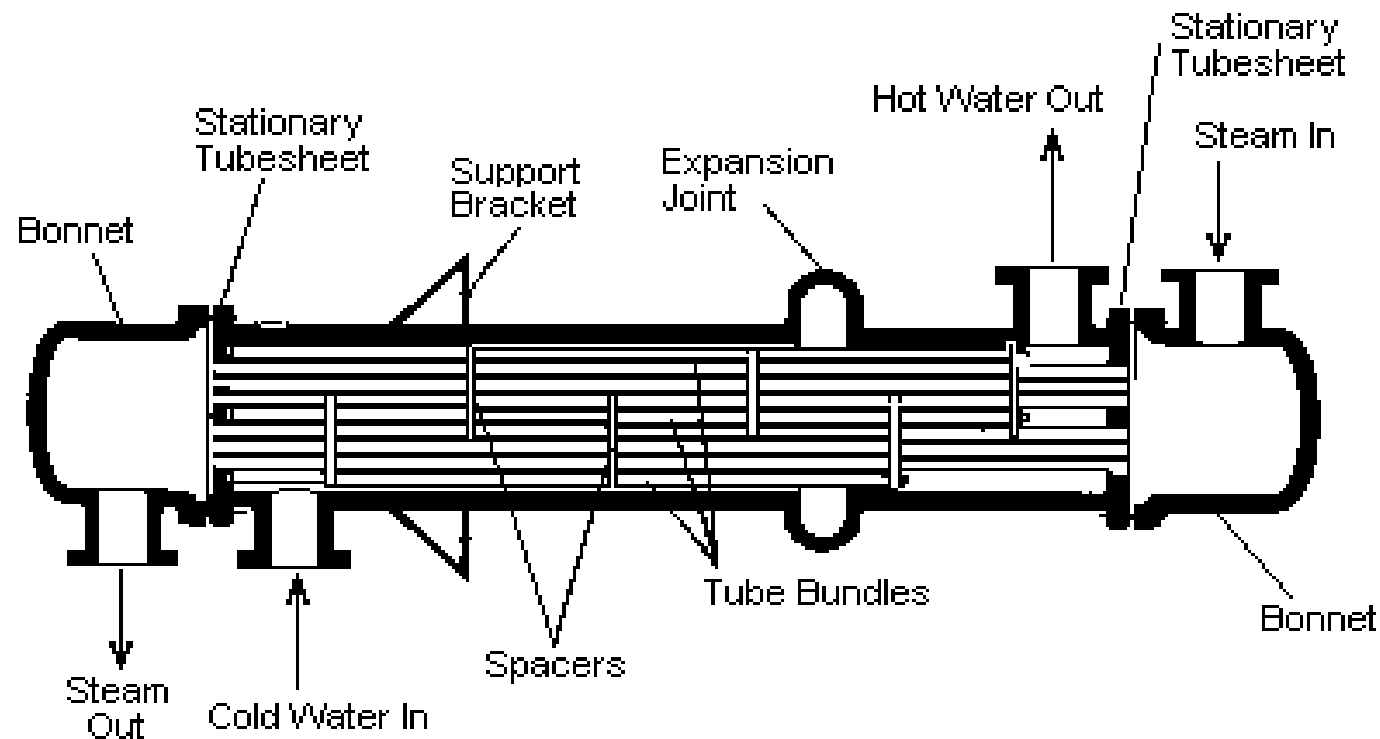
Shell-and-Tube Heat Exchanger





- Shell-and-Tube Heat Exchangers are the most important type of HE.
- It is used in almost every type of industry.
- This type of heat exchanger consists of a set of tubes in a container called a shell.
- The fluid flowing inside the tubes is called the tube side fluid and the fluid flowing on the outside of the tubes is the shell side fluid.

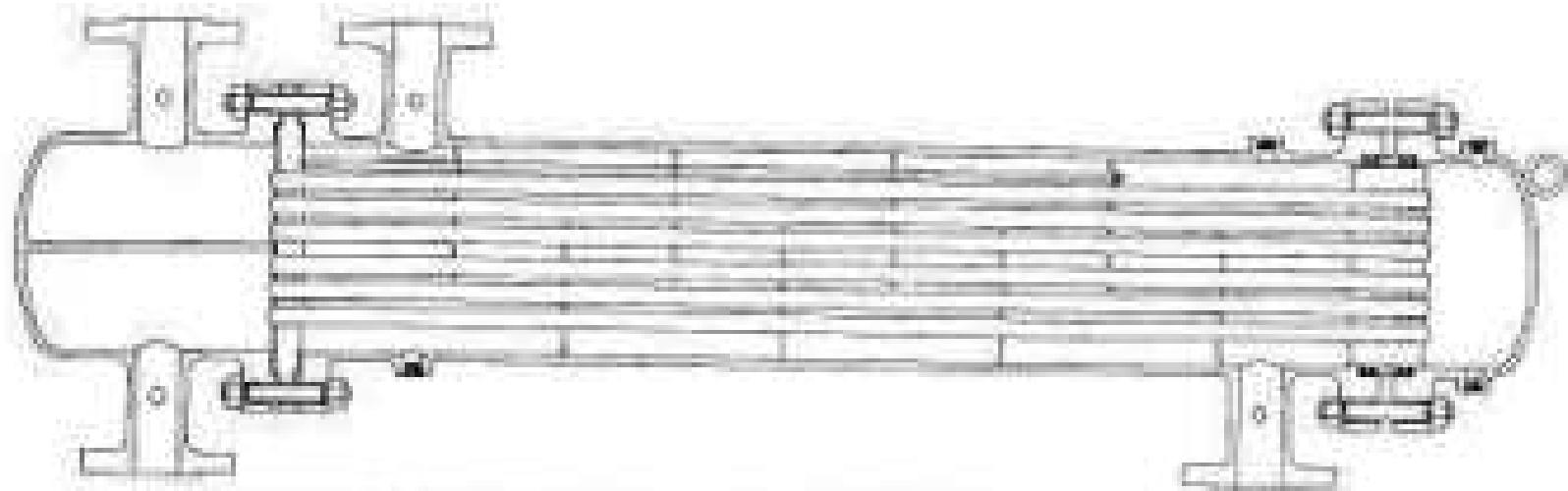
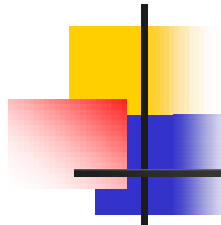
Main Components of Shell-and-Tube Heat Exchangers



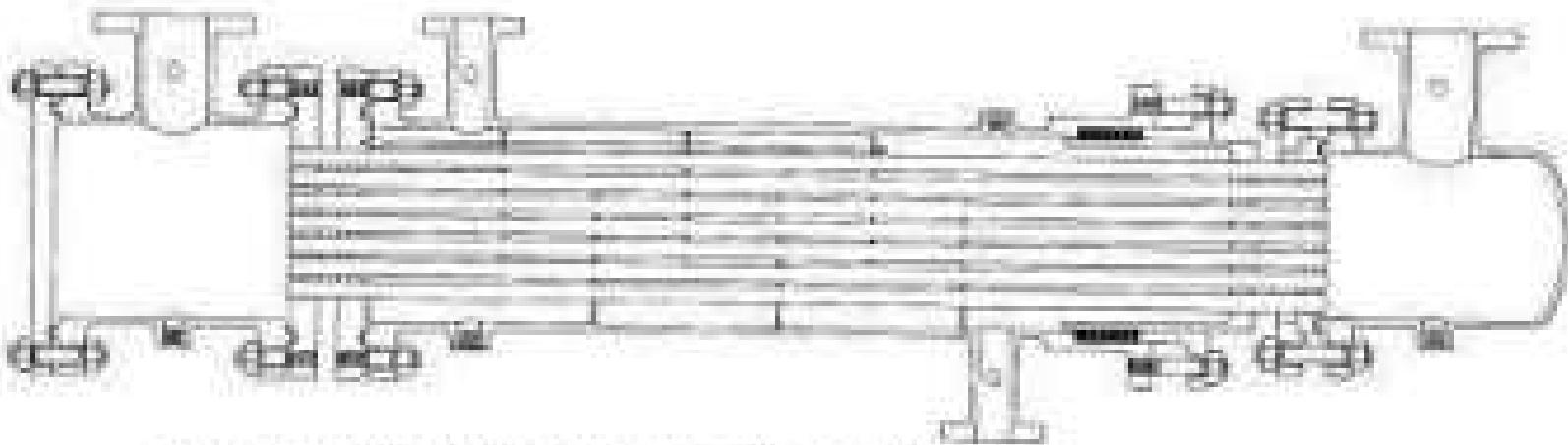


Some common heat-exchanger terms

- **Tube side:** Inside the tubes.
- **Shell side:** Outside the tubes, between the tubes and the shell.
- **Tube sheet** A thick plate provided with holes (one per tube) in which the tubes are fixed.
- **Tube bundle** Consists of tubes, tube sheet and baffle plates
- **Shell** A cylinder of plate in which the tube bundle is placed



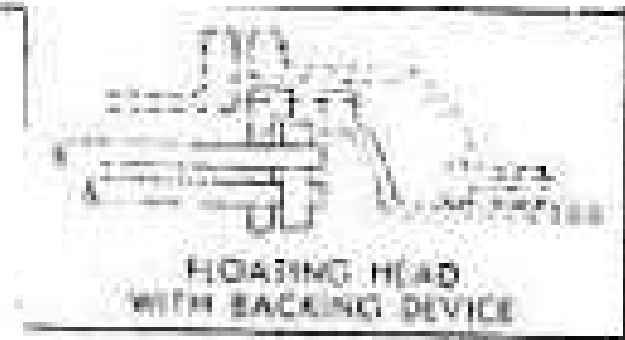
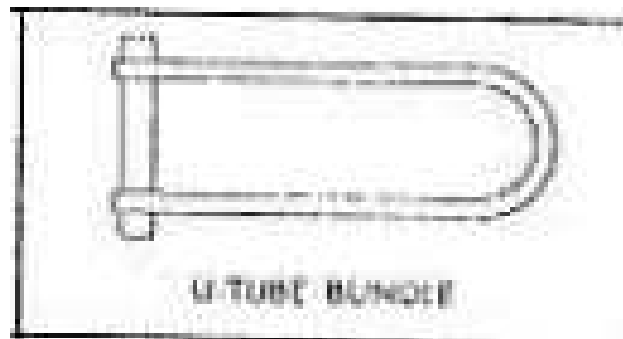
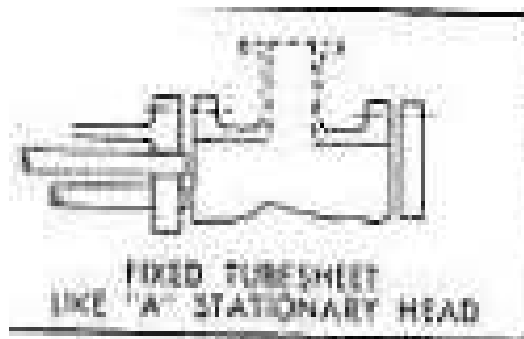
A heat exchanger similar to that of Fig. 1.18, except with a different type of shell head. (Courtesy The Parsons-Kelley Co.)



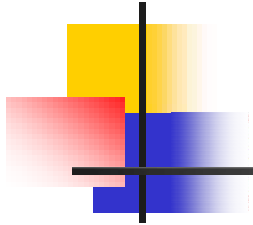
Single-pass tube, jacket single-pass shell heat exchanger with a packed-joint flange head and double flange doors to insure that no fluid from one stream leaks into the other. (Courtesy The Parsons-Kelley Co.)

Shell and Tube Heat Exchangers Construction

- Fixed Tube-sheet type
- U-tube type
- Floating Head type

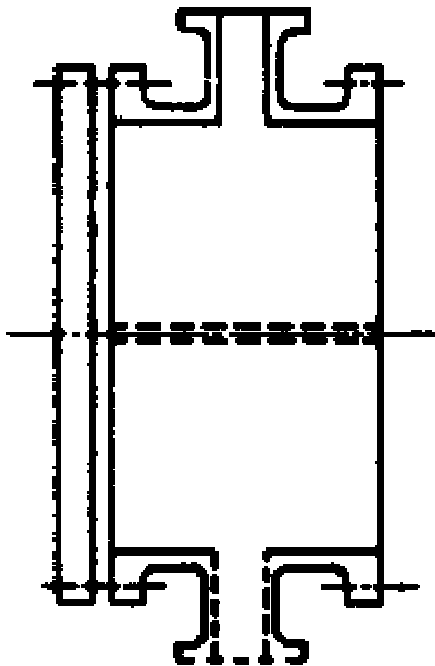


Front head type



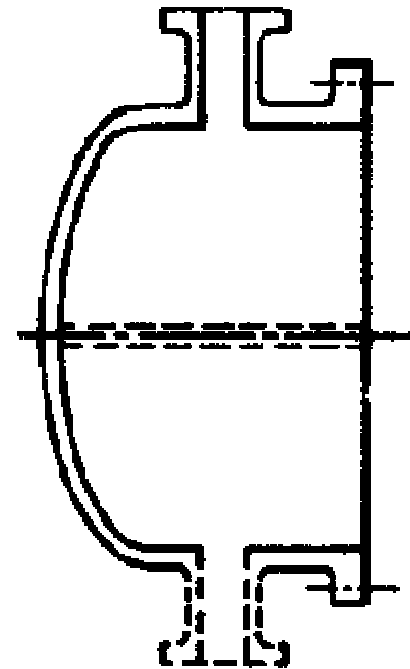
- A-type
- B-type

A



Channel and removable cover

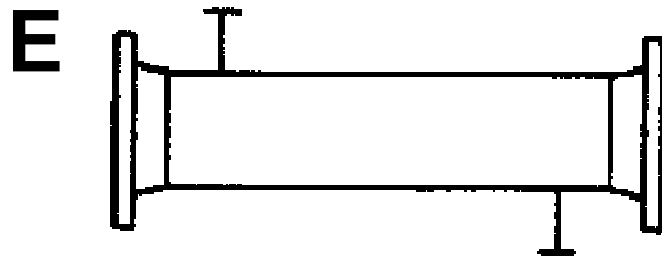
B



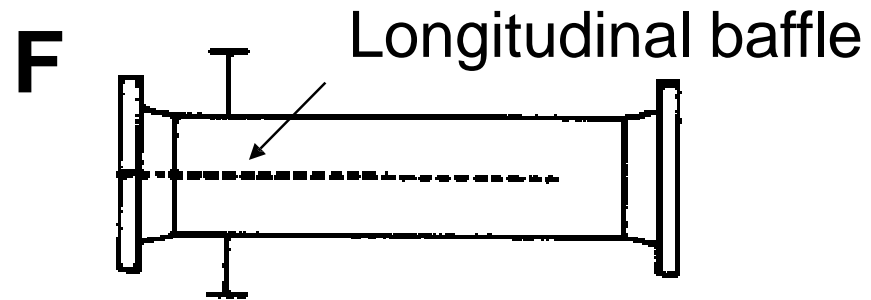
Bonnet (integral cover)

Shell type

- E-type
- F shell



One-pass shell



Two-pass shell

Plate and frame

- Plates hung vertically and clamped in a press or frame.
- Gaskets direct the streams between alternate plates and prevent external leakage
- Plates made of stainless steel or higher quality material
- Plates corrugated to give points of support and increase heat transfer

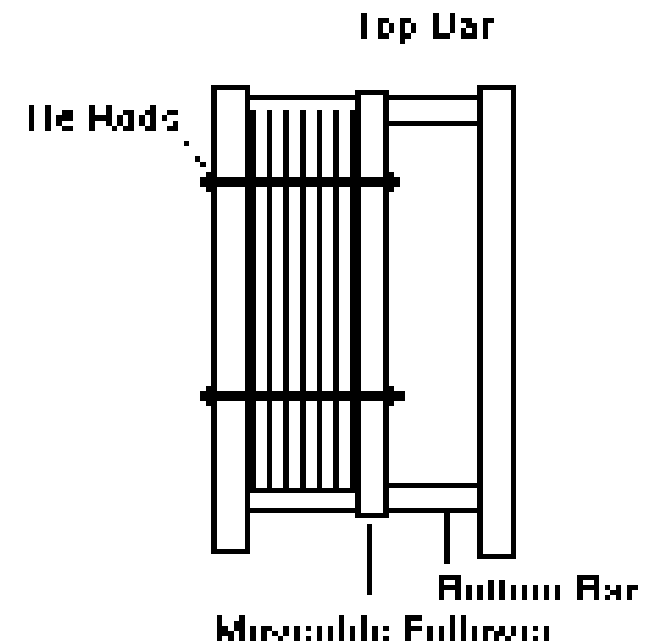


Plate Heat Exchanger

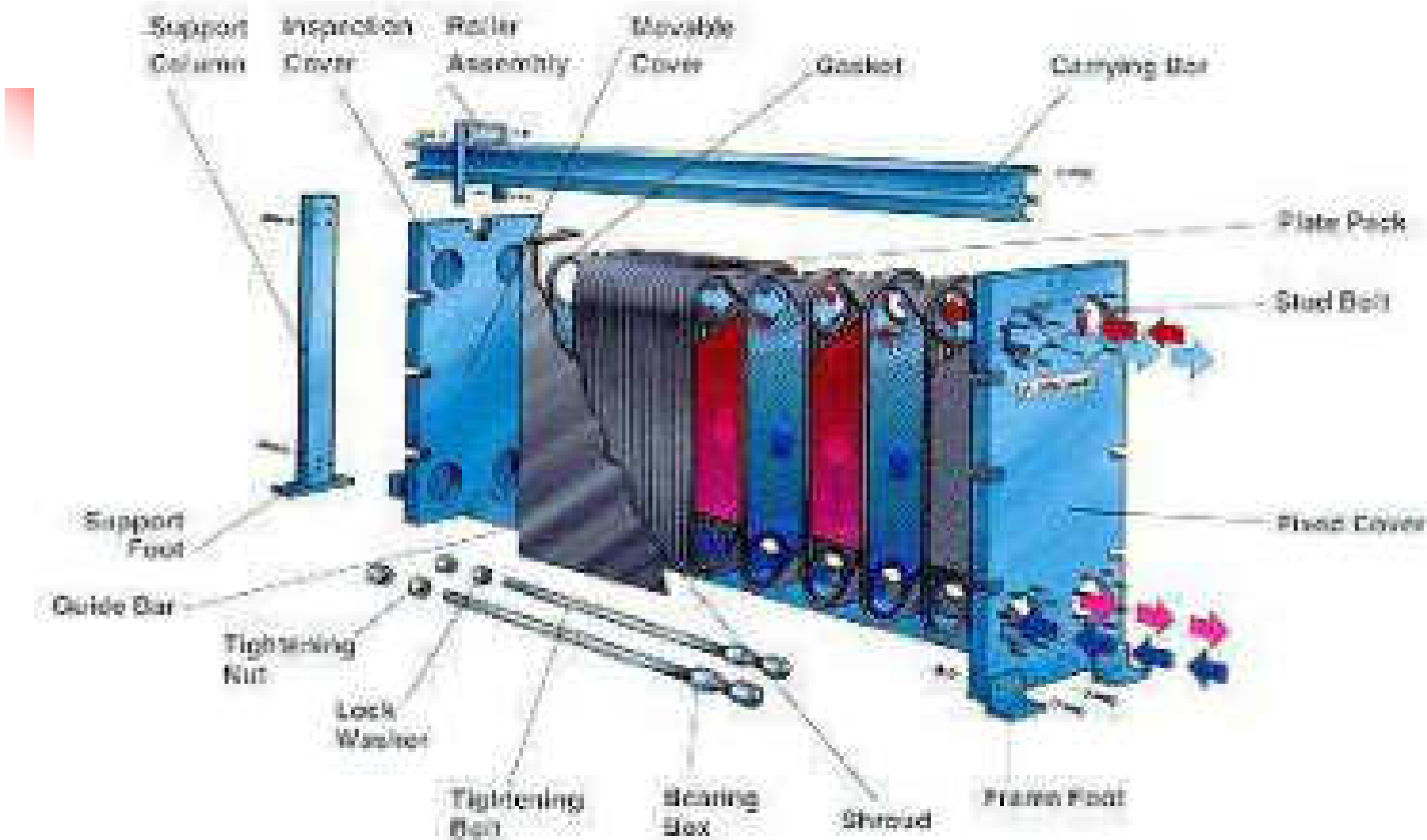
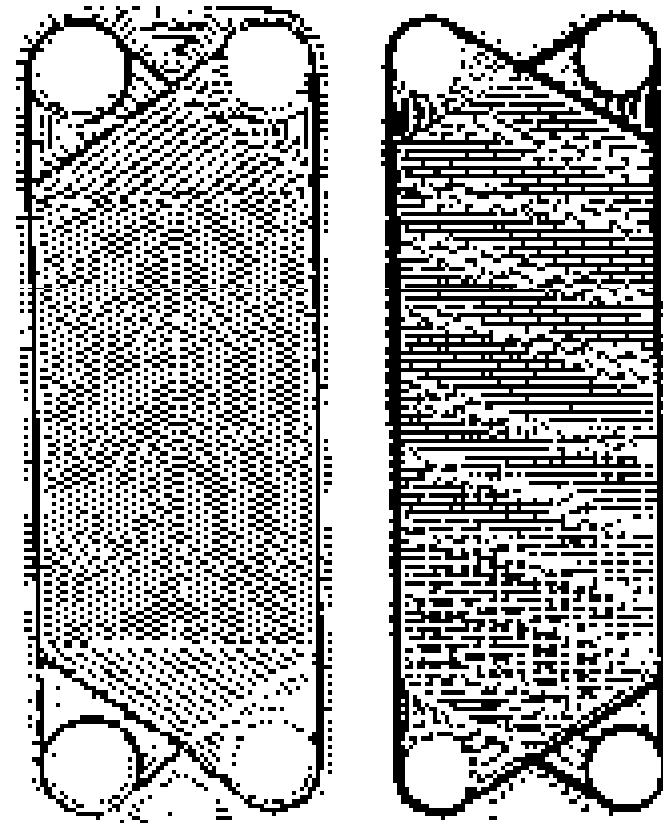




Plate types

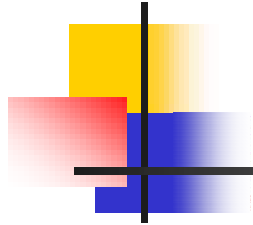
Corrugations on plate improve heat transfer
give rigidity

Many points of contact and a
tortuous flow path



Chevron

Washboard



General view of plate exchanger

“Plate exchanger” normally refers to a gasketed plate- and-frame exchanger

