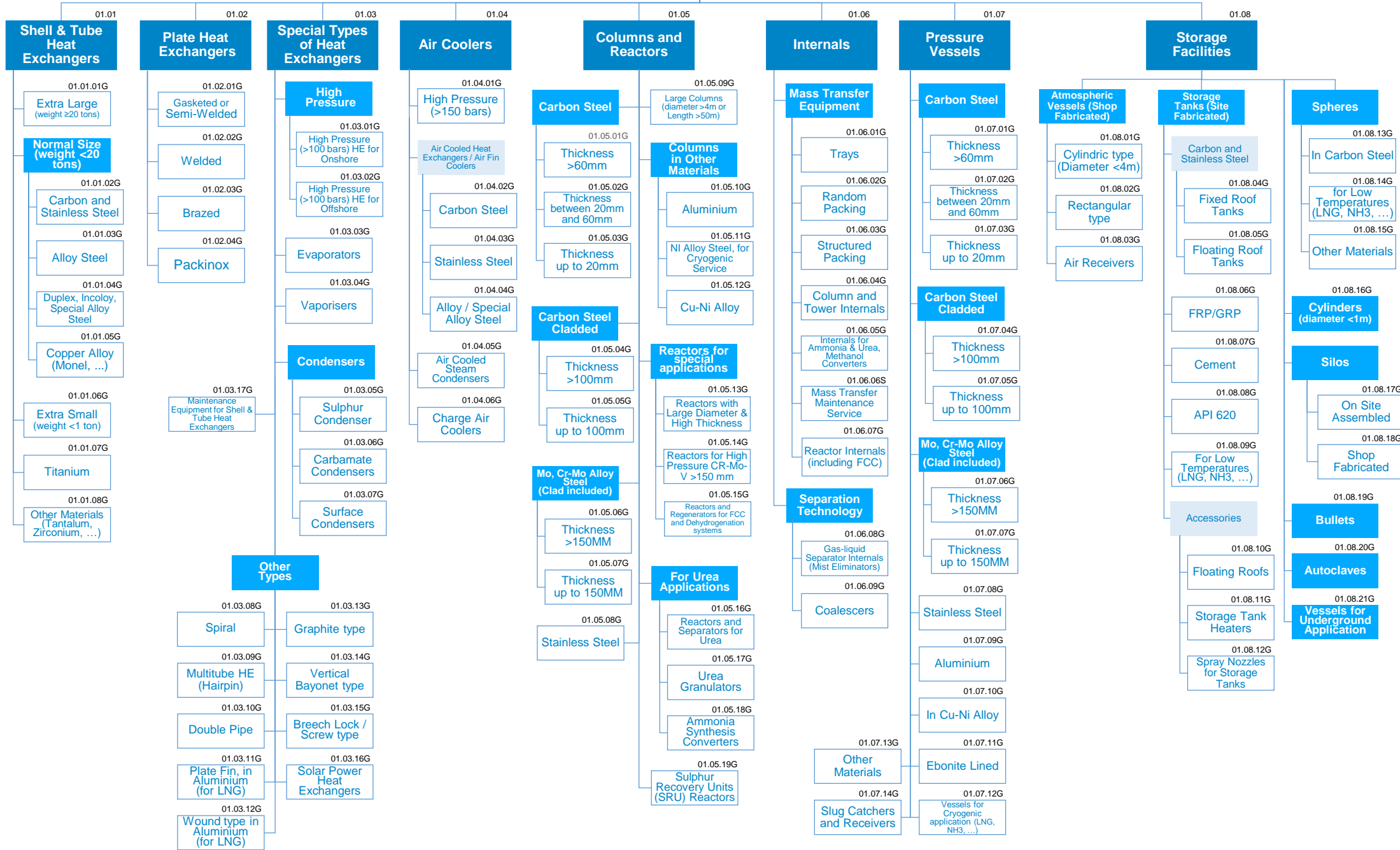


# Heat Transfer Equipment and Vessels



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This category is centred on all equipment with specific focus on high-pressure and high-temperature services.

The main purpose of half of the equipment in this category is heat transfer to and from process fluids, which is an essential part of most chemical processes. The most commonly used type of heat-transfer equipment is the shell and tube heat exchanger. Reactors, Columns and Internals are necessary for the chemical processes that occur during the refining process. The remaining equipment (Vessels, and Storage Tanks) focuses instead on storage of the products and/or raw materials of the plant processes.

## MAIN RATIONALES BEHIND THE STANDARD CATEGORIZATION

On a family level the priority has been given to the different type of equipment, whilst on a category level to the specifications of the products (material and sizes mainly).

### Shell & Tube Heat Exchangers

- Heat exchangers are the most commonly used means of heat transfer, the Shell & Tube type in particular.
- The word 'exchanger' really applies to all types of equipment in which heat is exchanged but is often used specifically to denote equipment in which heat is exchanged between two process streams.
- The categorization is based on materials and sizes of heat exchangers. However, in the industry the following terms are often associated to the Heat Exchanger (HE) family: Pre-Heaters, Vaporizers (if the process stream is vaporized), Condensers, Coolers, Heaters, Evaporators (if used to concentrate a solution) and Reboilers (if associated with a distillation column). In fact, in this categorization these objects are all considered to be heat exchangers, but they fall in the categories based on their materials and sizes.
- The rationale behind the separation is to try and include all used types of exchangers giving more space and detail to the most diffused ones, such as large Shell & Tube exchangers
- U-tube, fixed head and floating head are considered as part of the Shell & Tube categories.
- The Vaporisers category only deals with LNG vaporisers (for regasification).

### Plate Heat Exchangers

- In this case it is important to differentiate between Manufacturers – who actually print the plates with a proprietary press (8,10,12,20 and recently 40 tons) and sell complete apparatus with their own brand – and Licensees – who assemble plates printed elsewhere onto locally built frames under their own brand, different from that of the plates producer (citing, in some cases, the name of the plate within the apparatus).
- 01.02.02G Welded Plate Heat Exchangers includes the various types of welded HEs – plate & frame, shell & plate, cross flow.

### Special Types of Heat Exchangers

- Special HE for onshore usually have a large size (diameter > 500mm) and for H2 service, whilst Special HE for offshore usually have a small size (diameter < 500mm)

- 01.03.03G Evaporators include all types of evaporators (thin film, natural/forced circulation etc.).
- Condensers as intended for HVAC use or commercial cooling are not like the pressure equipment dealt with in this category, therefore, they are in the 03G Packages group.

### Air Coolers

- This category is separate from Heat Exchangers because they are generally used when there is a lack of water and they do not require any coolant other than air. Therefore applications vary and are in many cases different from those of other Heat Exchangers.
- Air Coolers include both induced and forced draft types and all header types (plug, welded, screw bolted etc.).
- 01.04.04G Includes all other alloys and metals that compose the Air Cooler.

### Columns and Reactors

- What differentiates the vessels from one another is their size, material and application. Therefore, our categorization is based on these three criteria.
- The rationale behind the separation of reactors such as ones for High Pressure and FCC use (01.05.14G) and Columns greater than 50m (01.05.09G) in length is that they require specific expertise and competences to be built.
- Ammonia and Urea reactors have their own categories due to the importance of these chemicals for fertilizing purposes.
- Towers are to be listed under the respective column category. This is acceptable due to their similarity in use and in competences necessary for construction.

### Internals

- The main purpose of internals for columns and reactors is to separate different parts of a solution. This can be done through distillation, absorption, stripping, crystallization, evaporation, phase separation, and membrane separation.
- Column and Tower internals includes all conventional internals that are not otherwise listed.
- Reactor internals include all of the internal components, from support grids to filters and baskets.

### Pressure Vessels

- The same separation used for Columns is used here too as Columns and Reactors are quite similar to pressure vessels and the aim is the same: to differentiate amongst manufacturers – who has which competences.
- All vessels are included in this family, whether they are drums, separators, scrubbers etc.
- We have included a specific category 01.07.13G for Slug catchers (and launchers) as they have a very specific use and market competition shows a split is required.
- Other Materials 01.07.12G includes all non-listed materials (titanium, zirconium, ...)

### Storage Facilities

The differentiation here is based on shape and use according to the following specifications:

- Storage tanks: large containers used to store liquids or compressed gases.
- Silos: more commonly used for bulk storage (coal, grains etc.). These categories can include Silos of all materials, welded or seamless and with or without rubber lining.
- Cylinders: Generally smaller and used for gas storage
- Spheres: preferred for LPG or high pressure fluids. The shape allows even distribution of stress on the sphere's surface, giving it a solid structure.
- Bullets: also mostly used for LPG storage and are horizontal.
- Storage Autoclaves: vessels used to process parts and materials which require exposure to elevated temperature or pressure. (they are here and not under pressure vessels as they are mainly used for storage purposes rather than processes).
- Underground vessels are a self standing category due to their nature.
- Atmospheric vessels also have a separate branch because they are used for storage of various types of liquids since they maintain atmospheric pressure.