CLEANING process, Measurements, Inspection and testing of castings

Cleaning of Castings
After the solidification of the casting, the mould is knocked out and solidified casting is taken out of the moulding sand. At this juncture the cast product is attached with risers, and gates. many times the moulding sand also get adhered to the casting as some of the sand gets fused with the molten metal. The cleaning of castings refers to the removal of gates, risers and sand. Also, cleaning may involve machining or abrasive finishing of the cast product. The cleaning operations usually performed on a casting are given below:
1. Removal of gates, in-gates, riser, feeder etc.
2. Surface cleaning
3. Trimming
4. Finishing

Removal of gates, in-gates, riser, feeder etc.
There are various methods of removal of unwanted metallic parts from the solidified cast product. in case of brittle material, the gates, risers, and feeder can be removed by impact force. this is usually done in shakeout or knock out devices. Other processes that may be used to cut off the metallic parts include, band saws, grinding machine, shearing machine, cutting torches, etc.

Surface cleaning
As the temperature of molten metal is usually high, sand particles near the surface of the casting gets fused and adheres to the surface of the casting. the cleaning of the surfaces both interior and exterior thus becomes necessary. There exist several methods to remove the adhered sand from the castings. Some of the most common methods of removal of sand are tumbling, and sand or
metallic shot blasting. Tumbling is done in a barrel like machine called as tumbling mill which helps to remove the sand by rubbing action of the cast parts with each other. Whereas, in blasting, abrasive particles are thrown on the surface of the casting in a carrying medium. Air is the most common medium used in this process. Sometimes, metallic shots are thrown on the surface of the castings to remove the unwanted material. Blasting processes include air blasting, centrifugal blasting, hydro-blasting etc. Other methods to clean the cast surface include wire brushing, and buffing.

**Trimming**

Trimming operations involves the removal of fins, gates and risers appendages, metallic chaplets, etc. These unwanted material is removed by using hammer and chisel called as chipping process, or by pneumatic chipping hammers or by the use of grinders.

**Finishing**

The finishing at this stage refers to the final cleaning. The castings after the removal of gates, risers, fins, chaplets, adhered sand is washed and then depending upon the requirements of the end product final finish is provided by machining, polishing, buffing, chemical treatment etc.

**Inspection of Castings**

Inspection of castings is done to ascertain various characteristics. Generally the inspection of castings is carried out to ascertain the required surface finish, dimensional accuracy, various mechanical and metallurgical properties and soundness. various tests used for inspection of castings are:

1. Measurement of the final dimensions
2. Measurement of Surface finish
3. Destructive testing
4. Non-destructive testing

**Measurement of the final dimensions**
The casting dimension can be measured through various callipers or gauges. The final dimension obtained is compared with the design dimension and dimensional accuracy can be calculated.

**Measurement of surface finish**
The surface finish of a casting can be measured by perthometer, roughness tester, and by using profilo-meter. Usually Root mean square values are measured.

**Destructive testing**
As the name of the test suggests destructive, the casting sample is prepared after cutting the final casting. Such types of tests are required to measure mechanical and metallurgical properties of the product. Mechanical tests include tensile strength measurement, toughness measurement, and hardness measurement. Metallurgical tests include dendrite arms spacing, type of structure obtained, and shrinkage cavities.

**Non-Destructive testing**
The various methods employed in this category of test are:

1. **Visual inspection**: is carried out to check the final appearance of the casting. Major cracks, swells, tears etc may be detected by this method.

2. **Radiographic inspection**: radiography is used to identify and measure the internal defects in the casting. Generally X-rays are used to identify the internal defects in castings.

3. **Magnetic particle inspection**: this test is not applicable to non-ferrous alloys. This test is conducted to determine and locate the structural discontinuity and subsurface defects in castings.

4. **Pressure testing**: It is employed to locate leaks in a casting or to check the overall strength of a casting in resistance to bursting under hydraulic pressure. It is carried out on tubes and pipes.

5. **Fluorescent penetrate**: the fluorescent penetrate is sued to locate the minutes pores and cracks in the final castings.