Pressure Vessels Introduction and Types

Any cylinder with fluid inside it subjected to the fluid pressure is called a Pressure Vessel. There are basically three groups of pressure vessels:

- **Fired Steam Boiler** In which steam is generated by the application of heat resulting from the combustion of fuel (solid, liquid or gaseous).
- **Unfired Steam Boiler** In which heat is generated without the application of heat resulting from the combustion of fuel.
- **Unfired Pressure Vessel** Used for containing, storing, distributing, transferring, distilling, processing or handling fluids under pressure.
**Code for Pressure Vessels**

Basic code is American Society of Mechanical Engineers (A.S.M.E.) code for evaluating the safety and reliability of pressure vessels.

The code is divided into nine sections:

1. Section I Power Boilers
2. Section II Material Specifications
3. Section III Nuclear Vessels
4. Section IV Low-Pressure Heating Boilers
5. Section V Non-Destructive Examination
6. Section VI Recommended Rules for care of Heating Boilers
7. Section VII Recommended Rules for care of Power Boilers
8. Section VIII Pressure Vessels
9. Section IX Welding & Brazing Qualifications

**Code Defines**

Code defines the material used in the construction of the vessels, construction method, strength, and safe pressure calculations.

**Code Limitations**

Code only gives the vessel and its appurtenances but no details of the connections provided for attachment to piping external to vessel.

**Criteria for Pressure Vessels**

Criterion for pressure vessels is given as follows:

1. Thin-walled
   \[ t \leq \frac{1}{10} (R_{in}) \]
2. Thick-walled
Pressure vessels Testing

Pressure vessels are tested as a part of the certification requirements. Normally Pressure vessels are filled with liquids such as water and then are tested for pressure and for leakage. The recommended testing pressure for a vessel is given by the following formula:

\[
\text{Test Pressure} = 15 \times \frac{\text{Max. Stress for the material at test temp.}}{\text{Max. Stress for the material at room temp.}} \times \text{Max. Allowable Working pressure}
\]

Applications of Pressure Vessel in Power Plants

The majority of vessels in nuclear power plants are classified as Unfired Pressure vessels. The main steam generators in the primary heat transport system in the nuclear power plants are examples of unfired steam boilers. In thermal power plants, water heaters, steam drum, mud drums, and pressure tanks are pressure vessels. Pressure vessels are tested as a part of the certification requirements. Normally Pressure vessels are filled with liquids such as water and then are tested for pressure and for leakage.